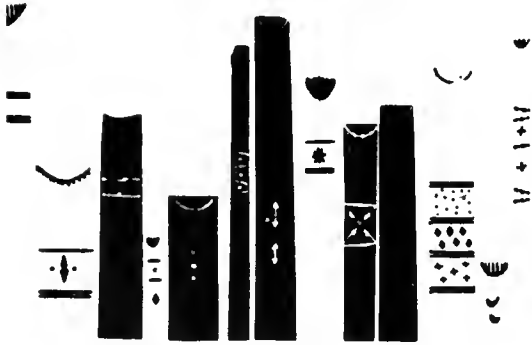




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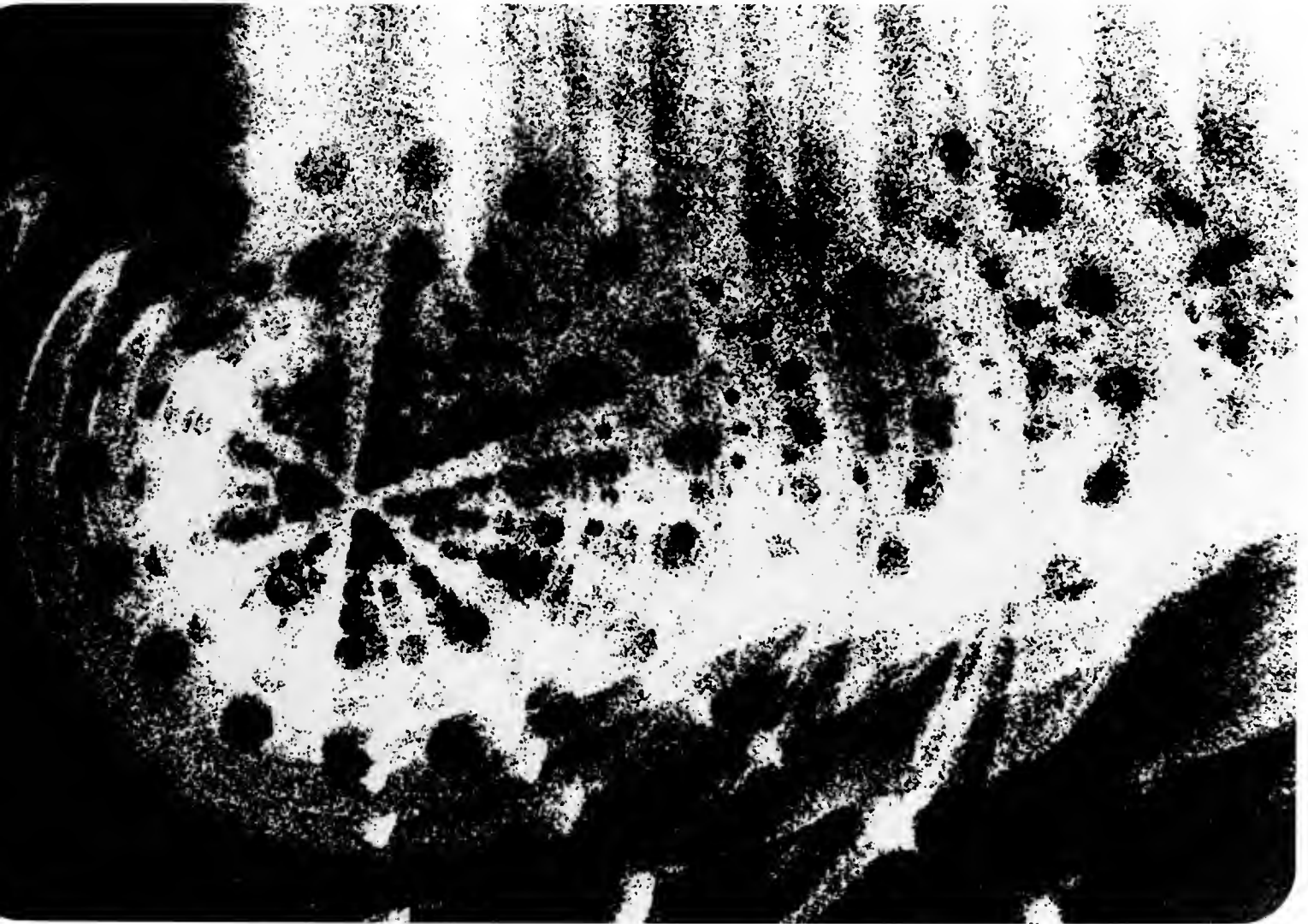




January/February 1968

# BELL

telephone magazine



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On the cover -- The vibrating gyrations of a telephone handset are symbolic of the fast-moving changes taking place in communications as a result of the innovative spirit of the Bell System. Radiating from the central purpose of creating even better ways for society to communicate, innovations in the Bell System provide new services for customers, challenges and rewards for employees, and earnings and dividends for share owners.

mericans will spend millions of dollars in 1968 on products and services that didn't exist 20 years ago, ten years ago, or even five years ago. In fact, the choices available to consumers, and the avalanche of "new" and "improved" products, are greater today than ever before in human history.

This unprecedented condition springs from an exponential growth of knowledge. For the past two centuries, the sum of human knowledge has doubled every ten years. Thus, while the rate of growth has been fairly constant, the volume of information available has increased phenomenally—a scientist who had two new technical papers to read every decade in the 1700's would be faced with one million such documents in the same time span today.

The dramatic growth of the knowledge explosion is just one indication of the innovative surge of society in the final third of the 20th century. Its magnitude and pace are apparent in everything from education to manned spacecraft, from the civil rights movement to communications. As the modern era rushes onward, it rapidly generates new dimensions of opportunity or disaster. The outcome for good or ill will depend on man's response to the economic and social consequences of an increasingly sophisticated technology.

Underlying the distinctly dynamic character of this age of monumental change is a process with obscure origins but highly evident impact: Innovation. The genesis of the innovative process has always been an idea, a concept. It is a unique mix of imaginative impulse and logical reasoning which must be directed toward a viable goal. The successful conversion of innovative energy from its point of origin in the mind to a useful product or service in the marketplace requires a collective expertise that marks every successful modern business enterprise.

The elements of this expertise, and how they work in the Bell System, are examined on the following pages.

# The Commitment to Innovation

“Leave the beaten track occasionally and dive into the woods. You will be certain to find something that you have never seen before.”

Alexander Graham Bell

The Bell System was born of an invention by Alexander Graham Bell, whose fertile innovative mind spawned new ideas in a wide variety of areas, ranging from aerodynamics to the breeding of sheep. This dynamic spirit for something new, something better has been the driving force that has provided this nation the world’s best communications service.

Any number of times in the history of the communications industry leaders of the Bell System might have reached the comfortable conclusion that telephone development had gone just about as far as it could go, and that future growth would depend primarily on expanding population. Yet wave upon wave of innovation in communications has resulted in this business expanding at a rate double that of the nation’s economy as a whole.

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What makes an organization innovative?

From the Bell System’s experience, there are three principal ingredients:

- People: Obtaining and motivating competent individuals;
- Purpose: The goals and objectives the organization sets for itself; and
- Environment: The freedom and incentive that the organization and the individuals in it have to meet those goals and objectives.

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Over the years, the Bell System has developed in response to one over-all objective: To provide the

best possible communications service and make it continuously better and more abundant.

This objective means that customers should find Bell System communications services more and more satisfying to use, more dependable, more versatile, more economical, more valuable. And implicit in this objective is a commitment to continuous innovation to a service that is not only “best” for today, but “continuously better and more abundant” for the future.

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Determining if an organization is “innovative” is difficult, especially since many people feel that new ideas flourish best in a small, young business. But that is not necessarily the case.

Businesses with a long history, or large organizations like the Bell System, can be equally as innovative. In fact, the economics of modern society require huge amounts of new capital and large numbers of highly skilled people to develop such concepts as the transistor effect, the Bell Solar Battery, a Telstar communications satellite, or a manufacturing application for lasers.

Innovation, too, does not restrict itself to technology. Any organization — young or old, large or small — can be receptive to applying new management techniques, exploring new ways of meeting its responsibilities to society, and adapting its policies and procedures to the changing needs of its customers.

First and foremost, it needs a commitment to innovation. □





# Organized for Innovation

Geared for evolutionary change,  
the closely integrated structure  
of the Bell System continually  
blends the best of the new  
into its communications network.

There is an innate discontent in the Bell System with the merely “good enough.” The source of this discontent is a basic precept—laid down by the founders of the business and often restated—that the growth and vitality of the business and its acceptance by the public are directly dependent on providing at reasonable cost the best communications possible.

To maintain the Bell System’s traditional standards of service and cost there must be a continual search for new knowledge and prompt development of communications improvements as they emerge. The result is that the Bell System is more often the creator of new demand rather than merely responsive to already established public needs or wishes.

For example, the Bell System’s work in television is as old as the technology itself. As early as 1925 Bell Telephone Laboratories engineers transmitted a still picture by sending pulses over a wire, and in 1929 first demonstrated color television. And the development of coaxial cable that same year laid the groundwork for modern TV.

Evidence that the continued quest for improvement

is fruitful can also be seen in such developments as microwave, which has been one of the fundamental factors in making possible today’s low-cost, high-volume transmission of voice, data and TV programs.

And, perhaps the most visible example is the most familiar: the modern 500-type telephone set. Since introduced in 1950, some 2300 different design changes have been made in it by Bell Telephone Laboratories and the Western Electric Company. As a result, the 500-set is more trouble free and efficient than ever before, and costs only half as much to make as in 1950.

## The freedom to explore

It is fundamental to the philosophy which engenders this kind of progress in telephone service that the seeker of new knowledge should be free to follow the road that might lead to improved communications. This freedom to explore not only brought profound changes to the telephone system, but has produced such dramatic results as transistors, solar batteries, and satellite communications.

Not only is cultivation of an atmosphere in which innovation flourishes a fundamental part of management philosophy in the Bell System, but the integrated manner in which the innovation process is managed is equally basic and has been shaped by the nature of the telephone network itself. As such it is unique in industry.

## Changes must be evolutionary

The uniqueness stems from the fact that the Bell System’s integrated network is a complete and homogeneous system—the world’s largest and most sophisticated machine. In this machine no single element functions alone. It is only when all elements function together as a unity that the usefulness of each is revealed and the total system fully functions. In a real sense, the proper functioning of the system is dependent on the smooth meshing of each of its parts.

Unlike other machines, the switched network must grow and change while it is operating. It can never be shut down while improvements are made. Thus, any changes in the nation's communications network must be evolutionary. The wholesale scrapping of working equipment in which billions have been invested and replacing it with new would be as unthinkable from the financial point of view as it would be disastrous in terms of service disruption.

And, as the system evolves, all additions must be compatible with existing equipment. Innovations must also be proved out in terms of their practical value and they must meet rigid reliability and cost standards to meet the overall Bell System objectives.

Achieving this calls for the closest coordination among all units of the System. People responsible for operations, for research and development, and for manufacturing and supply all must participate and all must understand the other's functions and needs.

A classic example of how change is blended into the operation of the telephone network is the development and introduction of the new electronic switching system, the largest development effort ever undertaken by the Bell System.

## Promises and Problems of ESS

The promise of the electronic age after World War II included a multitude of possible improvements in communications. From the outset, it was obvious that electronic switching elements could be a thousand-fold faster than those of electromechanical systems and could provide an almost unlimited family of new telephone services. But the new system had to be compatible with existing equipment and had to be installed gradually over a period of many years. Meanwhile, the existing dial systems would continue to operate, routing calls through combinations of ESS centers and electromechanical centers. The new system also had to match or better all the service and reliability standards of the existing dial system and do it at no greater cost.

But bringing production costs down in line with that of existing dial systems was not easy. ESS developers found that whenever they revised cost estimates for producing the electronic system, they found the cost of electromechanical systems also had dropped.

To make an electronic system competitive, Bell Labs and Western Electric engineers sought less expensive hardware — transistors, diodes and memory equipment. By 1963, the cost of ESS was low enough to put the new switching system into production. In 1965, ESS became a working reality when the first electronic exchange began routing calls at Succasunna, New Jersey.

## Coordinate to innovate

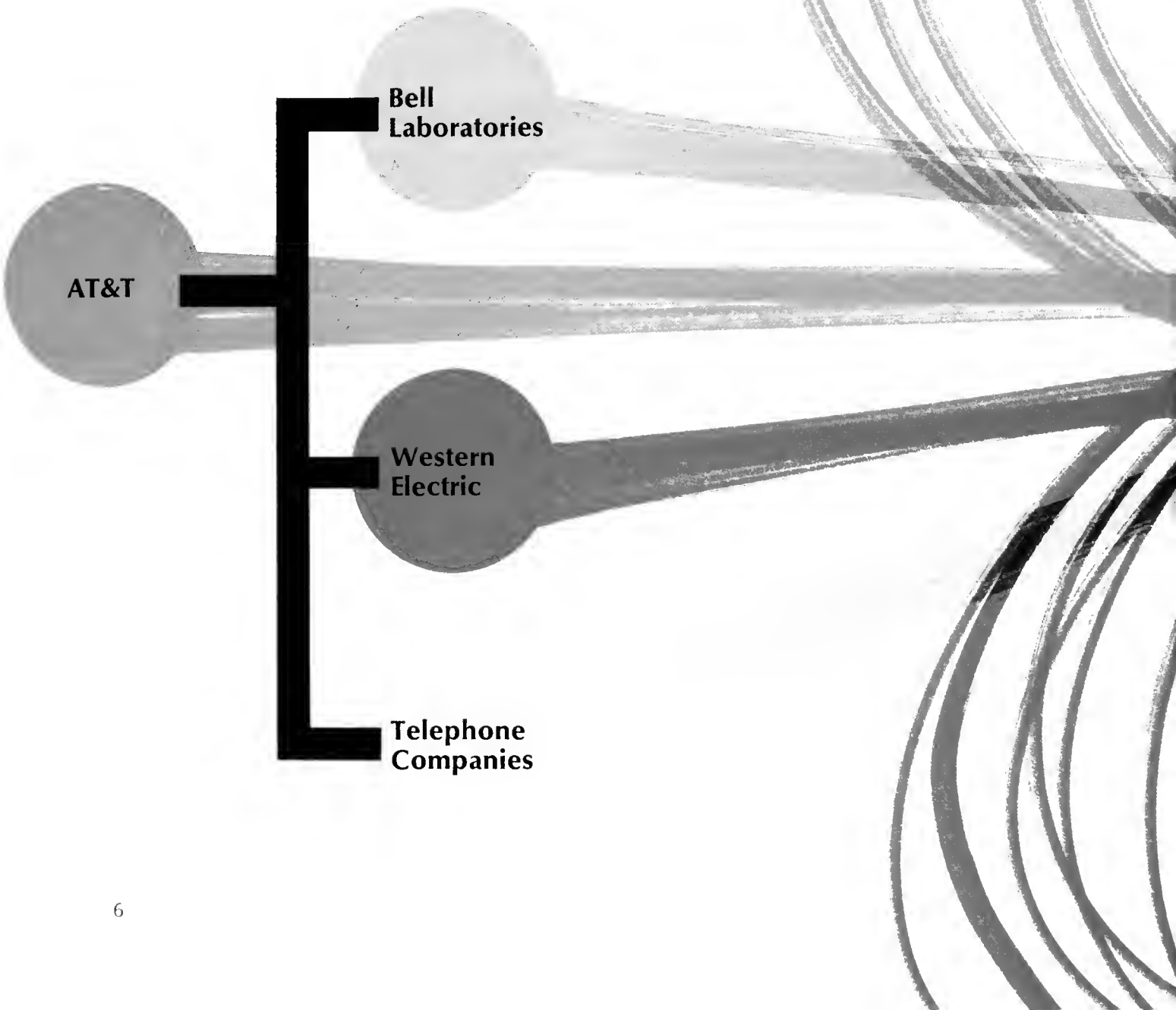
Electronic switching, along with an array of other Bell System developments, was the product of a carefully planned interchange of ideas and information between the four basic organizations that make up the Bell System—AT&T, Western Electric, Bell Laboratories and the 23 Bell telephone companies.

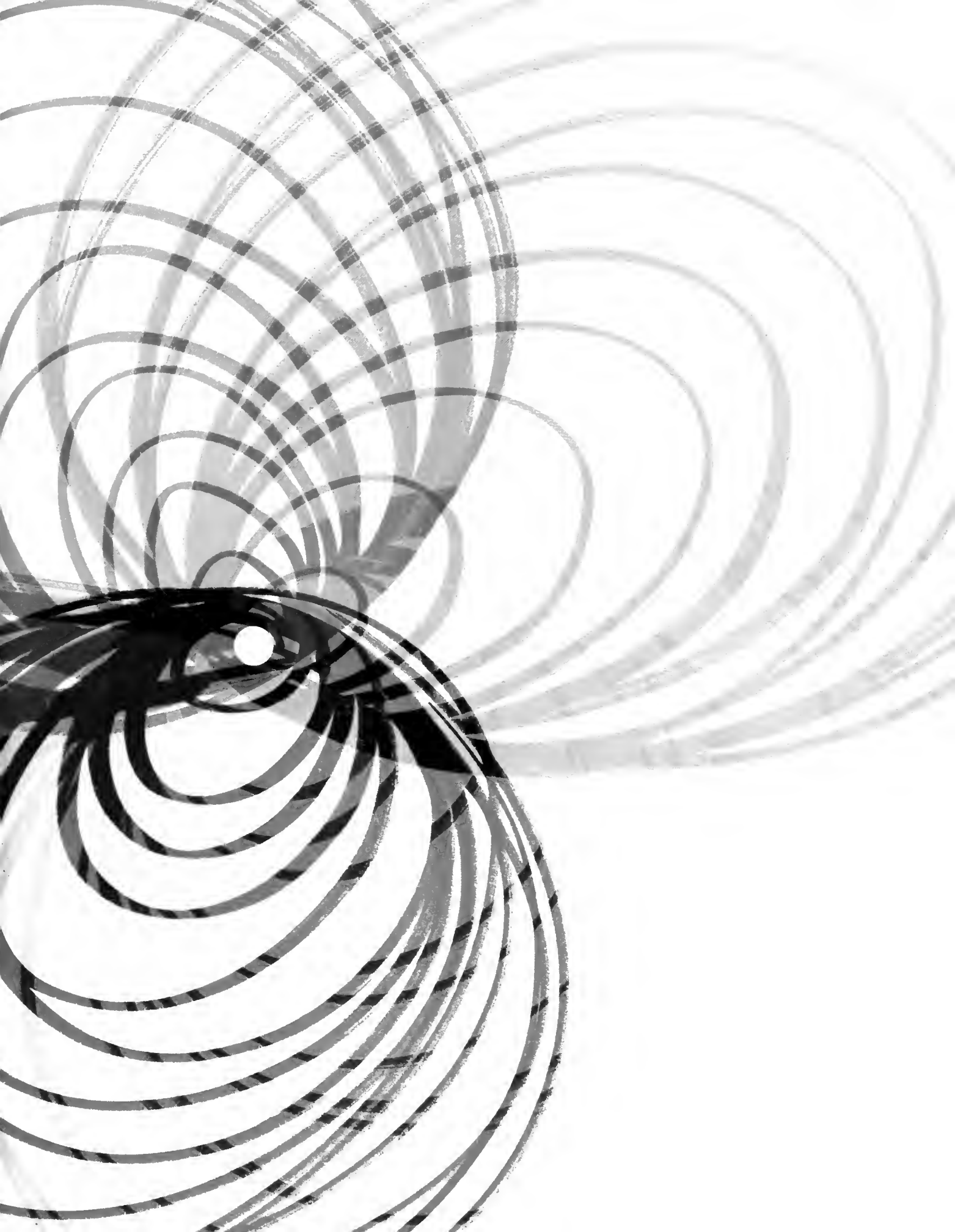
Overall administrative and organizational direction for the system is provided by AT&T; Bell Laboratories is the center for most of the Bell System's research and development effort; Western Electric manufactures the equipment used in providing service, and the operating telephone companies install and maintain facilities for the benefit of customers.

Any part of the Bell System can be the genesis of an idea to be passed along and polished by the other parts. Often the inspiration for an improvement comes from a telephone company's search for ways of tailoring its service to meet changing needs. New ideas can — and often do — spring from Western Electric's unrelenting search for better manufacturing techniques. And, of course, the Bell System's creative core is Bell Telephone Laboratories.

But it is the way the parts of the Bell System work together that makes the innovative process work and produce an abundance of ideas being shaped into finished products and services.

The energies of the three principal units of the Bell System are directed toward one central objective—providing ever-improving communications services. The research of Bell Laboratories, the manufacturing and supply activities of Western Electric, and the operations of 23 Bell telephone companies are focused on this unifying goal and coordinated through AT&T's common ownership.





# The Manager's Changing Role in Technological Innovation

The growing complexity of science and society—and their interaction—calls for today's manager to create an organizational structure that cultivates free communication between specialists in an increasing variety of disciplines.

**By Jack A. Morton**

Innovation means many things to many people. To some it means simply improving the old; to others it is developing new products and services by applying new technology.

Regardless of how you look at it, innovation is not a simple act. It is not just discovery of new knowledge, not just the development of a new or improved product, manufacturing technique, or service. Rather, innovation is all of these things, a total process in which all of these creative acts are present and acting together in an integrated way toward a common goal.

If an organization is to be innovative, it must motivate specialized people to be individually creative, yet collectively cooperative for organizational goals. To achieve this is a major challenge and responsibility for today's managers of research, development, manufacturing and operations.

Although managers have long been studying the behavior of corporations—how to make them more efficient, more profitable and longer-lived — little attention has been given to analyzing the process of innovation itself. Most enterprises limit their innova-

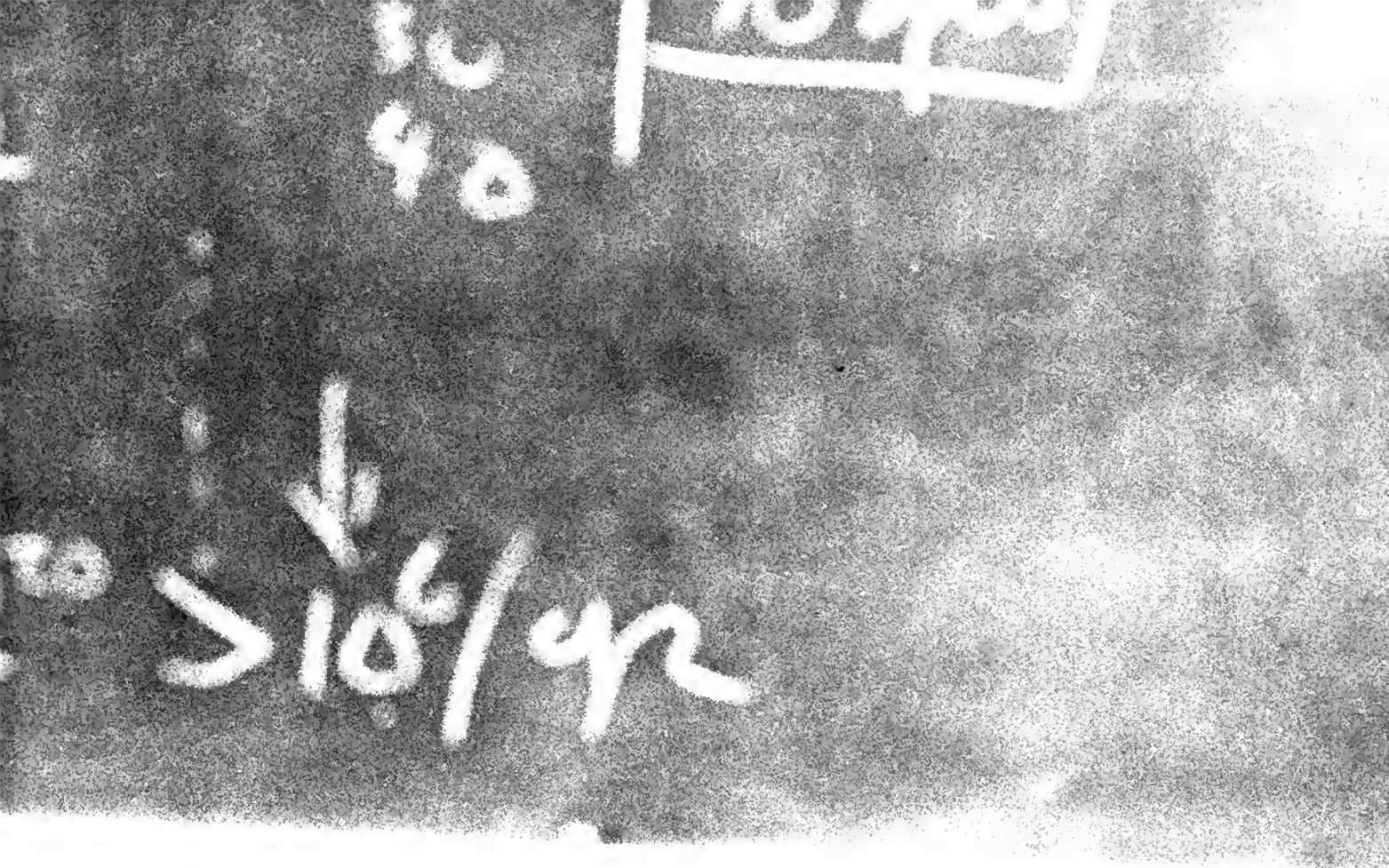
tive efforts to new products or services—when it is the organization itself which may be most in need of renewal for its people, its purpose and its structure.

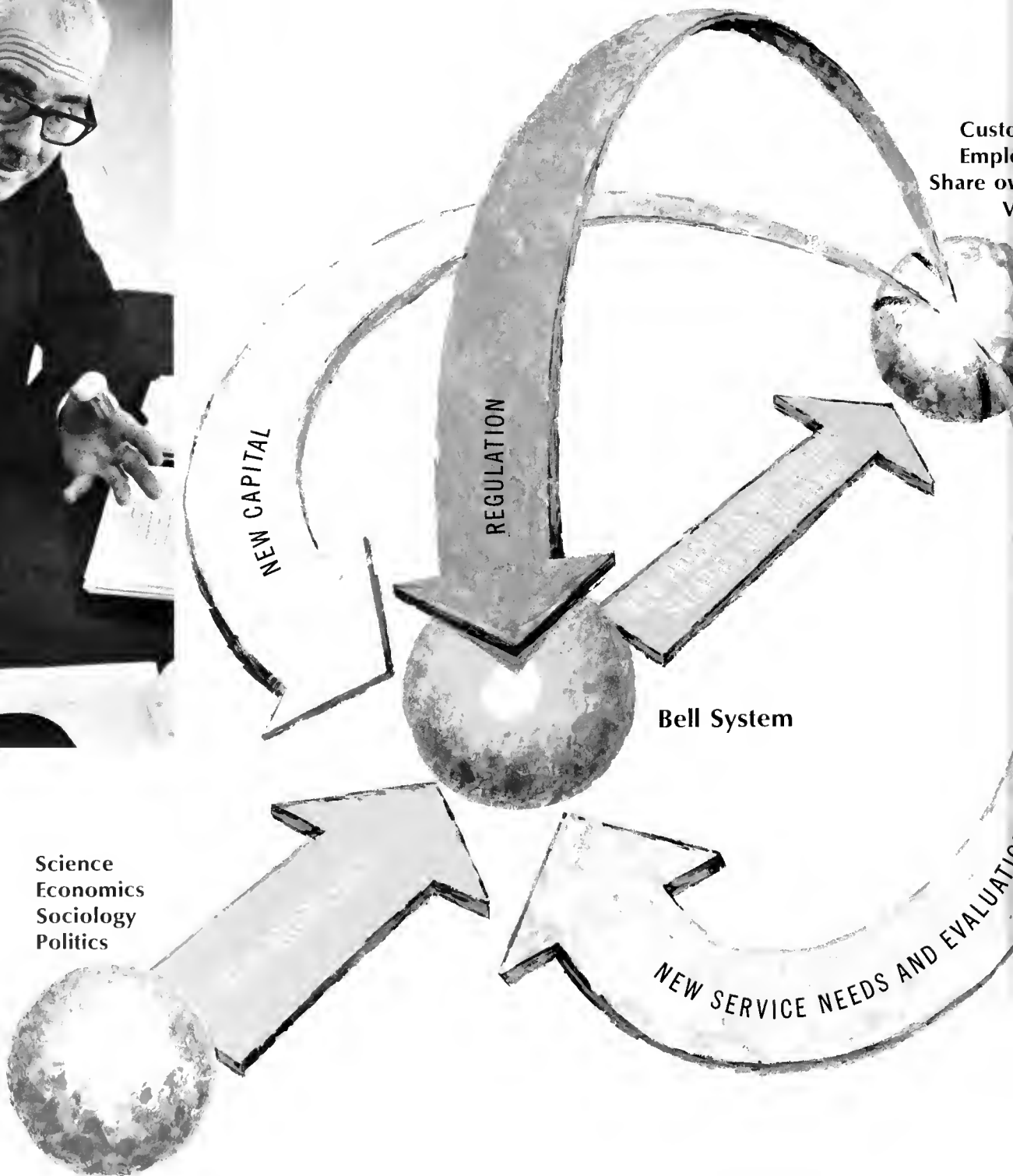
Today's fast pace of change calls for managers to study innovation from the ecological point of view; in other words, from the point of view of all the forces of change and the adaptive mutations in purpose, content and structure which living organizations try in seeking symbiosis in society.

In earlier times, the manager's role was that of a programmer for what was viewed as an inanimate system, where merely changing the physical environment would bring about improvement. But the limitations of this approach were evident in studies like the Western Electric Hawthorne experiments which forcibly reminded us that people were not inanimate parts of a machine; they had needs, desires and strong adaptive responses to change.

As technological innovation grew, the need for

*Mr. Morton, a frequent contributor to professional publications on the subject of innovation, is vice president in charge of electronic components development at Bell Telephone Laboratories.*







an understanding of its complex process shifted the manager's role to that of a systems engineer. This approach led to the specialization of people for creativity, and the coupling of specialties to accomplish overall purposes. As a systems engineer, the manager proposed and the specialized people disposed.

But now, the manager can no longer be viewed as a programmer or a systems engineer. Today, he must become the selective agent of change, which means he must be alert to all the forces of change and the creative responses of human specialists in seeking combinations of needs and possibilities. He must pay more attention to providing a community in which creative dialogue and decision-making take place at all specialist levels and interfaces. He must see that these people are thoroughly grounded in knowledge and understanding of corporate structure and purpose.

Managers must not only think about the internal characteristics and adaptive behavior of their own community, but also look at the cooperative relationships between their own and other communities.

This ecological approach to innovation gives added emphasis and importance to the individually creative, yet cooperative actions of, people. It does, in fact, recognize that creative people, acting individually and collectively, are the true source of innovation of "living" organizations.

## Specialists and common purpose

Today's technology is so massive and so complex that the finite limits of people require specialization for creativity. But, if we are to have overall system effectiveness, specialists must work together toward a common purpose. Only in this way can the result be greater than the sum of its individual parts.

How can we break down the total process into specialized parts, and at the same time take account of the similarities and differences and strengths and limitations of people? There is perhaps no one best way to do it, but the way the Bell System has done it

has been sufficiently innovative and adaptive for the business to survive and grow for almost 90 years.

We view the Bell System as an organization of many diverse people who discover and transform relevant knowledge into new communications technology. This technology, when installed and operating, provides improved communications services for customers, salaries to employees, and dividends to share owners. These people—customers, employees, share owners, and the public in general—supply feedbacks to the system from their many viewpoints. In addition, knowledge and resources from the world environment at large give us another important input. Together they provide essential error-signals that tell us how we are doing.

For example, if we cannot acquire enough operating revenues and capital, we cannot acquire the superior people and facilities to create new knowledge. Nor can we convert that knowledge into renewed technology and service. In short, if the inputs, outputs and feedbacks are properly balanced, the system can survive and grow; if not, it dies and more adaptive organisms take over the function.

## The creative action starts

To match people with different motivations and talents to Bell Laboratories' mission, we recognize clearly the separate but closely associated functions of basic research, applied research (or exploratory development) and development design. We rely upon the specialists in each of these areas to make relevant judgments on needs and possibilities within their own fields of competence. This is where the creative action starts.

Through their professional and organizational activities, these people are in intimate contact with each other and the outside world of science and technology. But the other important links—to AT&T, the general marketplace and the operating telephone companies—are geographically dispersed and greatly different in content. As a result, it is difficult for re-

search and development experts to absorb, understand, and be challenged by economic and social needs and opportunities, and still remain creatively effective in their own fields.

For this reason, we have developed the function of “systems engineering.” Systems engineers are our generalists. They are former specialists with experience in several areas of science who have broadened their knowledge to include new disciplines such as economics, sociology, and psychology. Their big job is to build information bridges connecting economic needs to scientific possibilities. By relating needs to possibilities at the system level, they propose plans for new system developments.

But each group, whatever its specialty, translates overall goals into subgoals and a hierarchy of needs for its own area. Each group makes its own evaluation of relevance for its work and its own creative connections between need and possibility. If they understand the needs, specialists are best able to make such evaluations and choices.

In this daily working of technological innovation, we are dealing with a two-way flow of highly unstructured information between specialists. The knowledge is usually incomplete and needs ordering through teaching-learning and tradeoff judgments between specialists. Thus, this processing depends vitally upon interpersonal communications. Many factors can stimulate—or inhibit—such communications. For example:

- *Language*: If people cannot understand one another, if their levels of specialized knowledge are too different, they cannot share a discourse on common problems.
- *Space*: Even when people share a common language, distance can still be a serious barrier. Eyeball-to-eyeball dialogue is essential between specialists discussing the unstructured problems of creativity.
- *Organizational structure*: This should be based on the specializations couplings desired. Person-to-person dialogue and tradeoff decisions must occur directly across specialist interfaces at all levels, re-

gardless of lines of authority. Complexity of the problem, not authority, should determine the levels of decision-making. Delays, noise and distortion result if communications must go up and down long organizational lines.

- *Technical aids*: More and more, technology is making personal communications effective despite distance. Modern transportation and communications are advancing at a rapid pace, and soon Picturephone service and multiple access computers will be added as new aids.
- *Motivation*: There must be commensurate challenges and rewards (fun, freedom, fame and fortune) for all specialists in the process from basic research to operations so that everyone will want to communicate for the common good.
- *Movement of people*: As people grow, gain experience and mature, their motivations change. Alert managers will sense these changes and move people around when organizational opportunities and motivational changes coincide.

## Bonds and barriers for creative growth

In terms of these factors, managers can either stimulate or inhibit essential dialogue between their people. They can build bonds and barriers to work in complementary, compatible fashion to optimize the flow of information throughout the process. The bonds permit constructive discussion and judgments, and the barriers prevent destructive domination or inhibition by one group over another. The right combination of bonds and barriers is needed to protect the creative growth and freedom of all specialists.

The problem of specialist coupling is vitally important and generally not well understood. It is difficult enough to acquire and develop high levels of creative specialization, but it is a much more subtle and complex task to couple specialists for overall system purposes. Moreover, as purpose, size and specialization of the organization grow, these couplings are affected and are difficult to modify. Historically,

vertical specialization has been so great that it has formed the prime structure for whole corporations. But the total process of innovation of systems today requires that these specializations be joined together.

Indeed, providing for productive interpersonal coupling is one of the great problems that the electronics industry must solve today to meet the challenges and opportunities of integrated electronics. Scientists, engineers and even marketing people have had to specialize according to materials, devices, circuits and systems.

This problem began to be felt in the transistor era and is now becoming acute in the era of integrated electronics. It is certainly more difficult now because the common purpose of a single corporation and the common language of a vertical discipline are often missing. At the same time, in integrated electronics, cost-effectiveness requires earlier and more intensive communications and tradeoff judgments between material, device and systems people. This important dimension of specialization and coupling needs far more study for understanding and managerial innovation. Indeed, this aspect of the innovation process may well have more impact on the structure of the electronic industry than anything in its past.

### Horizontal specializations change

In addition, the horizontal specializations from research through development to manufacturing and operations have changed in intensity throughout the years. As our organization has grown in response to larger possibilities and purpose, our corporate specialization have had to increase and we have had to decentralize. As a result, the nature of the couplings between and within AT&T, Bell Laboratories, Western Electric, and the telephone companies has required hard thought and has been changed drastically.

The organization which fails to change with its changing environment and changing internal and external problems and opportunities becomes a static organization. And a static organization decays.

### The manager's job evolves

In short, the manager's job is "The Innovation of Innovation." His job is to renew the purpose, content and structure of his process. He must not program his "machine" in the computer sense. Being composed of living, interacting parts, the organization is a living organism which can, itself, learn, change and grow in its changing world.

As the selective agent of change, the manager is the catalyst, the mutation selector. Through his understanding of the process and its responses to stimuli, he can judge, select, and reinforce those responses and changes that improve the organization and increases its capability for innovation. He can become the "Maxwell Demon" of adaptive mutations and increase the probability that adaptive response will succeed.

This means that the manager is like the ecologist, that specialist in the relatively new interdisciplinary science devoted to understanding the interrelationships between living organisms and their environment. Such a role helps the manager ask new questions about the internal and external workings of the innovative process: how, through people, it makes junctures between need and possibility; how it responds to change, threat or opportunity; and how it changes purpose, content and structure for growth as a living organism.

The environment of living organisms is made up of the physical non-living world and other living species. Different species group together in certain environments to form "communities." Each species or community of species can be differentiated from others by its particular function, content and structure. The concept of a "major community" is an intriguing one: an assemblage of different species and their physical environment so interacting that they are symbiotic — they survive in a self-regulating, mutually beneficial way. The total environment of living and physical effects is an "ecosystem."

In an ecosystem the internal and external forces

act on the species or community. Some of these forces can be purely physical from the non-living environment; others may be biological from the other living species in the community. Some come from the activities of the species or community itself. They too can be physical or biological.

For the species or community to exist symbiotically in its ecosystem, it must be able to respond creatively and *adapt* to the forces generated by itself, by all other species, and by the physical environment of its ecosystem.

### Ecology of organizations

Let us adapt this concept to the process of innovation. Our various specialists correspond to species. Grouped together in their corporation environment they form a community. Various communities (corporations) are differentiated by their particular purpose, content and structure. By immersing such a community-corporation in its ecosystem of the physical world and other communities we can look at the interplay of forces and responses among them.

Not only do the inputs to a community provide the resources (capital, information, and people) to be processed into useful outputs, they also act as forces for adaptive change in the purpose, content and structure. Further, the activities of the community itself—both the internal specialized “products” and the total output—act as additional important stimuli for change in purpose, content and structure. And finally, the community-corporation not only tries to produce outputs useful to the ecosystem and itself—based on its current capabilities—but even more importantly, it tries adaptive change of purpose, content and structure to improve its symbiotic potential.

We can find an example of this by going back twenty years to the invention of the transistor. Mervin Kelly (Bell Labs’ executive vice president in 1945) signalled the basic limitations of vacuum tubes and the great need for a new kind of electronic amplifier. But only James Fisk, William Shockley, and their fellow

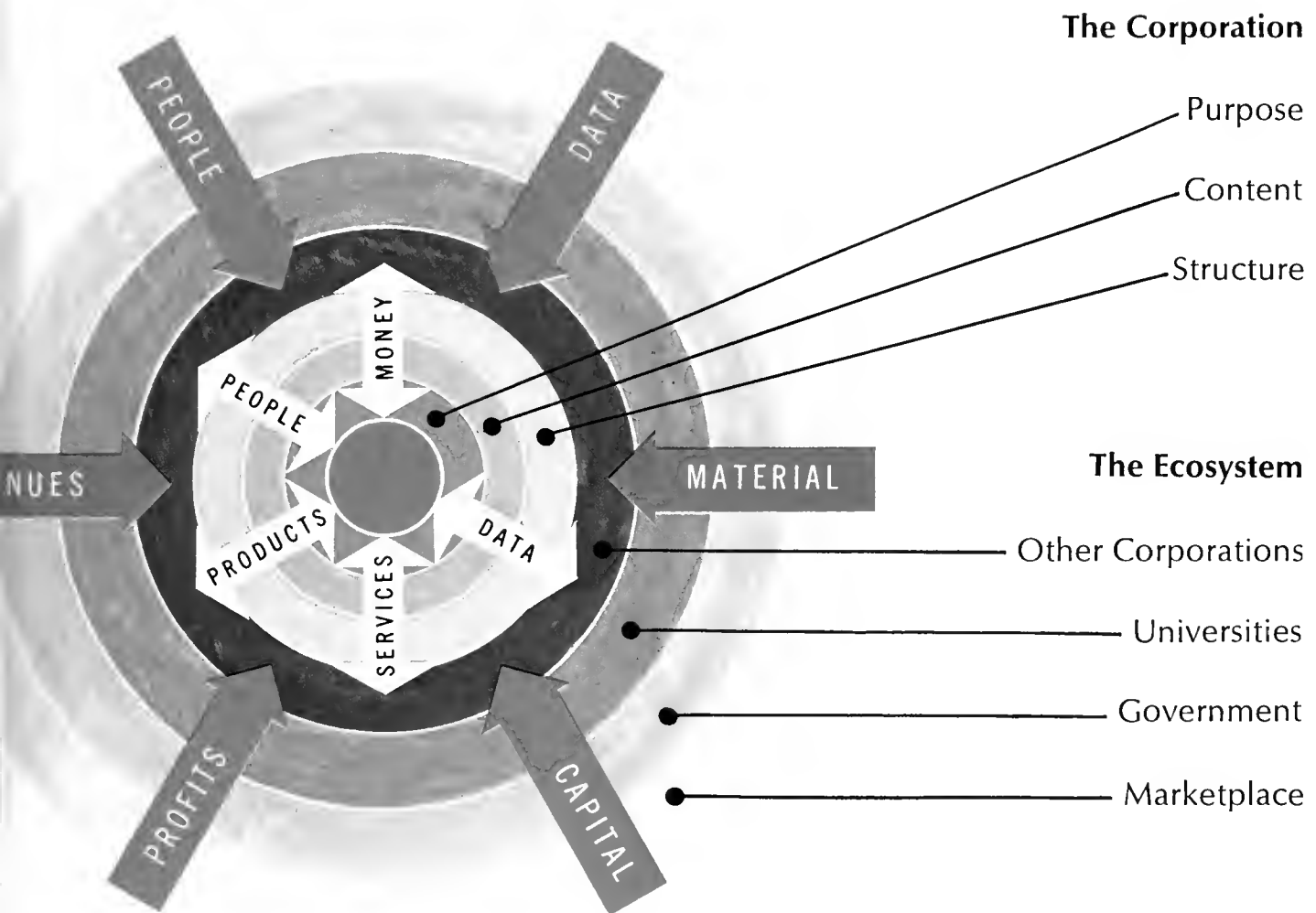
Just as a living organism survives by adapting to stimuli—both from within and from its environment—a corporate organization survives by adapting its purpose, content and structure to changes taking place within itself and its ecosystem.



scientists knew enough about the state of general physical science to creatively choose the field of semiconductor physics for basic understanding and application. It was the specialists who knew the most about possibilities and opportunities.

Prior to the research discovery of the transistor effect, the Bell System had no applied research, development, manufacture or operation of transistor materials, devices or systems. Nor did we have any specialized people or knowledge, beyond that of a small research group in solid-state physics, chemistry or technology. But, to exploit the innovative potential of this new discovery, we had to significantly change our purpose, content and structure.

That change was a product of both creative indi-



viduals and management. New purpose, new content, and new structure had to be created to meet the new opportunities created by the new knowledge.

The managers were the "Maxwell Demons" who encouraged the acceptance and application of the new, "hot" ideas generated by the creative specialists.

From this viewpoint, managers have a more difficult, subtle and non-structured role to play than in the past. It is not programming or directing. It goes beyond systems engineering to recognizing and re-

inforcing the best adaptive change in purpose, content and structure from the many alternatives generated by creative specialists.

The manager's role demands thorough understanding of the process of innovation itself. Beyond that, it requires understanding of the source of creative ideas and the importance of communications among specialists, plus knowledge of the needs, limitations and purpose of the whole. Though specialists innovate technology, managers must innovate innovation. □

## Flexibility to Innovate

Advanced product development groups are fostering creative interaction between specialists from Bell Laboratories and the Western Electric Company

During the past few years, a number of prominent organizations, including the National Academy of Sciences and the Department of Commerce, have sponsored in-depth studies in an effort to determine what conditions are most conducive to technological innovation.

These studies do not disclose any miraculous formulas that guarantee technological innovation. Nor was that their purpose. Their aim was merely to identify conditions that are common to most innovative situations in industry today.

A good many factors were cited in these reports, ranging from highly motivated personnel and sufficient capital to the need for a highly flexible organization that is geared toward identifying potential improvements and needs, and in promoting—rather than simply reacting to—change.

Representative was the study conducted by the Department of Defense into a number of its recent projects. In eight of the ten cases investigated, it was found that “flexibility of organization” was one of the key factors in developing new technology.

### The coupling of specialists

The study, which was headed by Morris Tanenbaum, director of the Western Electric Company's Engineering Research Center in Princeton, New Jersey, pointed out that organizational flexibility permitted a free and constant interaction between various groups of specialists which resulted in the introduction of innovative ideas and techniques.

Organizational flexibility that has permitted the coupling of specialists has been a characteristic of the Bell System down through the years. In the last two decades, in particular, there has been a steadily increasing interaction between various group of specialists within the Bell System, especially between

*Advanced product development groups bring together design and manufacturing specialists, help cut initial production costs and speed up the introduction of new products and services.*



groups of varying disciplines at Bell Telephone Laboratories and the Western Electric Company, the Bell System's manufacturing and supply unit.

Although a highly qualified staff of research and development specialists can contribute a continuous flow of new technology, it does not assure the rapid and effective introduction of new products and services. To speed up this process — and hold down the costs of applying the latest technology — the Bell System began in the 1950's to bring about an even closer interaction of specialists between the development people who design products and those who manufacture them.

### Design and manufacture linked

Organizing Bell Laboratories development groups in Western Electric manufacturing plants has proved highly effective. In addition to making a significant contribution to Western Electric's cost avoidance program, it has helped cut the time between product design and its introduction to service.

For example, the period of time between the final

product design and actual production of the standard desk telephone in use today was about 27 months. But, the new Trimline® telephone, a much more complex product, took only eight months.

Yet, bringing Bell Laboratories and Western Electric groups together was not the complete answer. Continued development of new technology and increased pressure to put it to use, has required more than proximity of research and manufacturing people. It has, in many cases, called for by-passing traditional organizational barriers and the creation of specialized priority groups, of Bell Labs and Western Electric people, who have considerable freedom of action.

To enable Western Electric engineers and their Bell Laboratories counterparts to work even more closely than before on cost avoidance, the Indianapolis Works in 1966 organized Advanced Product Development (APD) groups, representing a more intensive and formal approach in refining the team concept that has existed for years between Bell Telephone Laboratories and Western Electric engineers.

These groups, made up of Bell Labs designers and Western Electric product engineers, whose responsi-





bilities range from materials to aesthetics, are generally assigned to new products while still in the early design stage.

"The purpose of APD", says James R. Signorino, Western Electric coordinator of advanced product development at Indianapolis "is to use the new technology as efficiently and effectively as possible."

### Approaching at the basic level

While much of their work is necessarily of a highly technical nature, the advanced product development groups approach each assignment at its most basic level. This usually involves asking such elementary questions about a product or component as "What is it?" "What does it do?" "What must it do?" and "What else will perform the function?"

"The aim of this fundamental approach," comments Karl E. Hammer, a Bell Labs supervisor at Western Electric's Indianapolis plant, "is to reinforce the idea that nothing is taken for granted and to question even the most obvious. Only in this way can we be assured of an exhaustive analysis of a given product both from design and manufacturing considerations."

The Western Electric concept of advanced product development goes back to 1962 and a project called Ideas Unlimited. This was an experimental endeavor into cost savings that applied a number of value analysis techniques to various products. The result was cumulative savings of over \$400,000.

Subsequently, another project was conducted with the Call Director telephone, a multi-key set now in wide use in businesses. Although conducted late in the design stage, the project demonstrated that group creativity techniques can cut costs and reduce production time. It also revealed that benefits increase when manufacturing and development specialists get together early in the design stage.

*An APD group led by Western Electric's Max Potter (pointing) discusses the design and manufacturing specifications for a new Craftsman's Handset, developed for use by telephone linemen.*

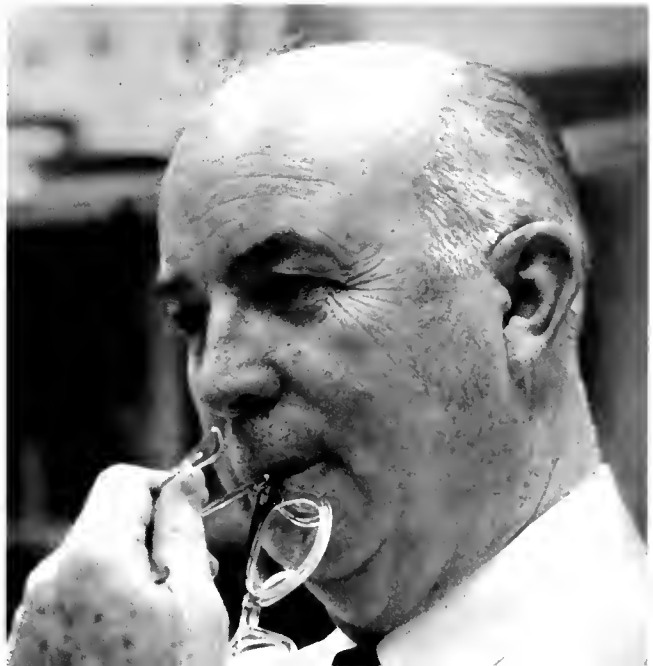
### An exhaustive evaluation

APD operates through a team of five or six men, each of whom bring to a project experience in some area of design, development or engineering.

The approach of an APD group to a problem is a practical one. It starts with a clear and concise defi-

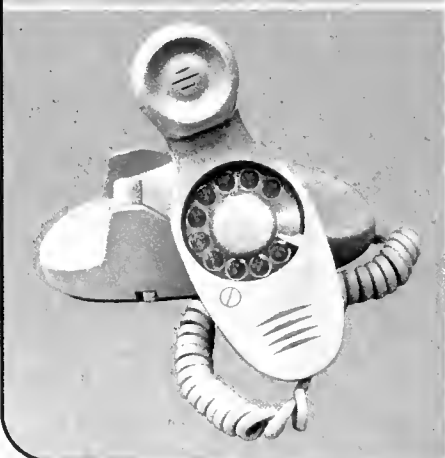


*Core of the Indianapolis advanced product development group consists of James R. Signorino (above) of Western Electric, who coordinates the group's efforts, and Karl E. Hammer of Bell Telephone Laboratories, who oversees product design.*



## The Evolution of a Telephone

The various shapes the Trimline telephone took before it was introduced demonstrate the need for a close relationship between design and manufacturing specialists. For each exterior design the complex internal circuitry of the telephone had to be modified.



inition of the function and an evaluation of the product's worth in terms of cost and value. Extensive research on the product is conducted by the experts in their respective areas, and suggestions undergo further evaluation in a special Performance and Reliability Laboratory.

"No change of responsibility for design or manufacturing is intended under the APD concept," says Mr. Signorino. "Bell Laboratories remains responsible for product design and Western Electric for manufacture. An APD group simply acts as an independent and objective team that endeavors to apply highly specialized knowledge toward lowering product costs and improving quality."

### Customer needs guide the effort

Since their formation, these advanced product development groups of Bell Labs and Western Electric people have been active in a wide range of product areas. Their performance has been indeed impressive. An illustrative case is the recent Preset Dial project. (A Preset Dial is a mechanism encased in a phone which enables customers to call a particular location, such as a hotel from an airport, simply by pressing a button.)

APD work started some 11 months prior to the date that Bell Laboratories was scheduled to present its final design to Western Electric production. A team, consisting of a BTL design engineer and five Western Electric engineers, held 38 meetings, consulted with 10 other Western Electric engineers, two other Bell Labs engineers and 19 representatives of suppliers and other companies. The Performance and Reliability Lab tested both the components of the prototype model and proposed alternative designs.

Since APD efforts began before design was completed by Bell Laboratories and conducted in parallel with final design work, it is not possible to determine "before" and "after" costs. However, changes proposed by the APD group alone would avoid first-year manufacturing costs of about \$250,000.

"There will also be cost avoidance benefits for the telephone companies in installation and maintenance as a result of the APD efforts," Mr. Signorino says. "We are sure that the improved materials and assembly methods and the simplification of design that the APD group came up with, will give the telephone customer better service through improved and more reliable performance."

Performance geared to customer needs is the objective of all efforts of these APD groups. For, while methods and means may be developed to reduce the cost of a particular product, they can be implemented only if they meet or surpass the rigid quality of the existing network and, at the same time, be compatible with all other components in it.

"Many times", Mr. Signorino points out, "specialists working by themselves have uncovered ways to reduce costs or facilitate production, but when we've gotten together we learned that we have to discard them because they would result in a product that, while workable, would not meet the strict reliability standards of the Bell System network.

"But this has not been discouraging. We're not out to cut costs for its own sake. Rather, our aim is to apply new ideas and technology toward helping our counterparts in the telephone companies provide the public with better, more economical service earlier without compromising Bell System standards. If we can't do this, APD groups are not really justified."

### Future promises increased interaction

What is happening at Indianapolis and at other Western Electric locations is, of course, just one way an organization can try to achieve the flexibility so vital to innovative efforts. Where the APD concept will lead, what new organizational groupings might evolve from it, no one knows. One thing is certain, however: the blurring pace of technology and the ever accelerating demand for newer and better communications calls for increasing interaction between all phases of the business. □

## Innovating the Production Line

Intensive and imaginative research into manufacturing techniques is generating major advances in telephone equipment production.

It has been 10 years since the Western Electric Engineering Research Center was started in a modified farm house in Hopewell Township, New Jersey. Since then, the Center, now housed in a complex of buildings in Princeton, has established itself as one of the finest applied manufacturing research laboratories in the country.

The need for such a center became apparent about a dozen years ago when the growing use of tiny electronic components required someone to step back from the production lines and take a close look at the wide variety of new manufacturing processes that were beginning to emerge. Parts of some Western Electric plants were beginning to look more like a laboratory clean room than the traditional manufacturing operation.

In the words of its director, Dr. Morris Tanenbaum, the Center's mission is "to create and develop new processes which will improve our ability to manufacture our present products and most importantly,

prepare us to manufacture and supply the completely new products and systems of the future. As new telephone equipment becomes more and more complex, it is absolutely essential that we start working at an earlier and earlier stage of design in order to make sure that we have developed the processes which will be required to manufacture new designs."

Because of the interrelationship of research and development, the Engineering Research Center works closely with Bell Laboratories, frequently conducting manufacturing research in parallel with product research. "Otherwise," says Dr. Tanenbaum, "we might end up either with a process for a product that was not useful or with a product but no way to make it reliably and economically."

In reviewing the Center's brief history, Dr. Tanenbaum says that when the center was first organized its work was generally tied to what were then current manufacturing problems. "Today, our work has two major thrusts: First, we are deeply concerned with future manufacturing problems that will result from new designs coming out of Bell Laboratories. Second, we try to take a fundamentally different look at old manufacturing problems and develop completely new approaches to their solution."

In many instances, the Research Center is helping to revolutionize manufacturing. For example, the Center developed a new process for forming metals which uses ultra-high pressure to increase the ductility of metal so it can be stretched and shaped far beyond its normal characteristics. Hailed as one of the most significant new basic metal working techniques to come along in many years, the technique enables Western Electric to use a continuous process in metal working instead of the conventional multi-stage operations.

Another result of the Center's research has been the development of new processes for the manufacture of integrated circuits, processes which must meet exacting requirements for tolerances and control. Working closely with Bell Laboratories scientists who had demonstrated the great potential of tantalum

thin film circuits in telephone equipment, Western Electric engineers developed a machine which makes it possible to produce integrated circuits in large quantities at a reasonable cost. The machine is essentially a continuous conveyor line which vaporizes the tantalum metal onto glass slides by moving it from atmospheric conditions into a very high vacuum and back out again.

"These examples show how we are using discoveries in science in order to greatly improve the way in which we manufacture today's telephone equipment," says Dr. Tanenbaum. "They also indicate how manufacturing research performed for the telephone business can have large stimulating effects on other manufacturing industries."

*A revolutionary technique for forming metal under intense pressure is one result of the Center's engineering research. Here, John Archer loads a new tool into a prototype machine.*

*The development of techniques to use a laser beam to drill holes through diamond dies is typical of the Engineering Research Center's work. With the laser drill, work that once required several days can now be completed in 10 minutes.*



## The Economics of Innovation

Service is the telephone company's most important product.

To meet the communications needs of a growing population requires not only a commitment to ever improving service but a regulatory climate that recognizes the need for adequate earnings to support that service goal.



Although regulation influences much of what they do, most managers of the telephone company have little personal contact with the people who man the regulatory commissions. It was a memorable occasion for the young district manager in Lynchburg, Virginia, therefore, when a member of the Virginia State Corporation Commission came to call one day. Particularly since the visitor was Judge H. Lester Hooker, senior member of the Commission and one of the most respected regulatory officials, not only in the state but in the nation.

It was not exactly a social call. Judge Hooker was there because he wanted an explanation of what the company planned to do about a service problem in nearby Danville. Fortunately, the service problem was soon remedied and forgotten. But the experience was something the young district manager had reason never to forget.

"I was amazed at the time that a commissioner would travel all the way from Richmond to investigate our service," says Samuel E. Bonsack, now a vice president and chief operating officer of the Chesapeake and Potomac Telephone Company of Virginia. "Today I would be amazed if any aspect of our service escaped the Commission's attention."

Mr. Bonsack is not complaining about the inquisitiveness of the Commission. On the contrary, he looks on the contacts which he and members of his staff have with the Commission as opportunities—opportunities to demonstrate the company's philosophy of good service and more particularly the long-range interests of both customers and company.

"We consider it essential that we give the public what it wants in the way of forward-looking service," Mr. Bonsack explains, "and the only way we can do that is by convincing the Commission that our objectives—and our performance—merit earnings adequate to finance improvement and growth."

*Regulatory commissioners like Judge Jesse Dillon (third from left) learn of telephone company service problems and objectives through on-the-scene observations and frequent meetings.*

Having worked on the operations side for most of his 28 years in the Bell System, Mr. Bonsack is well aware of the service needs and problems of the business, especially in Virginia, where he joined C&P upon graduation from college. And as a former assistant comptroller at AT&T, he is also intimately aware of the economics of providing that service.

### Serving a highly critical area

In terms of size and telephone development, the company he now heads does not rank among the largest Bell System companies. It does, however, serve the communications needs of 80 percent of the telephone-using public in the state, and being located at the doorstep of the nation's capital, it serves a significant and, in many respects, an extremely sensitive area. Within Virginia's borders are some of the free world's most important military bases, most of them participating in the Southeast Asia conflict. Norfolk is headquarters for the U.S. Atlantic Fleet, and its Naval operating base is the largest such establishment in the world. Across Hampton Roads on the Virginia Peninsula lies the U.S. Continental Army Command, which is in charge of all Army bases on the U.S. mainland, and nearby is Langley Air Force Base, headquarters of the Tactical Air Command. In addition, the nation's Defense General Supply Center for all military services is located near Richmond while the most important defense installation of all, the Department of Defense, is headquartered at the Pentagon in Northern Virginia.

This vast military complex plus a fast-growing private sector has placed heavy demands on the telephone industry. Since 1960, the company has experienced a 54 per cent increase in the number of telephones, a 55 per cent increase in telephone usage, and construction expenditures of \$500 million.

*Adequate earnings make possible construction of facilities to meet telephone growth. Here C & P Vice President Samuel Bonsack (standing, left) inspects new equipment building.*



Sitting in his eighth floor office in a building that doubles as the company's executive headquarters and Richmond's principal telephone equipment building, Mr. Bonsack discussed some of the challenges that this rapid expansion presents. With him was Arthur W. Harrison, assistant vice president in charge of revenue requirements and public relations.

"Our biggest single problem today is growth," Mr. Bonsack says, "and along with it the need for consistently improving earnings to be able to handle that growth. For example, the dollars of plant we have in service to serve our customers have increased faster than those of any other Bell System operating company during the last five years. Along with steadily rising wages and other inflationary pressures, our construction expenditures have nearly doubled in the five-year period. This has had an attritional effect on our earnings because many of our construction projects produce better service but no revenue.

"All of this means, we must constantly search for new ways to improve earnings."

### Growth brings customer benefits

One way to boost earnings, of course, is through rate increases. But it is a way that Bell companies adopt reluctantly and only when rising costs offer no alternative. Characteristically, they look to their innovative ability to find methods of operating the business more efficiently and to develop new services that generate more revenue, in an equitable manner.

The result is almost paradoxical. While the Virginia company in the last decade has gone through its greatest and most expensive growth period, it has still been able to produce "rate packages" which have meant increased service benefits and savings to customers of \$13.3 million annually, based on current volumes. Of this, \$8.1 million was ordered by the Virginia Commission in connection with intrastate

service while the balance resulted from changes in interstate rates. Even though the Commission authorized offsetting increases, chiefly in non-recurring charges, totaling \$2 million during the same 10-year period, the customers still currently net an overall benefit of \$11.3 million per year.

### Adequate earnings are the key

This kind of record, Mr. Bonsack said, would have been impossible if earnings had not remained adequate during that period.

It's also significant, as the Commission pointed out in a press statement, that, "This series of telephone rate reductions has been possible over a period when the cost-of-living index has been rising and prices in-



*Central office repairmen in Richmond man the test board of a \$10 million switching machine. Such large plant investments are essential to fulfill modern communications needs.*



creasing for many other commodities and products.”

The company’s ability to achieve its dual objectives of good service and good earnings, Mr. Bonsack acknowledges, rests in no small measure on the regulatory climate in which the company operates. To make his point, he picked up some papers from his desk and began to read:

“We expect a utility to be able to give service promptly at reasonable prices. In other words, it must be able to take care of the expressed demand for services. Then, of course, we expect the utility to improve its services; to keep up with the times; to better old services; and to introduce new ones.”

Flipping through several pages, he continued:

“In the consumer’s interest, every practical development should go to work as soon as possible. How-

ever, only the financially strong company can afford the heavy expenditures required to do away with the old and install the new.”

Finally, Mr. Bonsack read:

“It’s the responsibility of the utilities to provide what the consumer wants, and it’s necessary that the utility be granted the opportunity to attain the financial health required to meet its responsibility by the regulatory commissions.”

The author of this statement of regulatory philosophy? Mr. Bonsack pushed the papers across the desk and pointed to the byline: “Remarks by H. Lester Hooker at a meeting of the National Association of Railroad and Utility Commissioners.”

As one who has been handling telephone matters with the Virginia Commission and staff over the past 20 years, Arthur Harrison is well aware of the Commission’s concern with good performance. “Operating under this Commission,” he says, “is like undergoing a very demanding but fair trial.” He further observed that, in a showdown, good service always comes first in the Commission’s concept of the “public interest.”

“The Commission staff in Virginia numbers nearly 300 and is one of the largest of any state in the country,” he says. “They watch us closely and push us hard to make sure that we are improving our internal efficiency and introducing the newest technology.”

“The important thing, though, is that they are more interested in the long-range prospects than in the short pull.”

What this can mean to consumer and company alike is illustrated by a Commission decision when federal income tax rates were slashed in 1964.

The Commission was faced with ordering the company to pass these tax savings along to customers through decreasing rates for basic service, or allowing the company to invest the tax savings in a broad-scale service improvement program which would expand local calling areas by eliminating the toll charges between some 60 Virginia communities. Pointing out that an immediate flow-through would only amount



to a few cents a month on each customer's bill, the Commission chose the alternative of enhancing the value of the subscribers' service. This improvement plan resulted in increased service benefits and savings of \$2 million per year for the customers involved. By comparison, an immediate tax flow-through would have produced only inconsequential savings — with no long-range benefits from improved service.

### Long-range view prevails

What the Commission looks for when it considers the company's service improvement proposals is apparent from public statements made three years ago when a \$3 million rate package was approved. The fifth major intrastate telephone rate reduction within a four-year period, these latest changes, the Commission said, were part of a series of rate reductions designed "to reduce disparities between intrastate and interstate toll rate levels, to increase the 'value of service' through enlarging the subscribers' scope of local calling, and to facilitate the improvement in service quality."

One phase of the 1965 rate package included a unique proposal, worked out jointly by the Commission and the company, that was aimed at ultimately phasing out rural grades of service. Called Statewide Planned Residence Exchange Development (SPRED), the program, according to the Commission, "recognizes Virginia's change from a primarily agricultural to an industrial economy and will result in better service for our growing population in suburban and rural areas." The Commission further stated that, "Removal of short-haul toll barriers between exchanges has proven a popular factor in stimulating social as well as business intercourse, thus contributing to general progress in the areas involved."

Still another example of how a long-range regulatory view can have far-reaching effects, and insure equitable treatment of all customers, can be found in a program instituted to avoid lengthy formal proceedings that are expensive to taxpayer and company

alike. The company's exchanges are now divided into seven rate groups, with the number of telephones that can be called without a toll charge, as well as the rates, being progressively higher in each group. This recognizes the fact that for the main basic offerings, the more telephones available locally, the more valuable the service and, therefore, the higher the rate. The State Supreme Court had approved, on several appeals, this element of Virginia's statewide rate-making principle with its "value of service" concept. And in the 1957 Rate Case, the Commission decided when an exchange outgrows its rate group, it can — after due notice to the Commission and customers — be reclassified automatically to a higher rate group, appropriate to the exchange's expanded size.

"This means that we're not faced with the regulatory lag that you find in the traditional ratemaking process when everything is decided by formal rate cases," Mr. Bonsack says. "It also enables us to devote our energies to coming up with more innovative rate and service improvement packages such as we have been able to effectuate over the last 10 years. But more important, it helps us in our planning."

As in most Bell System companies, long-range planning is becoming increasingly important and it is something which the Virginia Company has developed to a fine art.

"With the state growing so rapidly," Mr. Bonsack explains "we have to take a long-range view to make sure that we have adequate earnings to meet the needs of an expanding population. The problem, of course, is that the development and implementation of both revenue producing and expense reduction projects are time consuming. Even when the project is launched, it may take a year or so of operation before it is contributing its maximum potential to the overall effort."

The long-range forecasting is done by two committees. One, an earnings policy committee, lends broad policy direction in four areas: revenue requirements, expense control, construction programming, and rate action. The second committee makes the

nuts and bolts recommendations from which the earnings policy committee picks those which the company will pursue.

"We prefer to avoid formal rate action whenever possible," Mr. Bonsack says. "And we believe that if our forecasts are good enough, we have a better chance of avoiding a general rate case by developing new revenue producing projects, by improving expense control, or by making adjustments in our construction program."

Whatever the company does, of course, is subject to the scrutiny of the Commission; but Mr. Bonsack and his staff are convinced that the Commission will not block projects that assure quality service at reasonable rates. "We know from past experience with the Commission that it is always facing the future to find the best for the consumers we serve."

### **New services must be planned**

How well the company forecasts its future needs and those of the telephone customer has much to do with how rapidly new technology and new services are introduced. The offering of the new Touch-Tone telephone, for example, requires a substantial investment in central office equipment, an investment which must be programmed years in advance. Similarly the company's ability to provide improved long distance service, to undertake projects such as accelerating the placing of telephone cable underground, and to introduce internal efficiencies such as computer-based information systems all require planning to make sure the money is available.

"We're not innovative in the sense that Bell Laboratories and Western Electric are," Mr. Bonsack says. "We don't invent a new telephone or develop a switching system. We are at the end of the innovative process where a new product or system is translated into service. But we have to be innovative insofar as deciding how best to introduce a new service, where it can be used to the best advantage, and how our service can best serve the needs of the state.

"The fact that earnings have improved in recent years, has enabled the company to speed up the innovative process," he added. It has also permitted management to risk increasingly large capital commitments for additions and improvements to plant, to introduce the newest technology, and to offer improved service at the same or lower rates.

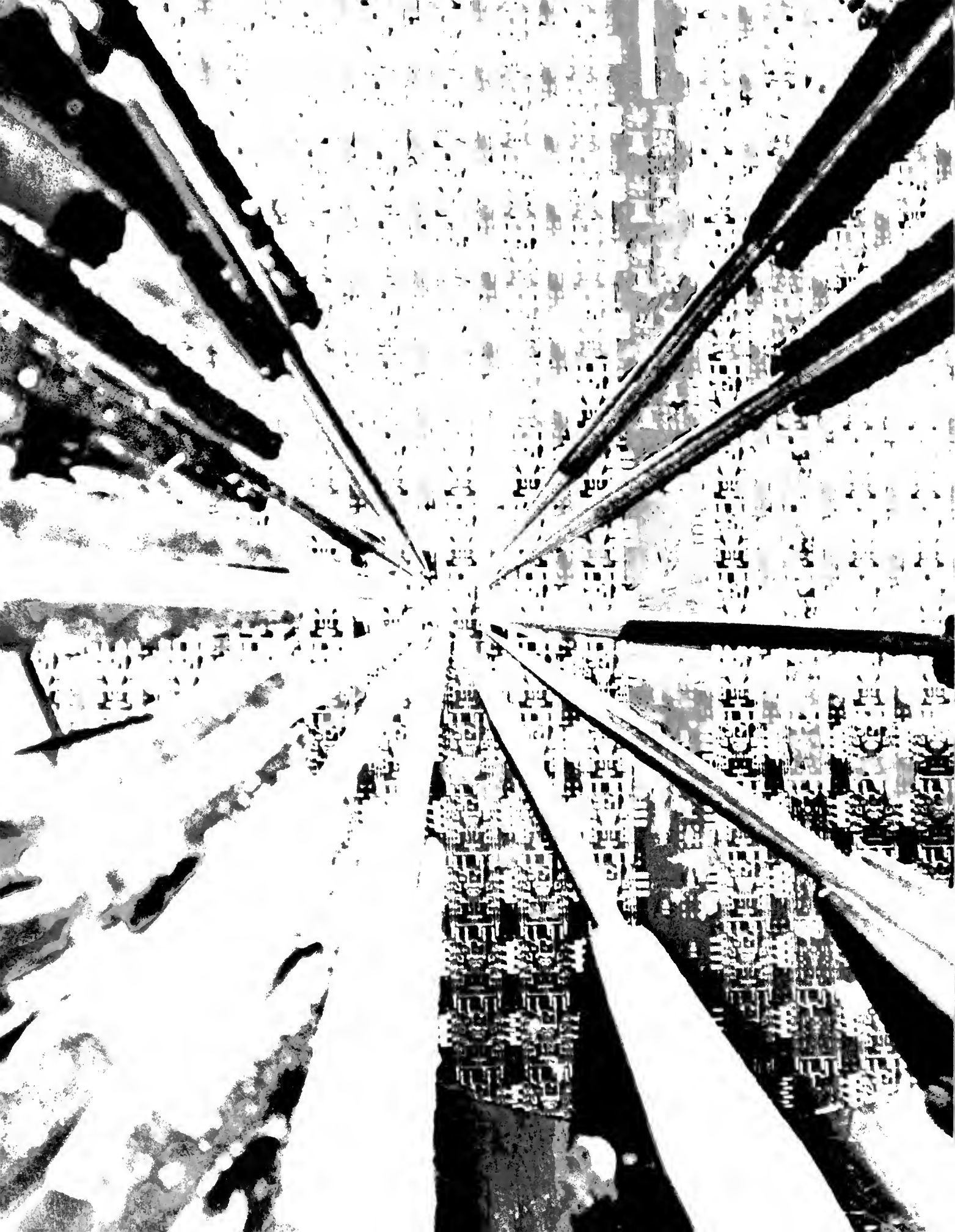
### **Building for the future**

For example, with sufficient earnings the company can afford to construct a new central office with enough capacity to take care of growth over a period of years. If earnings were depressed, on the other hand, management might be forced to the less efficient alternative of limiting the size of the office to immediate needs with very little provision for growth.

Adequate earnings also make the difference when it comes to offering innovations such as the Special Services Management Bureau in Richmond. Operating 24 hours a day, seven days a week, this bureau has the responsibility of insuring that highly complex and sophisticated communications services such as private-line networks are performing satisfactorily. Such innovations may not be obvious to the general public, nor are they necessarily revenue-producing services—but they are, nevertheless, important to the provision of complete communications service.

The Virginia Company's dedication to providing this type of top quality, ever improving service is not unique. It is fundamental to every Bell System company. But its ability to do so stems largely from the kind of regulatory climate in which it operates.

"What we need is an enlightened regulatory framework which provides the freedom to manage the business in the best interests of both the customers and the company, plus the knowledge that we can continue to improve earnings, within reasonable limits, through our own innovation and efficiency," Mr. Bonsack sums up. "As long as we have that incentive, we're confident we can provide the kind of communications the people of this state need and want." □



## The Results of Innovation

More than 500 of the over 5,000 non-government industrial research and development laboratories in the United States today are actively engaged in electronics and communications research. But even though Bell Telephone Laboratories' professional technical staff accounts for less than five per cent of the electronics industry's total, there is ample evidence that Bell Laboratories scientists and engineers—working in close concert with the Western Electric Company and Bell System telephone companies—have made significant technical contributions far in excess of what their relative size would suggest.

The massive electronics industry, for example, has been nourished in a large measure by the Bell System's communications science and technology; the semiconductor industry stems directly from the Bell

Labs, discovery of the transistor effect; and the Bell System had much to do with the origins of both analogue and digital computers and information processing.

Systems engineering, the weapons systems concept, information theory, and statistical quality control are other examples of industry-wide activities whose principles were first explored and practiced on a wide scale by the Bell System. Through a liberal policy of scientific publication of the results of its research and development activities, Bell System findings are made available to other industries. This interaction with other industries, in turn, brings values to the Bell System for it is able to learn and make use of the best technology—whatever its origin—to the benefit of the telephone customer.

*Bell Labs scientists Bardeen, Brattain and Shockley 20 years ago discovered the transistor effect. Considered one of this century's greatest inventions, the transistor gave birth to what is now a \$13 billion industry in the U.S. Bell Labs has continued to pioneer in semiconductor development; the transistor has spawned a vast progeny—in telephony, radio, TV, medicine, computers. Transistorized devices rest on the ocean's floor and on the moon's surface.*

*Now, the new art of integrated electronics lits 50 to 100 transistors in one pinhead-sized integrated circuit and carries semiconductors to new reaches of speed, economy and reliability.*

*When, in the fall of 1937, Bell Labs mathematician George Stibitz entered his office with a homemade contraption of tobacco tins, flashlight bulbs, batteries and old telephone relays, few realized that he had liberated the calculating machine from the notched wheel and foreshadowed use of binary number notation in today's computers. That weekend activity soon flowered into a Bell Labs project and in 1939 produced the first electrical digital computer. Such mathematical expertise has continued in men like Claude Shannon, whose information theory in 1948 paved the way for modern data transmission, and John Tukey, who daily probes the computer's limits.*





*Bell System research in transmission techniques led to a demonstration of intercity television in 1927, and to the first intercity color TV in 1936.*

*Bell Labs scientists have always sought ways to improve quality and capacity of the nationwide communications network.*

*The invention of carrier systems squeezed many conversations onto one circuit. Coaxial cable and microwave relay now spread radio and TV networks across the land.*

*Over the years, Bell Labs scientists studying transmission problems contributed to other sciences: Karl Jansky, in the 1920's, investigating noise in radiotelephony, founded the science of radio astronomy. And Harold S. Black's negative feedback amplifier became a keystone of the hi-fi industry. Now, Bell Labs is developing digital techniques for voice, TV and data transmission.*

*From the systems engineering concept devised by the Bell System to weapons control systems in World War II and today's huge and complex command networks for SAC and NORAD, Bell System expertise in communications technology has made steadily growing contributions to military security in our nation's defense. Western Electric designed and built the DEW Line above the arctic circle; designed and coordinated the Ballistic Missile Early Warning System; engineered, built and installed the command guidance systems responsible for launching and controlling the flight of over 200 U.S. missiles. And NASA's global tracking network for the Mercury program—an 830,000-mile radio and cable complex of data, TV, telephone and teletypewriter circuits—was conceived, and built by the Bell System.*





In 1954 John R. Pierce of Bell Labs first proposed a concrete, workable plan to use an unmanned artificial satellite orbiting the earth as a relay station in space for telephone and TV communications. Telstar I, the world's first active communications satellite, designed and built by a WE-Bell Labs task force, was launched July 10, 1962. There are now over 30 operational communications satellites orbiting the earth. But if it had not been for two Bell Labs inventions—the transistor and the Bell Solar Battery that powers the “birds’” electronics—satellite communications might not exist. Also important in today's satellites is the traveling wave tube which amplifies signals, invented by Rudy Kompfner, now at Bell Labs.

Behind the visible activity of a Western Electric assembly line there stands the invisible monitor of statistical quality control. WE led all major industrial organizations in implementing this technique, devised in 1931 by Bell Labs mathematician John Shewhart. It is now used in more than 80 percent of U.S. production. By predicting costly errors in production processes before they occur, it reduces the risk of tackling new products. WE also pioneered in improving factory output through group wage incentive plans and through formal cost reduction programs. These have achieved millions of dollars in operating economies and have helped keep down the cost of telephone service.









## Creating an Innovative Environment

How do you establish a climate in which the innovative process can flourish? One answer lies in having an organization which encourages every employee to contribute to the fulfillment of common objectives.

“We have certainly found that top level management doesn’t have any corner on ideas. The people out there in the field are the ones who know all the details and the problems. All you have to do is establish an environment in which their ideas can bubble up, and then stand back.

“You’re going to get lots of bubbles.”

That is how Gordon C. Bill, general manager of the AT&T Long Lines Department’s Southern Area, looks at his organization. He has 5,000 people working for him in a nine-state area, and he thinks each of them has some important things to say about running the business. Furthermore, he is working to

*The joint setting of objectives is one of the ways Gordon Bill (third from left) helps create an environment for innovation in the Southern Area of AT&T’s Long Lines department in Atlanta.*

create an organization which makes it possible for them to be heard.

What Gordon Bill is trying to build is something that every manager strives for: an environment which encourages and promotes creative thought and action by every member of the organization. Business has always been concerned with this problem, but never was the need for an innovative climate more imperative than it is today. With business operations becoming more complex and the pressures of competition growing steadily, the success of any business depends more and more on its innovative performance.

### OD breaks the ice

But how do you create an innovative climate? Many approaches have been tried. In the Bell System alone, attempts to find the best approach have led personnel through countless studies and down various avenues. Although no final answers have been found, some highly encouraging new programs have been developed, including one which the Long Lines' Southern Area is now using.

It is called Organization Development or simply OD. Based on the self-renewal and motivational theories advanced by John Gardner, Frederick Herzberg and others, Organization Development is a sort of do-it-yourself method of revitalizing an organization. Unlike other "development" programs which tended to be one-shot efforts aimed at individuals, OD is directed toward the total organization and is a continuing effort to increase efficiency and improve job satisfaction.

Although he is now an enthusiastic supporter of the OD concept, Mr. Bill admits that at first he had some doubts that the program would be worth the time and money.

"When we ran the pilot course, we had all levels of management from department heads to first line supervisors represented," Mr. Bill recalls. "Some of us thought it wouldn't work having such a big spread of levels all in the same room. But, lo and behold,

once the ice was broken, there were first line supervisors challenging me directly and telling me what they thought about the problems of the business. I realized then that this could really work, that it would open doors that needed opening."

A major objective of Organization Development is, as Mr. Bill suggests, to break down communications barriers and to create a common awareness of problem areas and a desire to work together toward solving these problems. More specifically, it provides an organization with a systematic method for working to improve their overall effectiveness.

In actual practice, this is exactly what the group approach to solving problems has done. For example, shortly after going through the OD training program, a plant first line supervisor was faced with the cutover of a new office. "Before this," he said, "I would have sat down and figured, we have to do this, and we have to do that. I would have laid out some work, given it to my craftsmen and said, here do it.

"Instead, I called the men together and said, 'We have a problem with this cutover coming up. Let's kick it around and figure out the best way to do it.' It turned out to be the best cutover we ever had. Those men wanted to meet better transmission results than I would have asked for. More important, this was something that they themselves had generated; they were made a part of the problem, rather than just being told what to do."

### Program brings positive results

Although OD promotes group solutions, it is not management by committee. The supervisor still has to make the decision—but he has no corner on ideas. The principle of group discussion and participation is the important difference from the old way of doing things. "If the people in a group have been party to the solution of a problem," Mr. Bill observed, "obviously they're going to support it, and the whole thing will work a lot better." This in itself makes the OD program of significant value to managers like Gordon



Bill, who, with 5,000 employees in his organization, is vitally concerned with the effective use of people.

Several examples illustrate how OD has increased efficiency and helped create an environment in which people can make a maximum contribution.

- A woman employee in Atlanta who had been administering only the employee benefit program was given the additional responsibility for pensions, insurance and security matters. Told that she was expected to make her own decisions and try new things, she arranged a series of meetings for retired people in several southern cities at which she explained recent changes in the benefit and pension program. Indicative of the response to this innovation was the comment of one retiree's wife who had herself recently retired from a large insurance company. "I thought they were good at explaining things," she said, "but they can't hold a candle to you people!"

- Faced with a high turnover among plant craft people, it was decided in an OD session that there was too much classroom training and not enough actual work experience. Bored by weeks of training classes, the men were leaving to take jobs where they would be put to work immediately. To overcome

*An innovative organization must mesh the experienced views of people like Plant Manager Herman Francis with new ideas and thinking of recent college graduates like Jerry Roberts, right.*

this, training was moved from classrooms to central offices where they could learn on the job. Furthermore, training packages were designed so that each of 10 or 15 different subjects would be taught in a different office, giving the men an opportunity to experience a variety of work situations. The success of this approach was demonstrated when test scores of a group of trainees were compared with those of craft people who had been on the job five years or more. In nearly every instance, the new men scored higher.

- In another case, the area was experiencing a high rate of "no-circuit" conditions on the DDD network. Customers were dialing calls but not getting through because long distance circuits were overloaded. A first line supervisor in Memphis came up with a plan for using unassigned equipment and idle facilities to relieve the congestion. As a result of this one innovation, the area was able to offer better direct distance dialing service. The idea has since spread throughout the Bell System.

"All of these examples grew out of the OD effort which encouraged group selections to various problems and enlisted the interest and commitment of the whole organization," Mr. Bill says. "Equally important, we were, in many instances, creating jobs which were more challenging, more meaningful, and which let people make their own decisions.

### Challenge from the first day

The Bell System's Organization Development program (comparable programs also exist at companies such as Humble Oil and Union Carbide) is actually the culmination of a long series of efforts—some successful, some not—aimed at improving managerial skills. One program in particular, although not exactly a forerunner of ODP, has nevertheless had a significant influence. This is the Initial Management Development Program under which recent college graduates were put into highly challenging assignments from their first day on the job. Working with specially selected "first bosses" who offer support and guidance but not tight control, these young managers were expected to tackle and succeed on some tough assignments during their first year.

But while the program got them off to a flying start, it also unearthed an unforeseen problem. After meeting the challenges of initial assignments on which they were encouraged to do some creative problem-solving, some young managers sometimes found themselves in more restrictive jobs. It became clear that the qualities found exciting in the specially selected initial jobs—such as encouragement of initiative, acceptance of both authority and responsibility—were not always prevalent in later assignments.

Assimilating these young people into a going organization has presented some problems, Mr. Bill admits. "We were trying to mesh new thinking, new ideas, with the experience and solidity of the older people. It's been a good experience for the older men because they've had a few corners knocked off. But at the same time, we couldn't let some of these



young men go into orbit as they were apt to do.

"I guess you could say we were in somewhat the same position as the Bell Laboratories and Western Electric when they introduce a new technical development into the System. It has to be compatible with what we have working now. Likewise, you have to make sure new approaches to the job are compatible with the way we have been doing things."

This, however, is where Organizational Development has played a big role. It has provided some insight into the need for challenge in just about every job. Where OD has been introduced, managers have started activities aimed at not only improving team effectiveness, but enriching jobs and making the general work experience more satisfying.

### A way of life for some

John W. Cogswell, AT&T management training administrator who helped develop the OD program, says "People who make a continuing organization renewal program a way of life are convinced that this approach to management does, in fact, create a new dimension of personal job satisfaction for them, their associates, and the company. For some, OD has become almost a definition of the management job itself. They actually define their work as constant innovation of the organization to meet changing needs."

Gordon Bill agrees that it can quickly become a way of life. He also thinks it may lead to some significant changes in the business.

"For example, I'm not convinced that our present departmental structure is the best thing for the busi-



*"An organization must break down its communications barriers and create a common awareness of problem areas," says Gordon Bill.*

ness today. I would like to be able to say to the area sales manager, 'Here's your piece of geography — you run it. You have all the sales responsibility, all the plant and traffic responsibility.' I would do the same for the plant man and the traffic man: give each one a different piece of geography and let him run it, rather than split the responsibilities. What I have in mind is more or less what the advertising people call a multi-media man. I think that eventually we'll come to this multi-functional structure."

### Payoff on the bottom line

In all their efforts to reorganize and do things more efficiently, the payoff, as Mr. Bill puts it, is still on "the bottom line: Can we do a better job for the same money, or for less?"

"The engineering department, for example, has been able to reduce manpower requirements by reorganizing work, streamlining, eliminating, mechanizing. To me, this is the real payoff. And I think it has happened because the climate now exists that makes it possible to stand back and take a new look at anything and everything, from the smallest details up to the overall mission of a department.

"In another instance, our sales people made a real contribution to our No. 1 objective, which is improving direct distance dialing service. At first glance, you might think, what can salesmen do here? But they have many customers — big customers — who use a lot of direct distance dialing as well as private-line service. The sales people developed their own questionnaires, went out and talked to the customers, their PBX operators, and provided valuable informa-

tion to help the organization achieve its goal."

This was possible, Mr. Bill says, because the OD approach has helped erode some of the departmental barriers that used to exist. Although each department sets its own goals, they all work toward the central objective. "I don't know of any better way to get commitment of people to a common task," Mr. Bill says. "They weren't just told what to do by decision-makers somewhere upstairs. They were made part of the discussion, the planning, the decision process, and that makes all the difference."

### Original thinking surfaces

Organization Development hasn't solved everything by any means, but it has made some important contributions to the overall job. Mr. Bill thinks his people now look at things differently, and are more apt to question what they're doing.

This new attitude, he says, has led to some original thinking including some real surprises from unexpected quarters.

"For example, in Memphis and Louisville, the chief operators grabbed at OD and ran like mad. They ate it up hook, line and sinker. And they showed the most fantastic improvement in results. Memphis, for example, had service and efficiency problems, but now they are tops. The same has been true of their safety record. Through group discussions of the problem, particularly the high incidence of off-the-job accidents, attitudes changed. Every girl in those offices took it seriously and contributed ideas and suggestions. They've gone from the worst safety record in the area to the best."

Where all of this will lead, not even Mr. Bill knows for sure. The concept of Organization Development itself is in a state of transition, just as any organization must be.

"All we can really do," Mr. Bill says, "is to continue to look for better ways to do the job — new ways if the old ones are outmoded. We can never afford to stand still and rest where we are." □

## An Innovative Approach To Inner City Schools

From the ashes of violence may come some urgently needed solutions to the nation's most pressing urban problem. Thus far the answer has eluded everyone. But in Detroit, there is a hopeful beginning.

In the grey gloom of mid-winter, Northern High School appears more down-at-the-heels than it really is. But there is no escaping the fact that, like many of the homes which surround it, Northern High is a victim of its environment. Located in the heart of Detroit, the three-story structure, stained by years of neglect, reflects the creeping decay typical of many inner cities.

To call Northern High a ghetto school is somewhat inaccurate since Detroit has no single massive ghetto, its 520,000 Negroes being scattered throughout the city, close to or mixed in with white residents. It is in the vicinity of Northern High, however, that all the scabrous elements normally associated with urban blight are most evident — deteriorating housing, declining business districts, and an atmosphere heavy with the frustrations of too few jobs, rising living costs, and too little hope.

This is also an area that has known violence of the worst kind. Last summer, the costliest riot in the na-



tion's history raged here for five days. Within walking distance of Northern High is Twelfth Street, scene of some of the most wanton destruction.

There is little doubt that the bitterness and unrest which culminated in riot and arson has left its mark on the 1800 students (98 per cent of them Negroes) who attend Northern High School. But it also left its mark on the entire community and helped set forces in motion which could profoundly affect the lives of many of the students.

\* \* \* \* \*

Even as the fires raged along Twelfth Street, Edward N. Hodges III, general employment supervisor at Michigan Bell Telephone Company, was beginning to prepare a memorandum outlining steps that the business community could take—not only to help the victims of the riot, but to alleviate the conditions which caused it. More than most people, Mr. Hodges understood what was happening in the ghetto. A Negro, he has lived in the Twelfth Street area and



*Having lived and worked in the ghetto area, Michigan Bell's Ed Hodges finds a receptive audience when he visits Northern High. Students with special aptitude attend classes at Michigan Bell's Plant School. Those successfully completing the basic telephony courses are guaranteed a telephone company job after graduation.*



worked there as a parole officer before joining the telephone company.

Housing and employment, he wrote in his memo, were among the greatest needs, but attention must also be directed to the problem of "somehow reaching the young Negro, juvenile and young adult, who feels cut off from the mainstream of life with no hope, no future, and, in many instances, no feeling of social conscience."

### Memo generates action

Although Mr. Hodges originally intended his recommendations to go to the Greater Detroit Board of Commerce, the memorandum instead wound up with the New Detroit Committee, an interracial organization of leading business and civic officials which was formed by Governor George Romney and Mayor Jerome Cavanagh after the riots. Chairman of the education and employment subcommittee is William M. Day, president of Michigan Bell.

Like most Detroit citizens, Mr. Day had found the fact of the riots hard to believe. No city has waged a more massive and comprehensive war on poverty. Millions of dollars have been spent to help Detroit's disadvantaged, including a \$27 million allocation early last year to provide adult and youth employment centers, medical clinics, neighborhood youth corps, and aid to small businesses in poor areas. City officials seemingly had every reason to believe their boast that Detroit would not have any riots.

"But happen it did," Mr. Day says, "and suddenly we recognized clearly something only barely visible before: the existence of a forlorn segment of humanity at the very bottom of the social scale. These were uneducated, unskilled, unemployable human beings

*Mary Muldrow, a telephone company employment interviewer (second from right, top), counsels students on job opportunities with Michigan Bell and many other Detroit companies.*

*Fred Gaulzetti discusses how to get a job with senior economics students. "Students from the ghettos are too often overwhelmed by the formalities of the employment office," he says.*







who felt they had never been given a chance, who had given up all hope of reaching a better life, and who had become lost in the shadows of the inner city. Most of these people lived in silent isolation; others, convinced they had nothing more to lose, took the riot road as a last desperate effort."

When Mr. Day saw Ed Hodges' memorandum, one recommendation in particular intrigued him: a proposal for the adoption of an entire school by a single company. He saw in the idea an opportunity to reach an important segment of the "underclass" which the riots had revealed. More importantly, he recognized that this was the kind of innovative approach that was badly needed since the old ways of doing things had obviously not been enough.

The "adopt-a-school" idea found immediate support in Dr. Norman Drachler, superintendent of Detroit's public schools, who was a member of the Day subcommittee. To Dr. Drachler, there was a real need for business and industry to increase its involvement with the schools. He was especially interested in having business lend talents and resources in "preparing young people for the world of work."

No one was really sure whether the idea would work, much less how to go about it, but Mr. Day volunteered his company to give it a try. The school they picked was Northern High, a school with a reputation for being a trouble spot. More than a year ago, the students rebelled against the administration and, as a result of a student walkout, the white principal resigned and a Negro, Dr. Leonard Sain, was brought in.

### Program requires risk

Michigan Bell's selection of Northern High School was not a grandstand play. Says Mr. Hodges, "We knew that if we could make the program work there, it would work in any school in the city."

But by picking Northern High School, Michigan Bell was taking another risk in a program that had many potential risks. The young people they would be working with, says Mr. Day, have difficulty relating



to either the business or social world. "What contacts they've had have been poor and unsatisfactory. Many of the young people think they don't have a chance, and they've just about given up."

Michigan Bell people were gambling that by making their manpower resources, training facilities, and technical and management skills available, they could give the students "a new set of values, new hope, and a renewed confidence in themselves." More importantly, they hoped to reach these young people before they became part of the hard core unemployables whose numbers are steadily increasing in Detroit.

### Preparing for jobs

After meetings with the school's faculty, the project got under way in late October. "We made it clear from the start," Mr. Hodges says, "that we considered ourselves educators' assistants—not educators. The school decides how we can best be used. All we said is 'Here we are, you tell us what you want.'"

Since a basic objective of the program is to help prepare the students to enter the job market, two courses were started immediately for those who would graduate in January. One is an "employment readiness" course which teaches the basics of job hunting: how to fill out an application, take employment tests, and arrange for an interview. Part of the economics curriculum, the course is taught each Wednesday to five separate classes by Fred Gaulzetti, who is in charge of the company's non-management employment activities. The second course is a 10-week Saturday training class in basic telephony at Michigan Bell's plant training school. Fourteen boys are currently taking the course for which they receive \$2.05 an hour while in training. Those who successfully complete the course will be offered telephone jobs upon graduation from high school.

In addition to these two courses, Michigan Bell has an employment office interviewer spending one day a week at the school where she serves as a consultant for students who want job information not

only about the telephone company but any business in the city. Although Michigan Bell hopes to fill some of its job openings from the school, it is more concerned with just finding jobs for the graduates. To this end, it will serve as a "job broker"—canvassing Detroit business and arranging job interviews.

Michigan Bell also hopes to encourage as many students as possible to continue their education, and has earmarked its annual contribution to Detroit's Higher Education Opportunities Committee to go to Northern High School graduates who need financial assistance to enter college.

Plans are now under way to broaden Michigan Bell's involvement significantly over the last half of the school year. Employees will be serving as consultants or lecturers in a number of curriculums including retailing, data processing, secretarial training, journalism and industrial arts. The company also plans to increase its participation in the school's co-op education program under which students will work on a part-time basis at the telephone company.

### Confidence must be gained

When it began the program, Michigan Bell quickly learned that one of its biggest problems would be to gain the students' confidence. "The first time I had one of the students look me in the eye and say 'I don't believe you', it really shook me," Mr. Gaulzetti says. "The problem is, they've been promised too many things which never materialized. We had to convince them that we are really sincere in wanting to help."

Dr. Sain, the principal at Northern High, is also aware of the danger of building up expectations and then not fulfilling them. "We have tried those things first where we could see some immediate results or application," he said. "So far only a relatively few have been exposed to the program but those who have been are enthusiastic about it. As time goes on, I hope we can start reaching down into the lower grades so students will be motivated early to start preparing for their career choices."

While employment preparation is the greatest immediate need, Dr. Sain sees much broader long-range benefits from the program. He thinks it will raise student aspirations, expose them to more career opportunities, and gradually enrich their education. The greatest contribution will come if Michigan Bell's participation acts as a stimulus to other businesses.

### Obligated to help schools

"Business needs to take a good, hard analytical look at the schools and decide how it can help to upgrade education," Dr. Sain says. "There is no more powerful force than business when it wants to be, and I hope that out of all this will come a realization that business and industry have a very real obligation and responsibility to help the school system."

Although still in its infancy, the Michigan Bell "adopt-a-school" project has already attracted considerable attention, not only in Detroit but throughout the nation. It represents a unique effort to establish a continuing relationship with young people in the ghetto and to demonstrate that business really cares what happens to them.

The eventual goal of the New Detroit Committee is to have all 23 of Detroit's public high schools adopted by businesses. But Mr. Day realizes that right now most businesses are waiting to see what happens at Northern High. "If we fail," he says, "it's going to be a nationwide failure."

The company is convinced, however, that it has a winner. "We no longer talk in terms of *can* it work," says Mr. Day. "It *must* work because what we're trying to do at Northern High School can go a long way to help prevent the formation of more ghettos."

As one with a special interest in the program, Mr. Hodges says that his greatest fear is that people will expect overnight results. "This has to be an evolutionary thing, but given time, I know we can help these kids restore their confidence in themselves. And it will not only raise the aspirations of the young people, but of their entire families." □

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### Intensified Recruiting, Expanded Training Help "Screen People In"

Besides its "adoption" of a ghetto school, Michigan Bell has taken other steps to improve job opportunities for Detroit's disadvantaged—Negroes and whites alike.

Along with the Ford Motor Co. and Chrysler, the company is actively recruiting in the ghettos. Thus far, Michigan Bell has had temporary employment offices at various locations, including NAACP and CORE headquarters and community centers. While the effort is not always productive, the company is hopeful of reaching those people who lack confidence to go to regular employment offices.

More significantly, the company has made some far-reaching changes in its employment requirements. "For more than 75 years, business tried to screen people out," says General Employment Manager Edward Hodges. "Now we are trying to find ways to screen people in."

The changes include dropping many of the barriers against people with police records and no longer automatically rejecting an applicant because he doesn't have a high school diploma. The company recognized that both of these requirements screened out many people—particularly ghetto residents—who might otherwise be qualified and capable employees.

In addition, Michigan Bell has developed a simplified job application procedure, limited the checking of prior work references, and developed new testing procedures. In still another effort to open more doors to ghetto residents, the company is about to embark on a program under which they will hire some men and women without any testing and give remedial training where necessary. The purpose of this training is to strengthen skills and prepare the individual for proper job performance.

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# BELL

## reports

### Round-Up for 1967

The Bell System gained about 3,800,000 telephones in 1967, bringing the total number to a record 83,700,000. Telephone conversations over Bell System facilities passed the 100 billion mark for the first time last year, including an 8.4 per cent rise in domestic long distance calls and a 26 per cent increase in overseas calls.

To meet an unprecedented demand for even better communications, the Bell System will spend \$4.25 to \$4.5 billion on new plant, equipment, and service improvements this year, compared to more than \$4.3 billion spent in 1967. Electronic switching, now serving 20 central offices, will be expanded to about 45 central offices during 1968.

The Bell System also raised more than \$1.5 billion through financing. Debt financing included the sale of two AT&T issues that totaled \$500 million and 10 issues of subsidiary companies that totaled \$825 million, raising the Bell System's debt ratio to about 35 per cent. One \$50 million associated company issue brought the highest interest cost for bond money in the Bell System in 47 years.

At year's end, Bell System physical facilities, such as the telephones, telephone lines, equipment, and buildings represented a net investment of about \$32.3 billion, compared to \$14.8 billion only ten years ago.

### World's Telephones Increase

The number of the world's telephones rose to 208.5 million at the beginning of 1967, an increase of 6.9 per cent over the previous year and twice the number in service only 11 years earlier. The increase was reported in "The World's Telephones," an annual sta-

tistical review prepared by AT&T.

The United States, which attained the 100 millionth telephone during 1967, was first in number of telephones with 98.8 million at the start of the year. Japan was second with 16 million, followed by the United Kingdom, West Germany, the U.S.S.R., Canada, France, and Italy.

The U.S. also retained its lead in telephones per 100 population with 49.9. Sweden ran second with 47.9, followed by New Zealand (39.9), and Switzerland (39.3). Canada led all nations in average conversations per person with 664. The U.S. again ran second, averaging 648.

### Ions Removed To Purify Water

Some of the purest water ever known is being produced by the Western Electric Company at its Allentown and Reading, Pa., and Kansas City, Mo., plants. The deionized, or DI water, is used to rinse delicate semi-conductor material for components in telephone equipment. The water used in the manufacturing process must be completely free of mineral deposits, which would ruin the tiny circuits. Even water pure enough to drink contains minerals which leave salt deposits, so Western Electric has developed an intricate process for removing the ions from water. Ions are electrically charged atoms or groups of atoms.

Since many atoms in solution carry either a positive or negative electrical charge, water is passed through tanks in which resins, or plastic granules, attract its positively charged atoms. Other resin tanks do the same to those with negative charges. The result is ionless water. The super-pure water then rinses the silicon wafers, the metal, and the glass which go into integrated circuits that are free of dust and mineral deposits.

### New Operating Company Formed

A new Bell System company — the South Central Bell Telephone Company — begins operations on July 1, serving the states of Alabama, Kentucky, Louisiana, Mississippi, and Tennessee. Southern Bell, which now serves the area, will continue to operate in Georgia, Florida, North Carolina, and South Carolina.

South Central Bell is being created to meet more effectively the burgeoning communications needs of the South. While the number of Bell System telephones has grown about 195 per cent in 20 years, growth in Southern Bell territory has approximated 325 per cent. Southern Bell's present 10.8 million telephones in service make it the largest in the Bell System.

With the division, the two companies will be substantially equal in terms of telephones, assets, employees, and other factors. As a separate subsidiary of AT&T, South Central Bell will be the 24th Bell operating company.

### Revolutionary Concept at Sandia

Rolamite, a new mechanical device as basic as the wheel and potentially almost as useful, has been invented by Donald F. Wilkes, a mechanical engineer at Sandia Corporation's Albuquerque, N. M., laboratory, which the Western Electric Company operates for the Atomic Energy Commission. Wilkes created rolamite while engaged in a project to develop techniques for designing and fabricating subminiature components for use in nuclear weapons systems.

The concept is surprisingly simple. A typical rolamite design consists of only four main parts: a rectangular frame, two rollers, and a relatively

long, "S"-shaped, flexible band. When the rollers are inserted in the loops of the "S" and the band tightened, the rollers move freely along the band with little friction because there is no sliding — the same surface areas of the band and roller always meet. Friction has proved to be as low as one-tenth that of ball and roller bearings under the same amount of contact pressure.

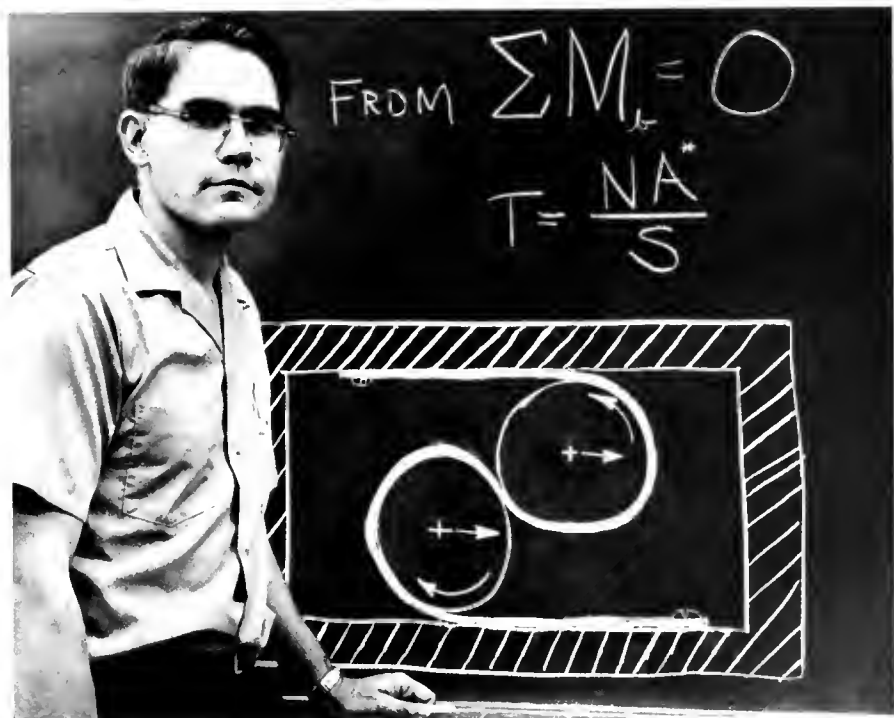
Engineers believe the rolamite concept may have the same fundamental effect on mechanical and electromechanical design that the transistor exerted on electronic design. Wilkes has demonstrated that rolamite has at least 54 separate functional capabilities, which may be applied in an almost infinite number of combinations and variations. Its potential applications range from the household appliance, automotive, manufacturing, and packaging industries to biomedicine, scientific apparatus, and

spacecraft instrumentation. While mass production is still in the future, engineers envision that rolamite will have such various uses as relays, bearings, pumps, pistons, dampers, shock absorbers, and sensing devices.

### New Rate Plans Offer Options

Many Bell System customers will have a wider choice in selecting telephone service when Bell companies introduce two new rate plans: the Single Payment Option and the Residence Package.

The Single Payment Option plan provides customers with the opportunity to make a single, one-time payment for certain premium items instead of paying a monthly charge. One-time charges for a Trimline phone, Princess phone, and Bell Chime ringer will vary according to the local



telephone company. Although a customer won't own the equipment — it remains the property of the Bell System — he can receive the same equipment at no additional charge if he moves to another Bell System area.

The Residence Package consists of the more popular premium service offerings now available. Customers ordering three telephones (a main station and two extensions) will have their choice of set style, color, cord length, and, if available in their area, Touch-Tone service.

Under the Residence Package plan, all non-recurring charges, except a visit charge or service connection charge, will be eliminated, and the flat monthly rate will be substantially less than if the component parts were ordered individually. Each telephone company will determine the exact rates it will charge for the Package.

### Circuits for Caribbean

AT&T will lay the world's first transistorized undersea cable this April as part of a major expansion of communications facilities in the Caribbean area. The new 720-voice transistorized cable system will extend 1,250 nautical miles from Jacksonville, Florida, to St. Thomas in the Virgin Islands. It will provide improved service between the U. S. and Puerto Rico and the Virgin Islands, as well as to areas served via these points, such as the Dominican Republic, Haiti, and Venezuela.

AT&T also plans to lay a 144-circuit cable between the Dominican Republic and St. Thomas this summer. It will be linked up with the 720-circuit cable and will be jointly owned by AT&T and Compania Dominicana de Telefonos. In addition, AT&T plans to lease 100 satellite channels initially for eastern Caribbean communications

when a satellite earth station becomes operative in the area.

Communications between the U. S. and the area are now handled on 236 circuits, but more than 1,000 circuits will be needed by 1975.

### Switching Center To Be Built

The world's largest switching center for long distance calls will soon be under construction in lower Manhattan. Scheduled for completion in late 1970, the 550-foot building will feature exterior columns enclosing elevators, stairways, heating and air-conditioning ducts, plumbing and electrical equipment.

Heat generated by the telephone switching equipment will be used to help warm the building and will be supplemented by an electrically-operated heat pump, eliminating the need for oil-fired boilers — a major source of air pollution.

The facades of three century-old buildings now on the site will be dismantled by the New York Telephone Company and turned over to the city's Landmarks Preservation Commission.

### Bell Labs Measuring in Picoseconds

Single laser pulses lasting about a trillionth of a second — one picosecond — can now be measured accurately by techniques devised at Bell Telephone Laboratories.

The advance makes possible the observance of picosecond events occurring in atoms and molecules and suggests new pulse decoding methods for potential laser communications systems. The laser pulses are measured by taking advantage of a phenomenon known as two photon absorption, first observed at Bell Labs in 1961.

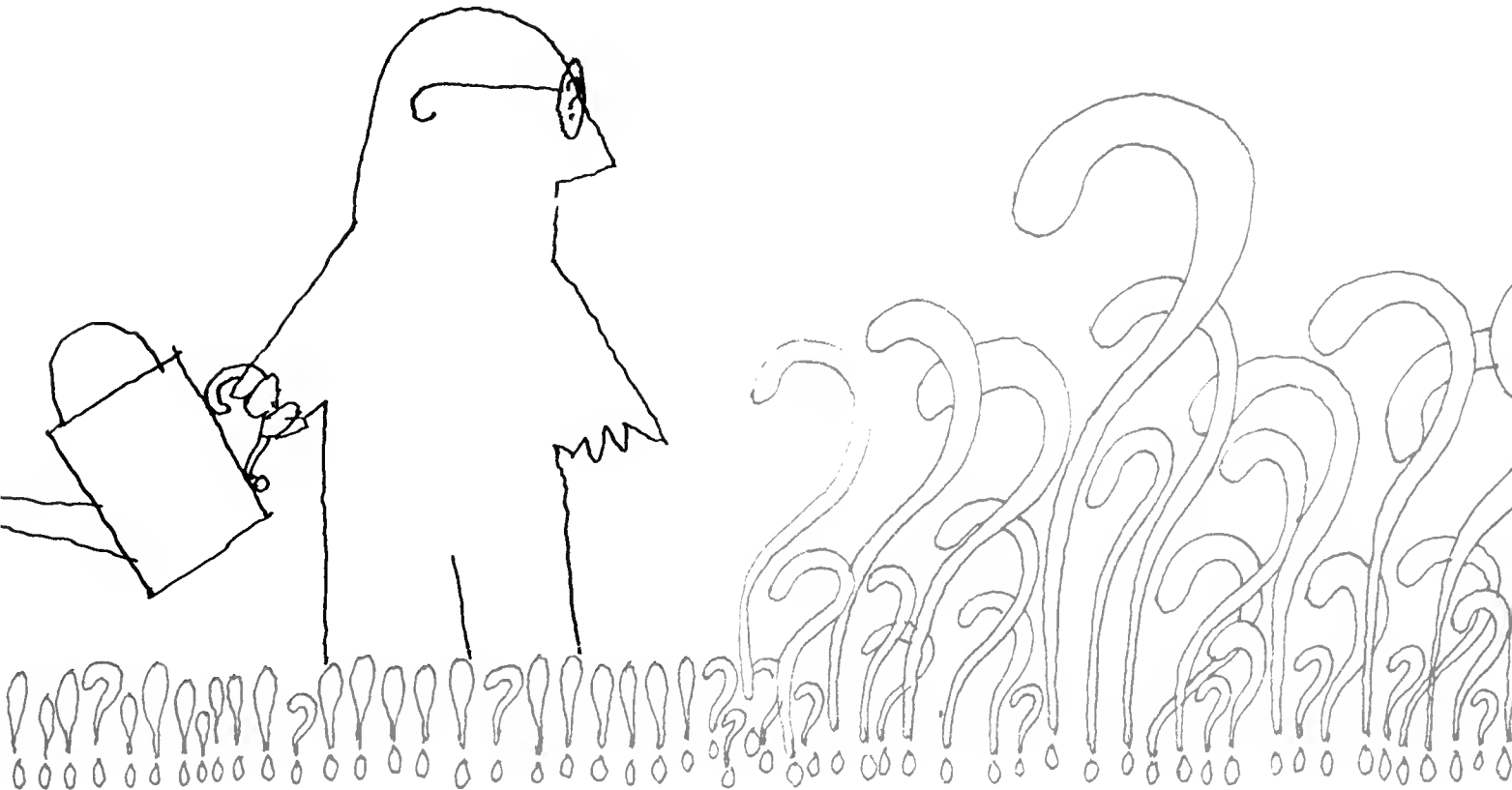
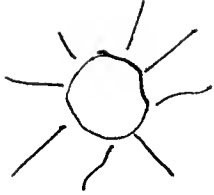
### Super-fast Teletypewriter Developed

A teletypewriter which prints at 1200 words a minute — 12 times faster than conventional equipment — has been developed by the Teletype Corporation, a subsidiary of Western Electric. Called the Inktronic® printer, the machine traces characters by firing minute ink droplets at ordinary teletypewriter paper. It uses a battery of 40 tiny nozzles, capable of shooting thousands of droplets a second.

The greatly increased speed of the new printer will provide Bell System customers with a teletypewriter which fully utilizes a telephone line's capacity to transmit data. The Inktronic® printer will also be valuable in monitoring high-speed tape-to-tape systems and computer interrogation.

The new machine, with proper programming, can print almost any conceivable pattern, including graphs, pictures, and Japanese letters. A receive-only printer will be available in limited quantities by mid-1968 and a send-receive set by the end of the year.





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March/April 1968

# BELL

telephone magazine



Central City Job Page 20



*An editorial*

## The Need for Concerted Action

*In recent speeches two AT&T executives, President Ben S. Gilmer and Vice Chairman of the Board John D. deButts, have emphasized the need for concerted action by all sectors of society—government, business, labor, education, voluntary agencies, and professional people—in dealing with the problems of the cities.*

**E**ach of our cities is different," Mr. Gilmer stated, "with a different mix of needs and resources. What is important, however, is that in each of our critically affected cities we provide a common context for the efforts of government and business and voluntary agencies, as well as for those of the concerned citizen who simply wants to help.

"Regrettably what is most notable about current efforts to resolve the problems of our cities is the sheer multiplicity of agencies and programs, public and private, that are mounting their own attacks on urban problems," Mr. Gilmer said in an address before the National Assembly for Social Policy and Development in New York City.

"What appears to me to be needed . . . is the leadership that will give coherence and direction to our currently fragmented efforts. In our social undertakings as in our economy, there is need for diversity,

even for competition. However, the problem of our cities are so massive and the need for effective action so great that we cannot afford to rely for their resolution on random and uncoordinated efforts."

In addition to stating the need for concerted action by all sectors of society, Mr. deButts emphasized that business initiative will be more effective "if companies are reasonably flexible in the way they organize and administer such efforts."

Speaking before the annual business conference of the New York University Graduate School of Business Administration, Mr. deButts said, "I have heard it argued that we in business, accustomed as we are to managing people and problems in a fairly well structured and stable environment, will find it difficult to apply our talents in the relative chaos of urban affairs. My answer to that is that difficult or not, we must learn how. Apprehension of difficulty is no reason for holding back. Moving in, on the other hand, is the only way to learn. If you ask me here today just *how* this coordination we need is going to be accomplished, the only answer I can make is that we are going to find out step by step—by learning from steady, unremitting effort that will produce answers from experience." □

# BELL

telephone magazine

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On the cover — The Bell System commitment to provide jobs for the hard-core unemployed is illustrated by some of the people at work in jobs that have been made available to central city residents in New Jersey. Participants in the program—organized by a coalition of New Jersey Bell Telephone Company, Western Electric Company, Bell Telephone Laboratories, and AT&T's Long Lines Department — have been placed in such jobs as coin telephone collectors, draftsmen, and cable formers. See Page 20 for details.



# People and Systems

by H. M. Boettinger

In this day of automation and the computer, how can we reconcile man and his need for identity with the machine systems he has created? One answer may lie in humanizing jobs to make people really important in their own enterprise.

For ten years or more I have been espousing the virtues of mechanization, automation and computers, and the systems these make possible. But it is only recently that I have come to appreciate the secondary effects that these tools can have on our society, and on business in particular. I have come to recognize some of their potential pathology, and have been concerned that we develop preventive measures that will allow their original promise to be fulfilled.

We have become convinced, by our achievements to date, of the great positive potential of the computer, its ability to bring order out of chaos, to save us from drowning in seas of paperwork and data, and to help solve the scientific, technical and social problems of the day—each of which contains more complex variables than our brains can handle practically. Conversely, many see the computer and the systems controlled by it as tools for removing human beings, with their inherent frailties, from the problem-solving tasks they face. This idea has provided the theme for endless numbers of speeches, magazine articles, films and science fiction stories.

Let me suggest that the situation is a little different today, and that it soon may be a lot different.

Accumulating evidence indicates that we may be at one of those crossroads in human history during which mankind's fortunes can take a sharp turn for the better—or for the worse. We must exercise our power of choice and decide which turn to take.

Within our businesses we see increasing numbers of examples of employee unrest. This in spite of the fact that productivity has never been higher, employment never higher, wages never higher, benefits never higher, and the overall level of living never higher.

Though employment is high, so is force turnover. Though wages and benefits are high, so is the number of labor disputes. Though productivity is high, so is there a leveling off in the amount of work an individual expects to do. In our own business we had

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*Mr. Boettinger is assistant comptroller — management sciences division for AT&T. His article is based on an address he gave recently to the National Industrial Conference Board.*



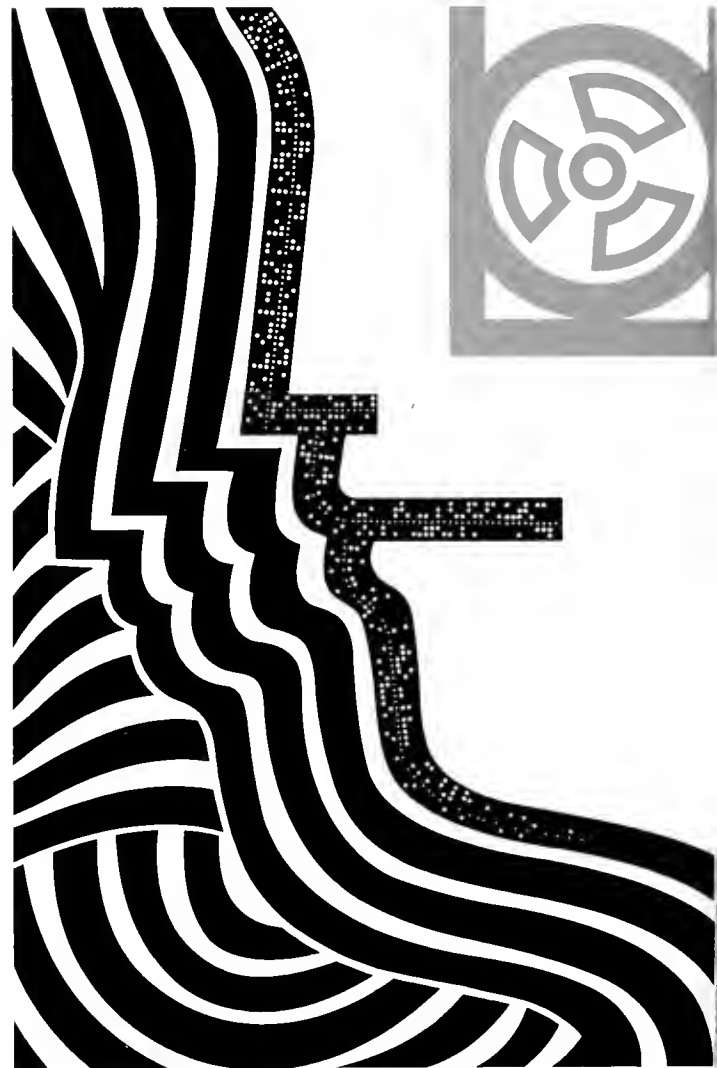
a strike for added worker protection in high crime areas (not an economic strike). In New York City we experienced a teachers' strike for added say in the makeup and management of schools (only partially an economic strike). In Youngstown, Ohio, police and firemen went on strike only partially for economic reasons. Almost daily there are demonstrations on our streets, in our factories, and on our campuses for a wide range of political, social, and economic causes.

Outside of our business environment, we are brought into almost daily contact with signs of great social, political and philosophical unrest. We see upheaval in family life, and changing religious and moral outlooks. Gloomy variations of international conflicts throughout the world are instantly displayed to millions every night on TV. Add to this the action on social and cultural frontiers: racial equality, ending discrimination; changing moral and ethical conduct; changing religious freedoms; changes in the content of education and methods of teaching. All these developments add up to one thing, that is: people want more to say about the things affecting their individual lives.

### In the eye of the storm

Business is at the center of all this action. It employs the members of society. It produces for that society the goods and services it demands. And it provides the working environment where many of the people I have mentioned spend most of their days.

What attitudes can business leaders take to this uproar? Attempts to stem it will encounter failure. The forces are too powerful to turn back. Can we afford to ignore it and hope to cultivate our gardens as before? Or should we intelligently appraise the changed situations and do our best to adapt our objectives and methods by reexamination of their old premises? If managers—experts at judging and combining diverse circumstances and resources—do not make the essential effort to cope with the changing world, what can we expect from other segments



of our society? This is biting off a lot, but I believe that we also have the requisite character, experience and ingenuity to effect the required alterations—if we want to. And one place to start is with the stuff that businesses are made of: people, machines, and that complex interaction of the two called “the job itself.”

Many jobs are being reduced in complexity and scope. More and more, as we automate and mechanize, jobs are becoming over-structured. What we

have done is to place more and more responsibility on mechanized systems, and less and less of the total responsibility on the many individual persons in those systems. We started out to increase productivity and decrease costs by making a system the tool for man. But as all of us progress in the introduction of more complex business information systems, we should now ask ourselves: Who or what is the servant? Who or what is the master? Who does what to whom?

As I see it, it won't be long before man becomes the servant of the machine and the system it controls becomes the master unless steps are taken *now* to change the direction and emphasis of our effort to utilize the enormous power of the new machines. I believe that can—and must—be done.

## The historical tensions

Since time began, man, his tools and his environment have been in a constant state of tension. But, it is this tension which has bred progress. Like the sailor, his boat and the sea; or the pilot, his plane and the air; employees, their machines, and their tasks—living in tension—are all mutually dependent. Each element is essential. Each element in the uneasy equation must function together in some harmony to attain the ultimate goal, whatever it is.

Each element in a system is in tension both within and without itself. Each element is both independent and interdependent, and no single element is more or less important than the other—when one fails, all fail to some extent. So I maintain, that man and his machine are separate but interdependent sub-systems to a “total system.” Each has its own dimensions. Each has its own capacity. In one it is born; in the other it is designed. Each has its own ability. In one it is taught; in the other it is programmed. But where has the attention been given these past ten years since the computer was first introduced on a large commercial scale? The answer is obvious and disquieting. By far the greatest attention has been given to the computer, with its “hardware” and “software.”

The great question we must face now is how to reconcile man with his machines, or to put it another way, how do we bring machine and man into tensions of mutual support, rather than tensions of disruption?

Answers to this question cover a wide spectrum of possibilities, but it seems to me that our best approach will be to humanize jobs again. To make them fun. To make them rewarding and satisfying. To make those doing the jobs feel and know that they are an important and essential element in the success of an enterprise—not by telling them, but by so structuring their work that they will see it for themselves and feel it in their bones. Employees should have the opportunity to be contributors; not the slaves of machines, but rather the masters of them. Employees should have the experience that the machines are tools in their hands, for *their* use in accomplishing *their* own goals and objectives as well as those of their employer. If we can provide these conditions, then we will have truly turned toil into work.

In humanizing jobs, I'm not talking about management/employee relations, or “human relations” as developed years ago. There have been many refinements, insights, and new techniques developed which take up where the “human relations” form of management leaves off. It is only recently that the work of people like Herzberg, McGregor, Gellerman, Argyris, and McClelland has taken on new meaning. What are these behavioral scientists now saying?

The common thread runs something like this: Employees are not being allowed to use or to develop their full capacity. Jobs have been traditionally designed after work plans and processes have been laid out. The argument has been: if the designer uses only the minimum capability of those performing the work, a person can learn a job quickly and training costs are low. It all made sense, but not for long. This approach fails to recognize that employees have *psychological* needs which must be satisfied if true employee “motivation” is desired.

What we've done, according to the modern behavioral scientists, is to give more and more in the

way of economic incentives for less and less productivity. They claim that as we become weary of this ratchet effect, we end up saying that employees are lazy, disloyal, and cannot be motivated. To a large extent, they further tell us, we are probably right.

But these same behavioral scientists *also* tell us that people behave this way because that's the way they are expected to behave. That's the way their jobs are designed. That's the way policies, procedures and traditions have taught not only managers, but labor as well, how to behave. Unlike our nineteenth century forebears, we do not call our employees "hands," (as though that was the only part of them that interested us), but have we completely abandoned their old attitudes?

Now, new, well-researched insights into human behavior force us to face a different "definition of man." Rather than being "lazy," etc., employees *want* challenging, rewarding, meaningful work.

What will work best in today's business environment, in today's machine and computer world, requires a complete restructuring of management's thinking and commitment. Some approaches introduced of late offer great promise. One is to assign tasks to an employee which "stretch" or demand more from him in terms of difficulty levels than what he has previously done. This helps satisfy a person's need to experience achievement in *his* terms, and those of his associates.

### The "how" of the job

Another step is to give an employee broad discretion over details of how his work is to be handled once he and his boss agreed on precise targets and prescribed cost limits. This works toward raising a man's "sense of proprietorship" in his work, which becomes a measure of his abilities rather than his boss's. More important, perhaps, leaving the "how" of a job in its doer's hands—and mind—opens the way to innovation and creativity.

"Participation" is another art which satisfies basic

employee needs. Participation means calling on people to help make those decisions that affect their work. Being "in" on the decision serves to increase understanding and lessen misinterpretation and anxiety in the face of change. And this happens even where specific suggestions are not accepted after frank, open discussion.

Employees need other things too. For instance, recent research has established that employees want, and often demand, real pride in their work. This requires giving them as big a "work module" as possible, as complete a "piece of the action" as we can, so they can see the results of their labors. Unless we do, employees become frustrated, another dimension to the creative tension problem, for frustration turns potential creativity into hostile and aggressive channels. It is appalling to think of the number of jobs today that would fit the category of "tedium."

### The "Herzberg breakthrough"

Perhaps one of the greatest behavioral science breakthroughs on the subject of motivation has been the work done by Dr. Frederick Herzberg of Western Reserve University in Cleveland. We've seen that the work people do is a central force in human motivation. His investigations have shown that the *work itself* should be designed so as to stimulate and challenge the worker, and provide the opportunity for the worker to be creative and grow in skill. His studies show that apathy and minimum effort are the natural results of jobs that offer the worker no more satisfaction than a paycheck and a decent place to work. These latter factors may keep the employee from complaining, but they will not make him want to work harder or more efficiently. Employees are saying not only "Treat me well," but also, "Use me well." Herzberg's "job itself" experiments strongly suggested that effective motivation can be accomplished when the workers' jobs are deliberately improved to encompass greater responsibility, broader scope, and more challenge, which is just what they want.



We have studied these findings. And under the leadership of my Bell System associate, Dr. Robert Ford, we have introduced them into our business on an experimental basis.

Our first trial was conducted in the Treasury Department at AT&T in 1965. It was built around the Herzberg motivation theories. The section involved handled share owner letters and telephone calls, and other questions pertaining to AT&T stock. These people are the crucial link between more than 3 million individual AT&T share owners and the complex computer system which handles the job of record keeping and mailings attending these share owners' affairs. The employees were all women, most had college educations, all were highly intelligent, all had relatively short terms of service with the company. These women worked in highly structured environments, under close supervision, strict guidelines and procedures. All of their work was checked and rechecked by supervision. We insisted on the highest quality goals and added verifications to eliminate errors. Before the "Work Itself" trial began, this section had generally low productivity, produced less than the quality we demand, had a high resignation rate, and the people were generally dissatisfied with their work and the company. This is a job we had had since the company was organized and it had always been considered a tough nut to crack. Consider our dilemma over the years: we needed highly intelligent, articulate people who could handle a diverse range of questions from any share owner. But their answers were so important and fraught with policy considerations that we felt we had to have their work checked by several levels of supervision.

### The payoff: quality

During the trial, since more than one group of employees were involved, controls were set up which provided measurements of control groups versus the experimental groups. The experimental groups had their jobs improved. Responsibility and accounta-

bility were dramatically increased. Supervision was strongly de-emphasized, and used by the employees only when answers could not be obtained from other sources. Employees composed and signed their own letters to share owners; employees carried on their own unstructured dialogue with telephone callers. They were encouraged to become experts on certain kinds of problems which appealed to them. In other words, the employees ran their own jobs to the extent of their capability and ability. Their performance was then compared with the control groups at the end of six months. (Incidentally, neither of the groups knew that this trial was being conducted.) Here are a few examples of what the trial group accomplished:

- Their quality measurement (maximum 100) index climbed from the middle thirties to the high nineties.
- Productivity levels were ahead of pre-study levels.
- More promotions were being made from the group than previously.
- Absence dropped.
- Resignations fell off dramatically.
- Attitudes toward the work improved considerably (as determined from special studies and interviews as well as observations). So impressive were the results of this trial that many Bell System companies and their operating departments have since held similar trials. These have produced many successes and, to date, no out-and-out failures. We have not fully evaluated what all this means to the Bell System—the other trials are also being analyzed—but I believe that customers, share owners and management will benefit in no small degree as we work these ideas and experiences throughout our operations and staff jobs.

Looking ahead toward the growing complexities of business enterprise, what becomes of the "total system" needs of the business? Within the limitations of our ever more machine-oriented, computer-run enterprises, will there still be any room left for individual action? In my opinion, there will be and must be; but we must *make* that happen. We cannot simply superimpose machine processes on the human environment and *hope* that it will happen. The human

organism is amazingly adaptable to change, but it has its limitations.

Traditionally, machines were designed with only vague and occasional reference to the human beings who would operate and maintain them. But as engineering technology advanced, the complexities of equipment began to touch the limits of operating and maintenance capabilities of available people. Now is the time to begin engineering machines for human use — to make equipment compatible with human characteristics, potential and limitations.

However, this “human engineering” effort for equipment alone is not sufficient to meet the requirements of present and future complex systems. We must develop personnel sub-systems and programs which complement and aid in the design not only of the equipment, but more importantly the jobs which involve and surround it; and to a considerable extent, develop the skills and qualifications of the personnel in the system through effective selection and training.

We are particularly concerned with this problem in our present attempt to implement our own Business Information System. We have assembled several thousand experts in our developing programs who can exploit the capacity of modern computers in every phase of our enterprise as rapidly as possible. What they develop will be influenced in major ways by both our evolving objectives and the attitudes we have toward human and machine interactions.

### STAR is born

Against this hastily sketched background, let us look briefly at what the Bell System has been doing by way of experimenting with the “personnel sub-system” concept. We call our project System Training Application Requirements—which, in the fashion of our time of acronyms, we have dubbed STAR.

The project had its beginning back in 1964. With the aid of American Institute for Research in Pittsburgh, a training development program was launched on a trial basis in Comptrollers Operations in the Bell

System. The program was in fact a new technology for designing and developing the *human* side of new and existing jobs within a system and its environment.

### Human and machine in harmony

Though initially designed for a computer-based operation in the trials, the same principles apply to any system requiring human involvement. An oversimplified definition of STAR might be that it is an approach to the human sub-system design which parallels the companion machine sub-system design, beginning with the earliest statements of overall system objectives and ending with the system’s operational stage. From initial design through operational evaluation, “trade-offs” are constantly made between the machine sub-system and the human sub-system. These trade-offs are determined by specially trained human and machine systems analysts, technicians, job designers and training designers. All sorts of options of human tasks and machine tasks are considered, evaluated and allocated.

In designing the human sub-system, questions which might guide the designers include: Is the new work possible to do and teach? Is the new work practical to do and teach? Will the new work be satisfying to employees? (For here is where we build in “Work Itself” motivation and job structure.) Does the new work demand special environments or working conditions? Does it require new skills and talents?

The importance of this function is immense, for these job-design specialists are at work on the very foundations of the business. The jobs they design dictate the kind of people who will be initially hired, and, eventually, promoted in the years ahead.

As this matching-machine-with-human process is developed, two documents are produced for the human sub-system: first, tasks are described graphically and verbally; so are sub-tasks. Each work module or job-part required in the new system is described in detail. These modules are then put together—as an artist would a mosaic—to design good, satisfying jobs.

An employee's work is then described on a "What to Do" basis, not "How" or "Why," which is covered in training sessions proceeding the start of work. Secondly, the "How to Teach" document for the new work is produced. Since most supervisors know *what to do* but not many know best *how to teach*, this guide helps the instructor through the training and evaluation procedures.

Most people, on first hearing this description, say: "That's what we do now." No one who has said that initially, however, has failed to recant after exposure to the process itself. Strangely enough, the greatest skeptics before exposure, and the most enthusiastic after, are the computer experts themselves. This whole project would have been worth it if its only

result was the new harmony it produces between the "machine" men and the "management" men. This in itself is another opportunity to convert disruptive tensions in a system to constructive mutual support—one group amplifying the contribution of the other. True, the STAR technology merely prescribes all of the steps which must be taken in designing "total systems" which are comprised of humans and machines. But, my point is that we found this obvious step had become lost in the grand progress to bigger and better machines. As Prince Metternich observed, "The obvious is always least understood." STAR is basically a new approach for systems designers of humanized systems. It contains rules and minimum standards for human performance. Note that I said *minimum* standards, since it must be open-ended to permit the individual worker an opportunity to excel, develop and assume greater responsibility.

All STAR principles have worked well. They have served to restore the human balance with the machine. Our trials proved successful and further development is being actively introduced into most new systems in the computer side of our industry. Of course, the great payoff of STAR has been in more highly motivated employees. Increased productivity has been a by-product of that enhanced motivation. Again, we got these results only by converting the disruptive tensions between employees and their machines into constructive relationships which render unto the machine the things that are the machine's, and render unto the employees those things which allow meaningful achievement.

Eric Hoffer is right, I believe, when he says that our country's greatest asset is the enormous latent talent, competence and leadership which exists at every level of our population. The techniques described here are designed to give this "greatest asset" new opportunities for realization and fulfillment. Only time will confirm the value of our undertaking; only time will reveal what further innovations will be needed to keep man's work meaningful in this era of the machine. □



# The Consumer and the Telephone

The secret to meeting the consumer protection movement lies in keeping a close watch on public opinion, anticipating customer needs, and providing quality products and services.

An increasing number of businesses, both large and small, are swiftly learning that the consumer protection movement is not to be taken lightly. Disgruntled by steadily rising prices, annoyed by inferior products, and angered by poor service, the buying public today is taking action in its behalf.

The voice of consumerism has moved from one of isolated individual complaints to a national protest movement that is still gathering momentum. And the federal government is responding as the consumer's advocate by becoming more active on several fronts.

President Johnson, for example, recently sent a proposal to Congress designed to "protect the consumer — and the honest businessman alike — against fraud and indifference."

The recommendation, which contains an eight-point program to help "assure every American consumer a fair and honest exchange for his hard-earned dollar," proposes new legislation affecting automobile insurance, fish and poultry inspection, deceptive sales, waterway safety, hazardous radiation, and repair warranties.

In the private sector, 60 national and state consumer groups late last year formed the Consumer Federation of America, an organization which will concentrate on informing the public about products and services, serve as a "watch-dog" on advertising, and pressure business and government to meet the needs of the individual in the marketplace.

Several forces have prompted the public's increased awareness and concern about consumer issues. Some of them are rising costs, fear of inflation, personal experience with poor products, and greater coverage of organized consumer activities by mass communications media. Also, recent federal investigations and hearings have revealed generally unknown, alarming facts about once respected goods and services.

Consumer issues typically have strong emotional overtones. Major complaints are voiced today in such terms as "hazardous, dangerous, disease-infested, unscrupulous, dishonest and deceptive." Proposed



legislation is often tagged with such names as a "truth" law or a "safety" law.

The sources of consumer unease are frequently obscure. An indication of this attitude is reflected in the results of a nationwide survey conducted last year by the Opinion Research Corporation—which showed that while only three per cent of those interviewed had heard about the Truth-in-Lending bill, some 80 per cent favored its passage.

Consumerism has existed for decades in one form or another. But it was the late John F. Kennedy, while still a presidential candidate, who drew nationwide attention to the needs and rights of the consumer by promising that if elected he would serve as "the lobbyist for the consumer." In a message to Congress in March of 1962, President Kennedy enumerated four consumer rights: "to safety, to be informed, to choose, and to be heard." He followed by creating the Consumers Advisory Council under the Council of Economic Advisors.

In 1964, President Johnson established the President's Commission on Consumer Interest and later created the office of Special Assistant on Consumer Affairs, the post now held by Betty Furness. Last year, President Johnson stressed the need for legislation to protect the consumer. "The Government must work to make the consumer's choice fully effective," he said. "The consumer must be protected against deceitful practices of a few businessmen that can undermine confidence in the vast majority of diligent and respectable firms."

Today the accelerating trend among consumer interest groups is to concentrate on federal legislation. Helping to set this climate have been recent Congressional hearings spotlighting cases of administered prices, monopolistic practices in drugs and other businesses, deceptive packaging and labeling, and misleading information in lending and advertising. The first significant legislation came in 1966 with the passage of the Truth-in-Packaging law and the Traffic and Highway Safety Act.

The business community at large is also becoming

aware of the serious implications of consumerism. The consumer movement is focusing increased public and government attention on the business world's obligation to serve its customers well. "We know that our opportunities in the future depend on the public's regard for what we do right now," states AT&T Board Chairman H. I. Romnes. "Even were we to approach technological perfection, our service will be judged — we will be judged — on how well we meet human needs. We think it vitally important that we never forget — even though we may handle millions of calls a day — that, in essence, we serve our customers one at a time."

While events cause the consumer movement to fluctuate in intensity, it continues to increase in influence and appears destined to be a long-term activity. Its impact could force more businesses to supply increased information on the quality, safety, and nature of the products they sell, and could also bring about closer regulation of pricing, servicing, advertising and production standards.

"The trend today," says Gordon Search, AT&T customer equipment rate supervisor, "is for the federal government to grow larger and impose all sorts of standards — perhaps because business hasn't altogether responded to the needs of the consumer. Any business has to consider itself more than an economic entity. It's a political and social institution as well. If we're going to operate as a free enterprise in a free society, we have an ethical responsibility to act in the best interests of that society."

### **Business should take initiative**

One of the most effective ways for a business to avoid external controls is to systematically anticipate its customers' needs by monitoring—both continually and objectively — the favorable and unfavorable market reaction to the products and services it provides. If a business enterprise takes the initiative in meeting its customers' reasonable desires, it may reduce the number of irate consumers pounding on its door.



*Telephone receivers are simultaneously removed and hung up during one of the endurance tests run by Western Electric to insure that Bell System phones will be as trouble-free as possible.*

Though the collective will of telephone customers is expressed through the activities of regulatory bodies acting in the public interest, AT&T and the Bell System operating companies have developed their own means of assuring that the telephone customer's needs are being met.

In an effort to determine precisely how well it is providing quality service — from the customer's point of view — the Bell System several years ago initiated SAM, the Service Attitude Measurement Plan. SAM is predicated on questionnaires sent to selected customers who have had recent contact with a telephone business office, installation or repair service. The plan has the advantage of measuring telephone service as the customer has actually experienced it in specific situations. Such objective criticism has uncovered some previously unknown trouble spots and enabled local telephone companies to take swift corrective action. Thus, the service of many customers is improved by asking a few for their frank opinions.

"For many years our customer attitude surveys could reveal broad trends in opinion," says John D. deButts, AT&T vice chairman of the board, "but they did not pinpoint for us what action was desirable in what place. Today we have been able to make radical improvements in procedures, so that in district after district, local management can really know what particular problems are bothering our customers most, and can act more effectively in each situation."

SAM gives the operating telephone companies an accurate and localized reflection of their customers' particular service needs, but is only part of the total and sustained effort of the Bell System to anticipate and respond to complex consumer demands.

As an example of what else is being done to adapt to customer needs, Mr. Search explains that Marketing and Rate Plans people are constantly looking at telephone tariffs and the restrictions on the use of the service that these tariffs impose. This is being done in an attempt to determine whether the tariffs are up to date and meet the needs of the public in a changing environment. "We're wading through the



*"If it's an emergency to you, it's an emergency to us"—a Southern New England Telephone Company repairman restores service to a*

*customer's telephone on an after-hours call. 24-hour repair service is available to about 95 per cent of Bell System customers.*

reasons for imposing the many tariff restrictions. If they are valid and reasonable, as most of them are, the restrictions stay — but if the reasons become invalid and not responsive to the customer's current needs, they are changed or dropped entirely."

Two recent Bell System service offerings — the Single Payment Option and the Residence Package — also represent constructive, innovative responses to customers who want a wider range of choices. "With the Single Payment Option, the customer can make a single, one-time payment for a Bell Chime ringer, Trimline or Princess phone instead of paying the present monthly charge," Mr. Search explains.

"And for people who desire an array of extra services, the Residence Package is a big step in the right direction. By ordering three telephones, a customer has his choice of style, color, cord length, and Touch-Tone service, if available. All of this service is provided at a rate which is significantly lower than would be the case if each item were ordered individually. We are also developing a number of services that are tuned in to what the customer wants, since we know that people are simply not going to be satisfied with what we think is best for them."

As the sophistication of the communications industry grows, the demands for more levels and com-



binations of service will also increase — and the Bell System will provide a proliferating family of service offerings to meet these needs. Looking ahead, it appears that this trend toward diversification will accelerate along with the demands of individual customers and consumer organizations.

### Repair service around the clock

Another effective response to consumer needs is the Bell System's 24-hour repair service, now available to about 95 per cent of its customers across the country. Five years ago, when there were only scattered round-the-clock programs in effect, about 20 per cent of the system's customers were covered on a 24-hour basis. The Bell System agrees with many persons who feel that the telephone is such a vital communications tool that any malfunction requires prompt attention and has taken the approach that "if it's an emergency to you, it's an emergency to us."

To further insure telephone service that is as trouble-free as possible, the Bell System subjects every new service offering to extensive market testing before it is introduced to the public. After a new product — such as the Trimline phone — has been developed and produced in a limited quantity, it is installed in the homes of selected customers for a product trial. Some redesign work is then usually done on the product, based on the customers' experience with its performance. Finally, a market trial is conducted in which selected groups of customers are offered the new service for a fixed rate. Only when the results of the market trial indicate the new service and the rate charged for it are compatible with the customers' desires is the service made available to the public.

"In many cases," explains Haynes H. Fellows, Jr., New England Telephone's vice president for operations, "the vocal customers demanding changes in telephone service are products of the 'restless generation.' This generation wants progress rather than promises. It is action oriented. It is unrestricted in its

expectations because it has seen so much accomplished in so short a time."

The rapid growth of Extended Area Service is one of many instances of the Bell System's response to the "restless generation." EAS expands a customer's local calling area by linking two or more exchanges with toll-free service. The customer pays a flat monthly rate and is able to call anywhere within the expanded area without paying long distance, multi-message unit, or interzone charges. Nine out of ten Bell System customers can now reach one or more nearby exchanges by making a "local" call, and EAS continues to grow. Last year, the Bell System expanded local calling in over 400 exchanges, including many large metropolitan areas. Thus EAS has increased the convenience and value of service.

### "911" meets an urgent need

The recently announced plan to offer "911" as the universal emergency number is another indication of how the Bell System is adapting its services to meet expressed consumer needs. In a time of steeply rising crime rates, particularly in the nation's urban areas, concern about public safety has risen sharply. To help insure that people can summon aid swiftly and easily in time of danger, the plan, when fully operational, will allow any person in the country to dial "911" to summon the local police or fire department, ambulance service, or other emergency agency. In addition, people will still be able to dial the operator for emergency assistance.

Through such procedures as the Service Attitude Measurement plan, and by keeping up-to-date on emerging problem areas, the Bell System will be able to anticipate the needs of its customers, broaden its options of service offerings and methods of payment, and introduce service improvements based on the customer's point of view. As Mr. Romnes puts it: "We can never forget that the ultimate test of everything we do is the satisfaction and convenience of the customer." □

## The Creative Climate

In an interview with Norman Cousins, editor of the Saturday Review, Dr. James B. Fisk, president of Bell Telephone Laboratories, emphasizes that research and development scientists and engineers need self-discipline and 'elbow-room' for imagination.

**MR. COUSINS:** When you walk into a building like this — and there aren't very many buildings in the world that give you this feeling — you're aware that you're inside a piece of sculpture, and not just inside a building. Where does the conception come from — the architect, or from specifications you gave him?

**DR. FISK:** We, of course, had a pretty clear idea of how we wanted our laboratories and offices arranged. But the specifications we gave Eero Saarinen had nothing to do, really, with the architectural form. They had to do with the internal working arrangements we thought would be most appropriate and most efficient, but the final form was his.

**MR. COUSINS:** What you have created here is much more than just a building; it is an environment, almost a total environment.



*In the central courtyard of the Bell Telephone Laboratories building at Holmdel, New Jersey, Dr. James B. Fisk and Norman Cousins discuss the climate for technological creativity.*

**DR. FISK:** It is, indeed, a total environment. It provides the right kind of atmosphere for our research people and our development and engineering people.

**MR. COUSINS:** I get the sense that there is plenty of elbow-room for imagination. How does this environment affect the people who work here?

**DR. FISK:** The thing that is most important in an organization like this — where research, development and engineering are being carried on — is the atmosphere created by the people themselves. This is the critical thing.

**MR. COUSINS:** Tell me something about the people here at Holmdel.

**DR. FISK:** We have about 4,000 people in this building, about a third of whom are professional engineers and scientists. Another third give them technical support of various kinds, in their capacities as laboratory assistants, draftsmen, expert craftsmen in the shops, and so on. Still another third provide all the services that are necessary to run any kind of organization: building services, comptrollers, operations.

**MR. COUSINS:** What are the differences between the research and development work done here?

**DR. FISK:** Bell Telephone Laboratories is thought of primarily, in the outside world, as a research laboratory, and we are that indeed. Yet, only about 16 or 17 per cent of our professional people are doing what I call research, in the sense in which the word is used in a university. That portion of our staff is doing the same kind of work you would find being done in the best universities. Another group of about the same size performs the function of planning, which we call systems engineering. This takes into account not only technical possibilities of new developments, but also the economics of their application. The remainder of our professional staff pursue development and design of new communications equipment. Actually, the preponderance of our work here is in the latter two fields of systems engineering and development and design. Most of our "pure" research is in our Murray Hill, New Jersey laboratories.

**MR. COUSINS:** Are you related in your work to the work of universities around the country?

**DR. FISK:** Oh, very closely. The kinds of things we do in our research department are very similar to the kinds of things we find being done in science departments in the better universities in the world. We maintain very close relationships with them, partly to be aware of what's going on and what may be available to us, and partly to contribute to the world

of science. You must be an active participant in research if you're going to make use of the results of research.

**MR. COUSINS:** I would guess that when you bring a scientist into the laboratory here, he may have a general assignment. At the same time, I would suppose he has a great deal of freedom — freedom in terms of drawing up his own program, freedom to roam. Does that kind of scope exist here?

**DR. FISK:** Yes, it does. The work we describe as research has freedoms of exactly this sort. However, the kinds of things that people do in this research area are those things which are, or we expect will be, relevant to the future of communications. Therefore, the choices made by the individual scientist are within that large area of work that is related to communications. There is a kind of self-discipline here. An individual is not going to pick up a problem that has no bearing whatsoever on the work of his associates. On the other hand, he has quite a bit of freedom in choosing problems that are important both to science and to communications.

**MR. COUSINS:** What specifically would scientists here be working on that is important to science?

**DR. FISK:** Well, for example, we are working hard to understand the properties of any and all materials that are of present or likely interest in communications devices. We are finding some astonishing new properties which will be of value in the future. We also would like to understand a great deal more about the fundamental nature of communications — not only the voice and hearing mechanisms, but also the intelligence content of messages and how we can transmit this effectively and efficiently. In addition for example, we would like to understand more about the use of computers in communications, and the needs of the public in connecting computers one with

another, or a person interacting with a computer. We want to know how this can best be done, and how our communications services can be most useful and valuable to the public as computers play a more prominent part in our lives.

**MR. COUSINS:** Do I understand correctly that there is biological research going on here?

**DR. FISK:** We're doing a very modest amount, but it is closely associated with the hearing and voice mechanisms. We are also doing important work — also on a modest scale — in the behavioral sciences, which supplements our regular work in the physical sciences.

**MR. COUSINS:** Looking around this laboratory and knowing that a great deal of free and unplanned research is going on, one naturally wonders whether anything is being done here that will add to the quality of life as distinct, let us say, from the convenience of life. I'm thinking of those things that might not strictly come under the heading of communications.

**DR. FISK:** There's a great deal of work going on here that is very broadly leading us to a better understanding of many phenomena in a wide range of scientific disciplines. I can't help but believe that with this increased understanding — and the kind of new things coming out of this activity — that there will be very real benefits, over and above the immediate utilitarian aspects of our work.

**MR. COUSINS:** This opens up the general question of serendipity. What are some of the specific things that have come out of the laboratory that were not planned, but came out quite by accident?

**DR. FISK:** The projects we work on over the years are projects that have some reasonable association with the main line of our activity, namely, commu-

nications. Nevertheless, some very important items have emerged as by-products. For example, many years ago the whole sound motion picture business came out of our work in acoustics. Some 20 years ago the transistor was invented at Bell Laboratories, and although it has been very important to us in communications, it has also been tremendously important to a lot of other people in a whole variety of fields.

**MR. COUSINS:** Was the transistor a by-product?

**DR. FISK:** No, it was not a by-product. It resulted from a very conscious attempt to make a solid-state amplifier. We started by trying to understand the fundamental properties of semi-conductors. We learned a great deal about those properties, but our eyes were focused on the possibility of making a solid-state amplifier. As you know, that was indeed done; but it was successful only because it was based on the accumulated background of a very basic understanding in the fields of physics, chemistry, materials, metallurgy, and so on. The by-product part of it has been the benefit that has accrued to the whole electronics industry throughout the world.

**MR. COUSINS:** Walking around the laboratories here I've heard rather exotic expressions such as wave theory of matter and laser. Are these specific items of research now going on?

**DR. FISK:** They're certainly part of our vocabulary. The wave theory of matter goes back to the original quantum theory in the late '20's, and was demonstrated in Bell Laboratories by Lester H. Germer and the late Clinton J. Davisson at that time. In fact, Davisson's demonstration that particles can behave and be described as waves won him the Nobel Prize in physics.

**MR. COUSINS:** Have you done laser research?

**DR. FISK:** Yes, a great deal. We're very much concerned with lasers because of their great potential for carrying tremendous amounts of information. Ultimately, we may be able to communicate by light waves, using the laser as the source of the light wave itself.

**MR. COUSINS:** What happens between the time one of your research men has an idea and the full utilization of that idea? How do you process your research, and get it into the actual engineering?

**DR. FISK:** Let's say that one of our people generates an idea for a new communications service. The first thing is to do enough laboratory work to demonstrate feasibility. The next step is for the systems engineering people to study the technical paths that might lead from where we are now to actually providing the service. Beyond exploring the various technical ways in which it might be done, they also examine the economics of the situation: Would it be a valuable service? How much would it cost? What kind and how much development would be required?

The systems engineering people then prepare a plan which gives a basis for our development engineers to design the new system, the new techniques and procedures and the new apparatus needed. Then it would go to manufacture. We work very closely with our associates in the Western Electric Company to insure that once a new system or apparatus is wanted, the transitions from development to manufacture take place effectively. We work right with them in our regional laboratories that are located in Western Electric manufacturing plants.

**MR. COUSINS:** With your hundreds of scientists and researchers, how does one decide — and who does the deciding — about what projects should be researched?

**DR. FISK:** As far as our forward-looking research is concerned, the decision is made largely by the peo-

ple in the research area themselves—by the individual doing the research who knows that we're in the communications business. He knows what things are possible, what areas are important; these are day-by-day decisions the scientists themselves make. There is a subtle balance here between doing what is possible and doing what is needed. We try to maintain an atmosphere that you would find in the best universities. We try to have our people dedicate themselves to finding the answers to those problems that are going to control the long-term future of this business.

Ideas for their work may come from any of several sources: from the Bell telephone companies, AT&T, the Western Electric Company, or from within Bell Laboratories. The decision to go ahead on a *specific* development project, however, is made only after careful study and by the combined judgments of people at AT&T, Western Electric, and Bell Laboratories.

**MR. COUSINS:** Do you have many people engaged in exploring what one might call "21st century life?"

**DR. FISK:** I wouldn't quite call it that. We do, however, have a number of research people and systems engineers who spend much of their time thinking about how people will want to communicate in the future: what they would like to have and what we can give them. The systems engineers are doing the planning so that our developments will really suit the needs of this country in the future.

The research people, of course, are working at the frontiers of knowledge in a great variety of areas. In fact, we try to cover all those areas that might be important to communications 10, 20, or 30 years from now. Our goal is to be able to provide any kind of communications service anyone wants, not only voice and pictures, but also data of all sorts: machines talking to machines, machines talking to people, and people talking to machines. We must be in a position to provide all of these — and others that may sound like science fiction now—when and where the general public wants them. □





## Central City Jobs

Turning a corporate commitment of providing meaningful jobs for the disadvantaged into effective programs requires varied approaches and reveals tough problems.

The question of whether or not a company participates in programs designed to provide job opportunities for Negroes and other minorities is no longer appropriate. The question today is how it should participate.

The number of programs—both government sponsored and those of groups of businessmen — is about as widespread as there are opinions on almost any given subject. Yet there are no clear-cut answers to indicate that one approach is better than another.

Within the Bell System alone, a wide variety of means are being used to provide meaningful work opportunities for both Negroes and others from disadvantaged areas. In varying degrees, these programs cover the full spectrum, from conducting employment readiness courses which teach the basics of job hunting, to providing jobs to individuals who fail to meet even traditional hiring standards.

One of the most comprehensive — and most unusual — programs combines the efforts of four Bell System units in New Jersey. Together, the New Jersey

*As construction workers speed alterations to a former automobile showroom in the heart of Newark, central city residents learn new skills under a unique Western Electric program that provides jobs for the hard-core unemployed.*

Bell Telephone Company, Western Electric Company, Bell Telephone Laboratories, and the Long Lines Department of AT&T are providing more than 550 jobs for residents of central city areas — and especially in Newark — where unemployment is most severe.

An important aspect of the program is that it is not limited to just 550 people. Rather, the hope is for a “flow-through” effect, that many of those hired into entry-level jobs — specially selected assignments that can be quickly learned — will go on to better jobs, thereby opening up new opportunities for others who have traditionally been considered underqualified for employment.

An unusual aspect is that virtually all applicants for both the New Jersey Bell and Western Electric programs will be drawn from ghetto areas. Individuals living outside the central city will be considered for jobs in the usual manner.

The unique aspect of the program is the means by which the Western Electric Company will assimilate its new people into its regular work force. In an attempt to provide individuals an opportunity to acquire the industrial discipline needed for a productive performance, Western Electric has opened a special 50,000-square-foot manufacturing facility at 200 Central Avenue, on the edge of the Newark ghetto. When an individual has demonstrated his ability to perform at the standard level of proficiency, he will be transferred to other Western Electric manufacturing facilities in northern New Jersey, where he will have the opportunity to increase his earning capacity.

### Employment standards modified

Since the program was announced in January, representatives of all four Bell System units have been working with school officials, civil rights leaders, business and government groups, and social agencies to acquaint the unemployed with the job opportunities and to obtain applicants. Recruiting efforts have been directed at the hardcore unemployed. Employment standards have been drastically liberalized.

Employment forms have been simplified, and though New Jersey Bell still gives applicants employment tests, successful completion is not necessary.

Medical requirements have been altered to enable as many as possible to be hired, within, of course, the limits of safety and the individuals’ ability to handle the work. An individual with a correctable physical impairment, for example, will be hired with the hope that the defects will be corrected after he is on the job.

Even prior standards of good conduct have been modified; police records resulting from misdemeanors no longer bar employment. In effect, each applicant is being evaluated as an individual.

### Adequate job performance required

To ward off the possibility that modifications in employment standards might ultimately adversely affect performance standards, the companies involved in the New Jersey program are not lowering performance requirements because the same high standards of production and service as before must be met.

By lowering admission prerequisites and expanding training intervals, the companies are letting people prove their employability on the job, rather than judging their ability on the basis of diplomas and spotless past.

Another facet of the approach in New Jersey is that promotability no longer is a criterion either for being hired or holding onto a job. Sooner or later, given extra time and additional training, each person hired in the program must meet the production or service standards of the job he holds.

“While those hired under the program,” explains Robert D. Lilley, president of New Jersey Bell, “will be expected to fulfill the requirements of jobs, continued employment will not depend on the ability to move ahead.

“However, those who show by their performance that they can advance to better jobs will be given every opportunity to do so.”



In the basic areas of hiring the disadvantaged, lowering employability criteria (while maintaining eventual performance standards) and providing extra time, patience and training to those participating in the program, all four Bell System organizations in New Jersey are in agreement. All four share the ambition to take the initiative in the cities, rather than react to demands or crises.

In implementing the policy of providing job opportunities, however, differences of approach are evident by comparing the programs of New Jersey Bell and Western Electric. Between them, they are providing over 80 per cent of the jobs, simply because they, by the nature and size of their operations, have more jobs to offer.

### Western Electric program distinctive

The Western Electric plan to open a new manufacturing facility in downtown Newark near the scene of last year's rioting is similar in purpose to what the Aerojet-General Corporation did when it established the Watts Manufacturing Company as a Los Angeles subsidiary, and what was done by the Avco Manufacturing Company in Roxbury, Massachusetts.

But, the way Western Electric's plan works differs in several aspects. For one thing, governmental funds, or government contracts, are not involved in any way.

And instead of organizing a subsidiary company, Western Electric's new plant is simply a satellite manufacturing site for its mammoth Kearny, N. J., works. As such, workers at the 200 Central Avenue location will have the opportunity to carry over their seniority with regard to benefits when they have proven themselves and to transfer to other Western Electric locations where greater opportunities for wage increases and advancement are available.

Among the other advantages of the separate plant is that it gives the people who live in the core city one less pressure to cope with while they try to acquire the skills needed to adjust to an industrial situation. The world of the factory may be strange to



*Simplified employment procedures are designed to make it as easy as practical for the hard-core unemployed to get jobs with the Bell System in New Jersey.*

such an individual initially, but by working near his home, it is expected that he will be able to acclimate himself to the business world more quickly.

"Our hope," says Paul W. Smith, director of industrial relations at the Kearny Works, "is that after getting their feet wet in a job near home, these men and women will be ready, willing and able to go on to better jobs. What this new plant does is give the inexperienced worker extra time to work near home while he acquires skill and, equally important, industrial discipline."

Experience in other Western Electric projects for underqualified, disadvantaged workers has revealed that while it is generally relatively easy for an individual to pick up the skills needed, it is more difficult for individuals from core communities to adapt to regular attendance and working hours, punctuality, and cooperative relationships with co-workers.

"It is in this area, more than in picking up skills and tools and materials," Mr. Smith adds, "that some of the people who come to us from ghetto areas need extra time and patience. With our new facility in Newark, at least they won't have to travel across what they consider 'alien turf' to get to work."

Unlike Western Electric, New Jersey Bell does not have the kind of business that allows it to set up separate facilities. As a communications common carrier, its operations are spread throughout the state. Consequently, the 200-odd disadvantaged newcomers to New Jersey Bell must be absorbed into the existing body at a variety of locations.

To take account of their inexperience and give these people a chance to break in on the less demanding jobs, New Jersey Bell has set aside a block of relatively easy-to-learn existing jobs for participants in the program.

Available to residents of the central city are jobs such as messengers, supply men, duplicating machine operators, coin telephone collectors and telephone booth maintainers. Certain other jobs, like the removing of disconnected telephones, are also available.

### After-hour courses encouraged

All the people hired — at AT&T's Long Lines Department, Bell Telephone Laboratories, New Jersey Bell, and Western Electric — are being given on-the-job training and are being encouraged to take such after-hour courses as remedial reading, arithmetic and basic electricity so they can become equipped for better jobs.

Coordinating the New Jersey Bell program is Robert B. Tuttle, the plant department assistant vice president. Recalling an experimental project with 10 underqualified workers begun over a year ago, Mr. Tuttle says, "We hired ten young men without high school diplomas just on intuition and their own expressed desire to work. Eight of the ten completed out-of-hours courses we offered and went on to better jobs. The other two quit to go to college."

Another group of ten was hired on the strength of the first group's performance, but only six of them were able to hold their jobs. "A creditable enough number," says Mr. Tuttle, "but also an indication that there are no panaceas that can embrace everyone."

### Not a reward to lawlessness

Despite his caution, Mr. Tuttle is, on balance, optimistic. During last summer's rioting in Newark, he was on a rooftop, looking after some delicate transmission equipment. "After seeing what was happening in the streets, I realized that, although we had done quite a bit in the job area, I knew we had to do more — not to reward lawlessness, but to soften the misery that leads to it."

At Bell Telephone Laboratories, the emphasis is on training to equip people to fill the existing jobs of draftsmen and bench machine operators. In addition, the job of a laboratory assistant has been created to help relieve technical aides of the more routine tasks like taking measurements, reading instruments, wiring, programming and key punching. Plans call for training about 100 people at Bell Labs locations in Murray Hill, Whippany, and Holmdel, New Jersey.

Besides the commitment to find a way to help the hard-core unemployed in the central cities, the Bell System organizations in New Jersey are finding that common problems are being revealed as their programs proceed. Of course, this is not unanticipated. From the outset it was realized that intensified efforts at social action could submit the Bell System to some controversy and criticism, and could involve management in balancing some new variables, in addition to its already complex mix of concerns for quality of service, costs, wages, profits, financing, et al. But based on evidence to date, there is no reason to suppose that the problems cannot be solved.

One of the major concerns has been the acceptance that these new people have with their co-workers. Some employees have expressed concern about working near those with police records. Others have



*Training the disadvantaged is a vital aspect of the Bell System program in New Jersey. Upon completion of training, individuals will be expected to meet usual job performance requirements and, hopefully, be able to move on to better paying jobs.*



claimed "reverse discrimination" due to the longer-than-usual training given participants in the program. While these anxieties do not appear to be widespread, the companies involved have been trying to allay them by discussing the program and its objectives with employees.

The question of how the new employees will accept the company also remains to be answered. How will a youth used to roaming and keeping irregular hours — no matter how squalid the conditions he roamed in—take to that "industrial discipline" needed to hold steady employment? Early indications, both in New Jersey and in other Bell System companies throughout the country are encouraging.

But no one has definite answers yet on what the real, irreducible minimum criteria for employability are. Until such data accrue, some mistakes may be made, and those responsible for the programs emphasize that the number of dropouts should not be a criterion for the success of the new ventures.

### Experiment in method, not purpose

It is clear, however, that no one group has the final answer on every detail of how to implement programs most effectively. On the other hand, Bell System executives, including AT&T President Ben S. Gilmer, are emphatic in declaring that the Bell System's commitment to the cities of America is *not* an experiment. As Mr. Gilmer has put it: "I think it is absolutely essential that we in business make this effort to meet the problems and evils that beset the cities a success. There is no question that the good health and growth and creative vitality of private enterprise depend on the soundness and health of developing urban life . . .

". . . The very life of the business, and the nature of the road ahead for all employees and their families, depends on our success, and the country's success, in dealing with the problems before us. Or I might better say, not before us, but the problem that is upon us, as it surely is." □

# Innovation: Its Effect on Service and Costs

In a recent talk before the New York Society of Security Analysts, AT&T Board Chairman H. I. Romnes discussed regulation, growth trends in communications, and the effect of technological developments on service and costs. Excerpts of his remarks on the impact of innovation follow:

Through the years, the Bell System has been able to more than offset the inroads of inflation through continuous advances in technology and operating methods, supplemented when necessary by increases in telephone rates. The overall result, even when rate increases have been necessary, has been that the cost of service has declined in relation to the cost of living and personal income levels. This has broadened the market for our services. We hope by means of continuing cost reduction efforts to minimize needs for rate increases, but where increases cannot be avoided we shall apply for them.

Projecting growth rates of the last decade into the future, we may have some 140 million telephones in 1980. But increase in telephones is an insufficient measure of growth. It is increase in volume of business that counts — greater usage of our facilities for long distance and for various business purposes.

Long distance usage has grown an average of  $8\frac{1}{2}$  per cent annually for the last decade. Last year's growth was right at that level, and we estimate 9 per cent in 1968. There may be as many as 15 billion long distance messages in 1980.

In 1960 we had about 1,100 Data-Phone® sets in use. Now the number is nearly 50,000 and the current growth rate is about 50 per cent a year. Some tentative projections suggest that we might have something like 750,000 Data-Phone sets on the

big switched network by 1975.

Overseas services have shown a 19 per cent compound growth rate in the last decade. Messages last year were up 24 per cent over 1966. That sort of growth means that the volume doubles in three years and triples in five. The increasing interdependence of the family of nations — world travel, multinational corporations, potential for interconnection over the worldwide network of computers and machines — all these factors suggest the breadth and depth of growth potential.

The effectiveness of our effort to control costs is indicated by the fact that a decade ago we had 112 employees per 10,000 telephones. At the end of last year the number was 79. Even so, the total number of employees increased substantially over the period because our volume of business doubled.

This more effective deployment of people has come about because much of our switching which formerly was handled by operators now has been mechanized. Because equipment and cables have undergone vast technological changes which make them more trouble-free and easier to install and maintain. And because better methods, tools and training have permitted us to do our job more efficiently while improving our service.

Now that we have mechanized so much, what opportunities remain to reduce wage costs? Another question may be, "While long distance costs have been cut by technical advances,

aren't you rather stymied in the local exchanges?"

Such questions can be answered by giving a few examples of developments now in the works.

First, electronic switching. Much has been said about how this can provide "customized" services. Equally important, however, are potential savings in maintenance costs.

It looks as though the cost of maintaining so-called #1 ESS exchanges — our first electronic central office system — will be about half the cost of maintaining electromechanical offices of corresponding size. Further savings are anticipated with later models.

#### **Expanding and saving with TSPS**

Then there is TSPS, short for Traffic Service Position System. This is the electronic system that makes possible Expanded Direct Distance Dialing.

The important things about TSPS are (1) it will work with any kind of existing equipment to enable people to dial many kinds of long distance calls they cannot dial today, such as, person-to-person, collect, credit card, etc; (2) this system does so much work automatically that there will be a large saving in the number of operators needed; and (3) operators can work at locations convenient to them, and the actual switching equipment they control can be somewhere else. This means minimum travel problems and lower force turnover, which produces another saving.

Another extremely important new development lies right now under mile after mile of city streets, in the ducts that carry cables interconnecting local telephone exchanges. In New York, for example, hundreds of local offices must all be interconnected. To help do this, here and in other cities, we already have thousands of what we call "T1 carrier" systems that can

carry 12 messages simultaneously over a single local pair of wires.

It is "carrier" systems of various kinds that have cut circuit costs per mile on long distances. The point is that in T1, our first digital, stream-of-pulses system, we now have a carrier that is economical for local — as distinguished from long distance — use.

Now about integrated circuits. These will have a tremendously important role in electronic switching systems of the future. What is their advantage?

Largely in cutting the costs of electronic components to a fraction of what they are today — and at the same time increasing their reliability. So we expect to use them in many other ways.

In equipment for customers: telephones, Picturephone® sets, data sets. In transmission systems — for example, to make even more economical the local digital carrier system. In electronic PBX's and improved electronic central offices.

A particularly interesting use of integrated circuits will be in equipment that can provide a second line from central office to home, for example, without using a second pair of wires. Up to now it has been about as economical to use the second pair as it would be to use electronic gadgetry. But we think integrated circuits will change this in many situations and we're sure there is a large demand for a second line into many homes.

Integrated circuits also make an essential contribution to Picturephone service prospects. They greatly reduce the cost of our new, improved instrument that is soon to be tested.

Incidentally, someone may ask, "Is there any estimate today of the Picturephone market?" To which I answer no, there is not. But looking, say ten years ahead, when there will surely be many more than 100 million phones in the Bell System, one might observe

that if there were a million Picturephones in use, that would be less than one one-hundredth of the number of telephones. Is this attainable? We don't know — but I don't think the figure is too outlandish.

We are confident that the steadily unfolding demand for communications of all kinds in industry, education, government and everyday life will surely continue. And all evidence points to the public's eager interest in responding to new services.

#### **Ready for the future**

We believe the Bell System has a management and employee organization fully able to cope with the future.

Bell Laboratories is in the forefront of technology. Innovation is a way of life with us and we intend to keep it coming. Also, our patent position is strong. We have more than 6,000 patents that have issued since 1956 and they reflect a position of leadership not only in integrated circuit electronics but in the entire range of solid-state technology.

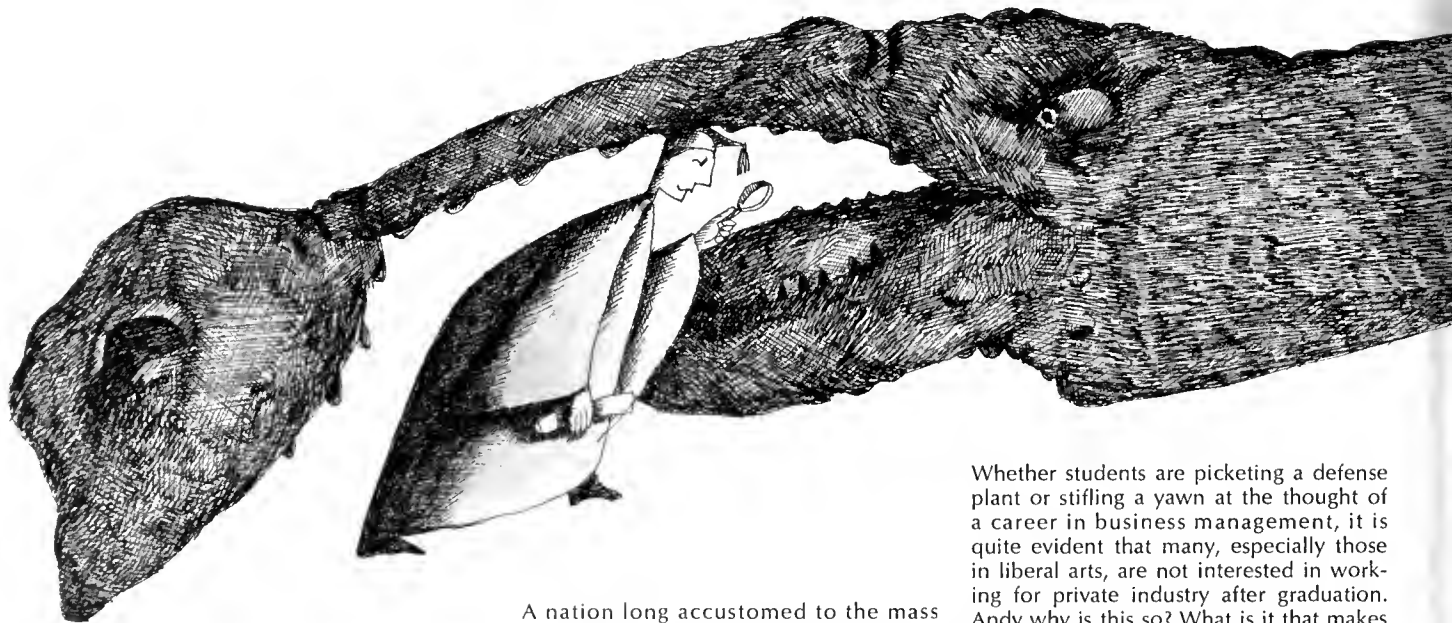
These patents, in addition to being used in our own equipment, are very important trading material in helping us obtain patent rights from other organizations everywhere. In fact, we believe we have access to more technology than any other organization in the world.

Western Electric is unmatched in ability to produce equipment of highest quality at very attractive low prices. The Bell telephone companies have operating experience and skills that are constantly refreshed.

Very importantly, innovation in our business is not a matter of new equipment and services alone, but also of operating methods — how we schedule, install, repair, develop new ways to do a thousand different jobs better and at lower cost. □

## The Realities of Business

A young businessman emphasizes that if college students want to make an impact, they should actively confront the challenges that many businesses offer.



A nation long accustomed to the mass anonymity of the "silent generation" suddenly awoke in the fall of 1964 to the eruption of the "Free Speech Movement" on the Berkeley campus of the University of California. From that point forward, the increasingly strident and restive tone of student opinion has been very much in the news. For what first surfaced at Berkeley and has since spread to nearly every campus in the country is a vivid contempt among college youth for a supposedly hypocritical and unresponsive status quo. This intense student dissatisfaction has lashed out in several directions. One of its targets has been the business community, particularly the larger corporations.

The adverse sentiment ranges from outright hostility to languid indifference.

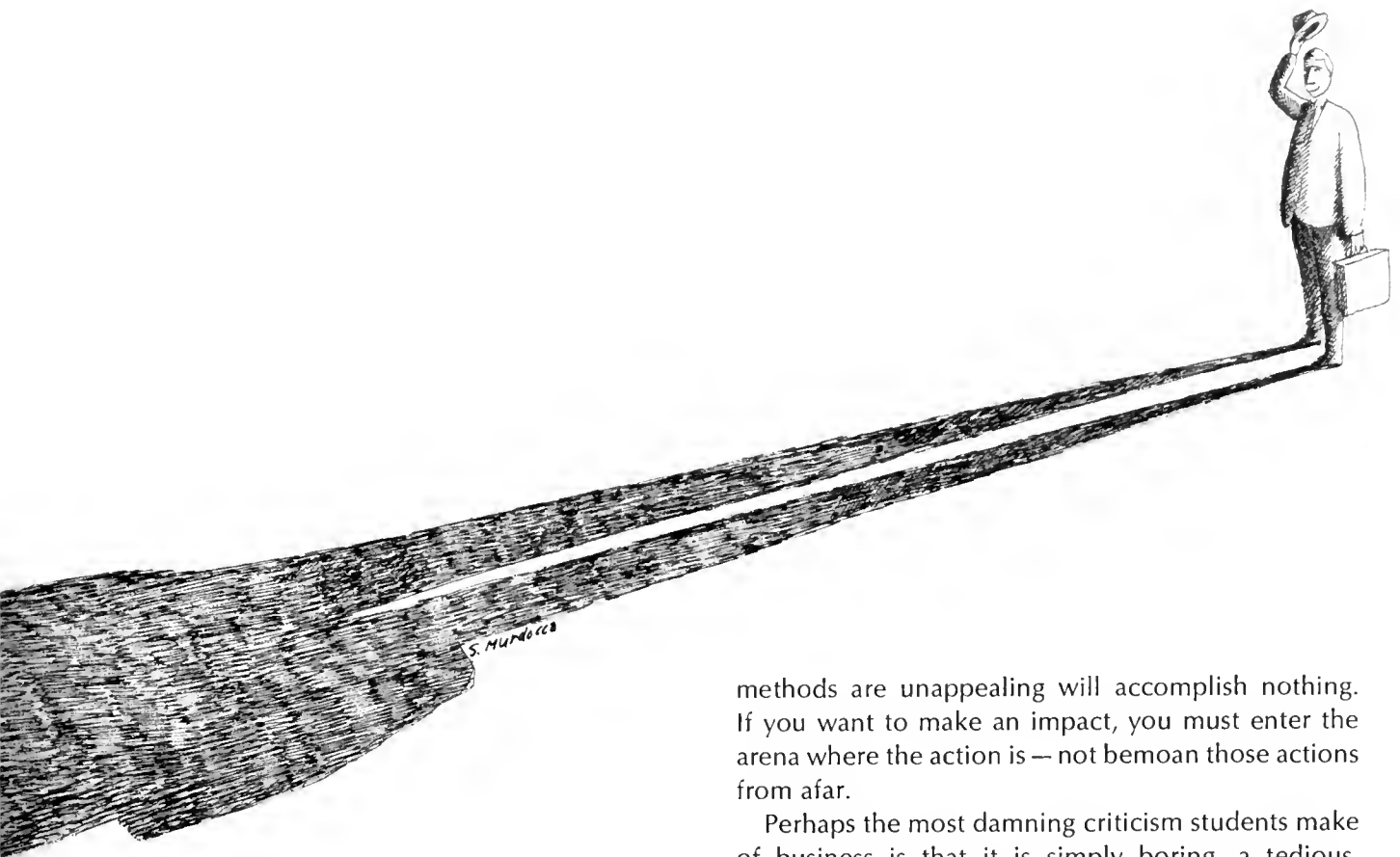
Whether students are picketing a defense plant or stifling a yawn at the thought of a career in business management, it is quite evident that many, especially those in liberal arts, are not interested in working for private industry after graduation. And why is this so? What is it that makes business an unattractive prospect for today's student?

From the college campus resounds a catalogue of criticism which usually invokes these objections to the business world because it:

- restrains initiative and creativity
- lacks personal challenge
- demands excessive conformity
- is devoted to piling up profits, and
- may require unethical conduct.

In response to such criticism, Assistant Editor Richard R. Draper, who joined the Bell System from the University of California's Berkeley campus about a year ago, offers his reaction and those of other recent graduates to the business world.

by **Richard R. Draper**



Though we are far removed from the days of the robber barons, conditions reminiscent of those times still linger in some businesses. To the extent that they do, student criticism of the business world is justified. But an individual who idly or actively deplores such conditions from a distant vantage point will not change them.

If there is anything that today's college student affirms, it is his desire to be actively involved in a meaningful enterprise. Consequently, it is difficult for me to reconcile this commitment to activism with his disenchantment for business.

The only effective way to change an institution's objectives or conduct is through constructive confrontation: By working within a company, expending your talent and energy, and exerting your will, you can eventually alter its course and character. Direct participation is the way to substantiate or refute your impressions of modern business. Avoidance of the corporate world with the excuse that its aims and

methods are unappealing will accomplish nothing. If you want to make an impact, you must enter the arena where the action is — not bemoan those actions from afar.

Perhaps the most damning criticism students make of business is that it is simply boring, a tedious, paper-shuffling exercise. "Working in the business world today can be dull and monotonous, but only if you make it so," says John R. Bejarano, public relations staff supervisor for the Pacific Telephone and Telegraph Company.

Mr. Bejarano, like a great many Bell System managers, feels that business has unlimited, although not clearly obvious, challenges. "They're not just waiting for an executive to assign them to you. These challenges must be sought; they must be recognized and identified."

Some 3500 college graduates now working in management positions throughout the Bell System know from first-hand experience exactly what Mr. Bejarano is talking about. They are veterans of IMDP, the Bell System program designed for college graduates who demand a large measure of responsibility and an immediate opportunity to demonstrate initiative.

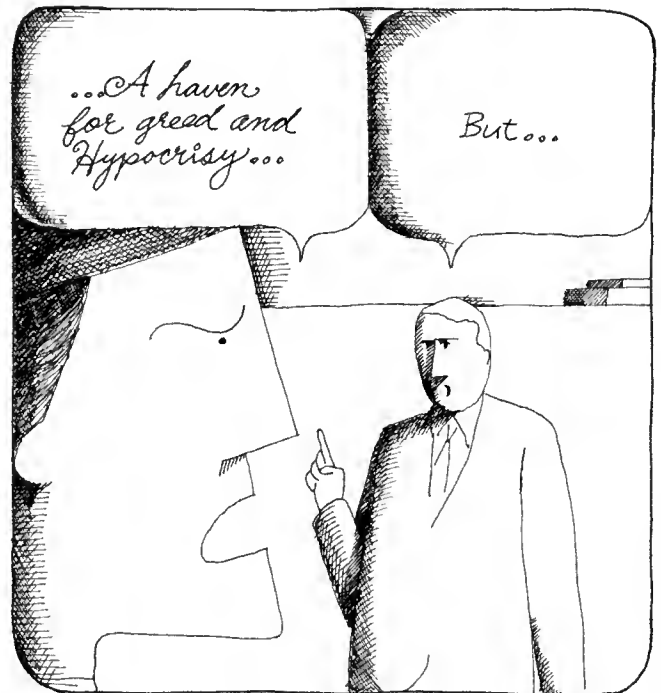
IMDP is an acronym for the Initial Management Development Program, a rigorous, year-long immersion in a sea of on-the-job problems which college graduates are expected to solve. Now in its tenth year, IMDP imposes direct and immediate responsibility



on the individual, yet gives him the authority and leeway to creatively meet his objectives.

"I received my first project just four hours after I started work," states Dennis Cooper, a former IMDP with Bell of Pennsylvania now on a leave of absence studying for his masters degree. "Some of the projects are glamorous. Most of them aren't. In either event the assignments are not 'make work' jobs, but projects that need to be done and demand right away the level of intellectual effort that we should have been trained for in our college years. Of course, our bosses supervise and give direction, but the responsibility is ours — and we know it."

IMDP supervisors are carefully selected to provide a job environment where originality and individual approaches to goals can flourish. Frank Pazlar, a district commercial manager for Northwestern Bell in St. Paul, Minnesota, has experienced the IMDP program from both sides, first as a participant and later as a supervisor. "I try to let my people run their own show," he states. "I give them as much freedom as they want to assume, within the limits of the operating goals we have to accomplish. I would rather have



them ask me for guidance than cover them with supervision they may not want or even find useful."

A man hired as an IMDP participant is expected to put in a high quality performance. If, at the end of one year, he fails to demonstrate that he is capable of reaching third-level management within four years, he is asked to leave. George Bird, an IMDP coordinator for Bell of Pennsylvania, believes that "the better men thrive on this 'up-or-out' proposition. The weaker men seem to see it as an immediate threat to their security — and it probably is. You can't bluff your way through this program."

A man progressing through his IMDP year is subjected to "vertical loading," that is, his areas of responsibility are enlarged, the pressure to produce higher-quality work at a faster pace is increased, and the element of risk involved in the outcome of his projects is widened. While he proceeds up this graduated scale, he is also expected to show an increasing amount of initiative in accomplishing progressively more difficult tasks.

The word "challenge" has been so overused in the inducements which college recruiters offer to student job-seekers that it is practically devoid of meaning, but challenge in a particular sense is what the IMDP program is all about. IMDP extends to the person





anxious to express himself in individual thought and action the opportunity to fall on his face or rise to the top. Not only must you independently devise means of reaching established goals, you must also generate and attain additional objectives which increase your competence and set you apart from the "average" manager.

Charles Hulse, now a second-level manager supervising 43 people for Northwestern Bell, states that "as an IMDP, I was given broad objectives in areas where the results of our business office operations needed improvement. The projects assigned gave me an opportunity to set my own objectives and intermediate goals, so that I could determine more precisely just where and how much the results were improving."

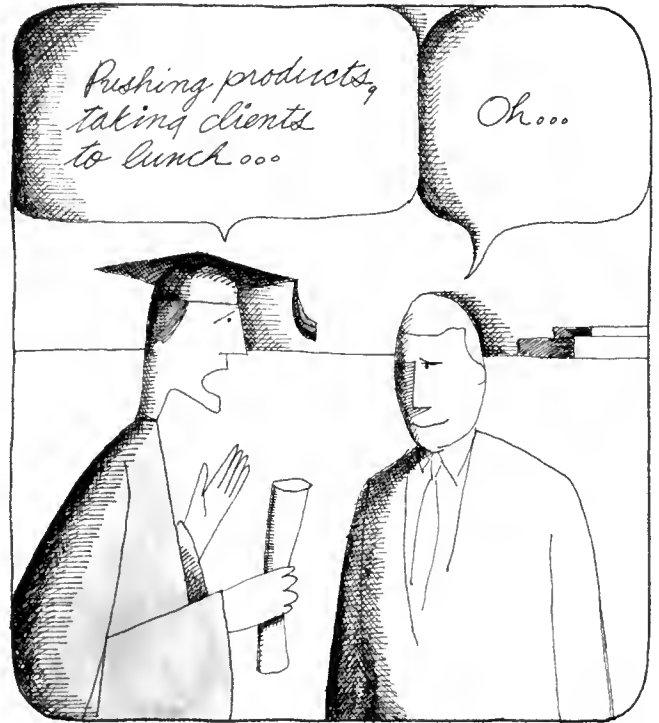
Your development is not up to the company — its full weight rests on you. The IMDP experience can be as vapid and stultifying as sitting through an over-long, badly produced play — if you don't infuse it with your enthusiasm and imaginatively create opportunities to prove your ability. IMDP is more than a training program. It's a course in self-development that demands individual growth. The challenge of IMDP is intensely personal and requires a vigorous and ingenious response. The last thing anyone ex-



pects, much less demands, from an IMDP is conformity; you are hired to generate fresh and original approaches to a multiplicity of problems. You know you'll be dismissed if your performance doesn't live up to your potential.

"Though we are constantly working to improve our IMDP selection techniques," says Neil Greenhalgh, AT&T's personnel supervisor of college employment, "we have to concede the probability of some wrong choices." Inevitably, there are some mismatches between individual IMDP's and job assignments. Some men leave of their own accord and others at their supervisor's request. There is always the chance that the needs of the man and those of the company won't mesh — and each IMDP is made fully aware of this possibility before he starts work.

Of course, one of the built-in problems almost every IMDP encounters during his first year is the ingrained reluctance of some management people to accept ideas and programs advanced by someone barely out of college. Mr. Pazlar feels that "some supervisors may have a tendency to be set in their ways, inward-oriented, more concerned with their re-



tirement, promotion, or pay increases than the people they are responsible for developing in the business."

One innovation that Bell System companies use to deter such militaristic supervision is the Organization Development Program, which brings together several levels of management to set common objectives and work out group solutions to the organization's problems. OD strives to establish a constructive rapport which promotes a candid flow of ideas from all quarters of the management force.

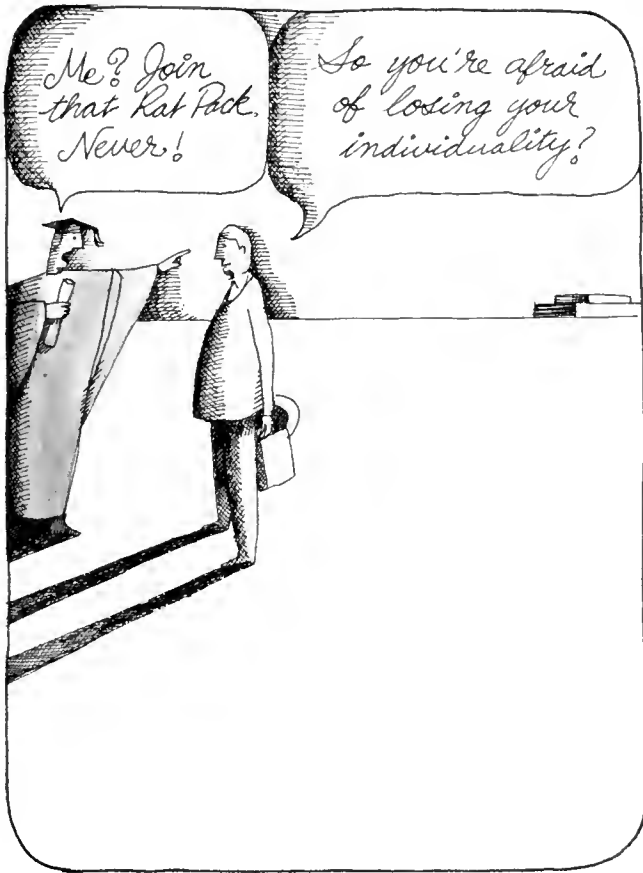
Caution and hesitancy on the part of some managers are not confined to business — they are just as prevalent in educational and governmental institutions — but they are facts of life. Coping with these people (whose caution may be justified because they know much more than you do about the business) is sometimes frustrating, but can be very rewarding, since you must use all your persuasive skills to convince them of your view.

The much-discussed "generation gap" also operates to polarize businessmen and college students.

Too many students take literally the advice to "never trust anyone over 30" and too many businessmen readily accept the "bearded demonstrator" stereotype of the college generation. The sad consequence of this polarization is that neither group gains an understanding of the desires, motivations, and identity of the other. The space between them never narrows, and is filled with the rhetoric of exaggeration and distortion. Of course, there are students entirely unreasonable in their ideological absolutism, just as there are some unethical business executives—but these are small minorities on the extreme ends of the spectrum whose identities shouldn't be confused with the entire business or campus community.

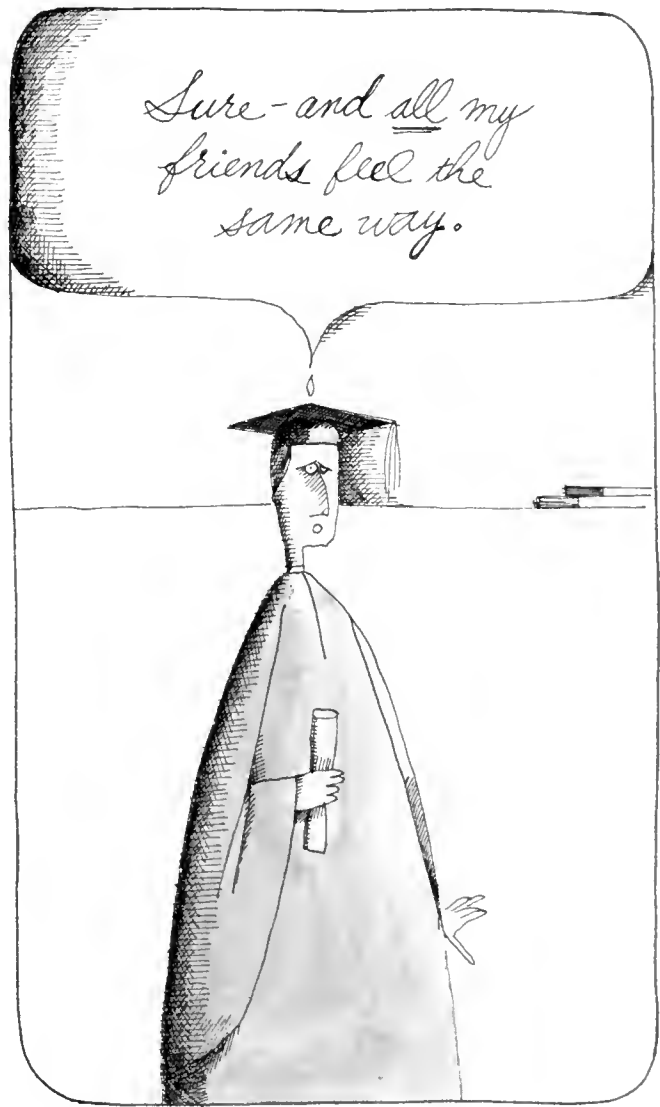
Can the idealistic objectives of students ever productively converge with their acrimonious objections to business? They can and have in many industries, and the Bell System IMDP program presents an excellent opportunity for them to do so.

The most jarring revelation an IMDP experiences once he begins work is that he really *is* on his own—in most cases, he has more latitude, more freedom to operate, more chances to assert himself than he had in college. Mr. Hulse says that "during my IMDP year I was given full latitude to approach and accom-



plish projects in any manner I wished. I got the chance to succeed or fail, because I was responsible for the project's outcome. I sometimes sought my boss's counsel, but didn't expect him to tell me how to do the work — that was my responsibility."

Dr. Robert N. Ford, AT&T personnel director for manpower utilization, stresses the importance of self-development among young managers. "It is fair to say that business has, over the years, attempted to motivate people generally through emphasis on what we could do for them, rather than on what they could do for themselves inside our walls," he explains. "The emphasis in IMDP is to shift the burden for the accountable performance to the man himself. Accountability is essential and we argue for spreading this feeling of responsibility or accountability. Every job assignment of the IMDP year should be aimed at letting the young manager solve his own problems and holding him accountable for solutions. In time, top-flight managers set their own tasks, they become uneasy about their own failures, but not because they



don't meet the boss's notion of success or failure."

Only an idealist could believe that, even in our largest corporations, one person's ideas and vigor can make a difference. Yet there are many idealists among the men managing the affairs of American business today, men who are making a difference, men whose efforts determine the activity and direction of the enterprises they run.

The character of a business is a reflection of the people who shape its policies and generate its actions. If you object to the way those policies and actions are trending, there is something you can do about it: join the company and become competent and influential enough to change it. □

The rising assault of decibels on the human ear from man-made sounds is becoming an increasingly important environmental problem that calls for greater public concern and more dollars for research and noise controls.

## The Quest for Quiet

John O. Powers of the Federal Aviation Administration calls it "the most dominant obstacle to air transportation development."

G. J. Thiessen of Canada's National Research Council says the problem results from thoughtlessness and carelessness.

Manfred Schroeder of Bell Telephone Laboratories says that more systematic research is imperative if the problem is to be solved.

All three men are talking about noise — more specifically the bothersome and annoying effects of noise. And like a growing number of public officials, scientists, and businessmen, they are struggling to find ways to minimize the problems caused by an increasingly noisy environment. Urging them on are aroused citizens such as New Yorker Robert Alex Baron who has issued this ultimatum: "The old bromides of 'you'll adjust to it' just won't do anymore."

Mr. Baron is a witty and engaging spokesman for an organization called Citizens for a Quieter City, Inc., which he says was formed to "create an awareness of the need for control of city noises and of the means available for noise control." While he may appear to take a good-natured view of the problem ("The New York Sanitation Department is buying \$4 million worth of quieter garbage trucks; now all we need is a quieter garbage can."), he and his organization are dead serious in lobbying for noise control.

They were at least partly responsible for getting New York Mayor John V. Lindsay to set up a committee to study the noise problem. And they have a champion in Congressman Theodore R. Kupferman (R-NY) who has introduced a bill to establish an Office of Noise Control within the Office of the Surgeon General.

When one considers the various environmental ills which plague modern society, noise might seem to many a minor grievance in comparison to air and water pollution. There is clearly far less public concern about the noise problem, but this attitude may change now that more attention is being focused on the problem. The Environmental Pollution Panel of the President's Science Advisory Committee, for example, has recommended that steps be taken to impose controls on noise. "What are the effects of noise on human life?" asks Dr. John W. Tukey, the Princeton and Bell Laboratories mathematician who served on the panel. "Somehow, those who study man must move rapidly to answer this question, as they must to answer similar questions in many other areas."

The answer, some think, is as important as any questions concerning our environment. Constantinos Doxiadis, world-famous Greek engineer turned city builder, believes noise is a major urban problem and says it is one of the reasons why upper-income people are fleeing the cities. A number of prominent people in the medical profession also are viewing noise pol-



lution with growing alarm. Dr. John Dougherty of the Harvard School of Public Health, for example, blames increasing noise levels for the upsurge in deafness among the general population.

Like other environmental pollutants, noxious noises cannot be completely eliminated. But most experts agree that noise levels can be controlled so that the ill effects are minimized. Unfortunately, the problem has been allowed to reach such proportions in some areas that remedies will be costly, complex and time consuming.

### Noise intensity rises yearly

The New York City Health Department, for example, studied the noise problem in 1930 and found that the chief irritants were traffic, subways, garbage collection, emergency vehicle sirens and construction noise—in that order. All of these noises still afflict New York residents, but to an even greater degree. It has been estimated that noise levels in urban environments have increased by about one decibel per year over the last 30 years, meaning a thousand-fold increase in intensity in total. The problem, however, is not confined to the big cities. Almost every place inhabited by human beings has experienced an increase in noise level during the last decade.

"Not only has there been a substantial increase in noise," says Dr. Schroeder of Bell Laboratories, "many noises, such as aircraft noise, no longer affect just an immediate area. Even the most isolated areas are no longer immune."

Mr. Schroeder, who is the Bell Laboratories' director of acoustics, speech, and mechanics research, thinks more research on noise control will prove that the problems of noise pollution are not unsurmountable — providing public apathy can be overcome.

As an example of this, he points to the current clamor about noise in apartments. "Much progress has been made during the last decade in developing building materials and methods which provide better sound insulation," he says. "But pitifully little use has

been made of these materials and methods in actual construction, especially in the construction of apartment dwellings, where the need is perhaps greatest."

Would the public be willing to pay more for a quieter apartment or home? Many builders don't think so, and with some basis of fact. A large Dallas building firm, for instance, tried to promote "quiet homes" a few years ago. The sound-conditioning package that they had developed added only about \$500 to the cost of the house. Yet they managed to sell just four such homes.

Another builder who had a similar experience sums it up this way: "We were very disappointed with the public's reaction. People are interested in price; the average buyer has only a nominal interest in quality."

Costs may well be a determining factor in the fight against noise, but Dr. Schroeder believes there is more to it than that. "Too often," he says, "people accept noise, thinking there is nothing that can be done about it. But we must also recognize that people react to noise in different ways. Some people can live in a noisy environment without any apparent adverse reactions. Others are affected by even the slightest noise. Until we know more about the psychological effects of noise, it's difficult to get agreement on what should be done about the problem."

### Sound affects the psyche

Some studies have tried to explore the psychological effects of noise. One of the best known was conducted a few years ago among people living near London airport. It was found that many people were increasingly bothered by the noise as time went on, indicating that prolonged exposure can affect attitudes toward a specific noise. More significantly, however, it was discovered that people who tend to be dissatisfied with other things in their environment were more sensitive to the aircraft noises.

"It's relatively easy for us to measure sound levels," says Dr. James L. Flanagan, head of Bell Laboratories' acoustics research department. "But it's not enough

to simply assign a number to a noise. We also have to find some way to quantify the psychological and physiological effects."

Although a telephone company does not face the noise problems with which heavy industry is confronted, the Bell System is nevertheless alert to the problems that might arise. Studies have been made in telephone equipment rooms, and other work locations to determine if certain noises, such as the clicks an operator hears in her headset, could be annoying or disrupting. "We've been able to control noise levels and determine how much background masking is acceptable in certain situations," Dr. Flanagan says. "But problems arise because an individual's threshold of noise tolerance can differ from day to day. This could be the result of metabolic changes or it could be because of variations in work tasks. How and why tolerances fluctuate is something we're trying to learn about.

"We also need to know more about the fatiguing effects of noise. What does this do to efficiency? Much depends on the extent to which a person militates against noise, but we know it also depends on his individual sensitivity to noise and the task he is trying to perform."

An informed approach to the noise problem relies heavily on a thorough understanding of acoustics. Much of the knowledge in the field today has resulted from work done in the Bell System, which has a natural interest in how sounds are created, transmitted, and perceived. Outstanding among the Bell Laboratories acousticians who have made important contributions to the art is Dr. Harvey Fletcher, who has been called the "father of modern scientific acoustics."

Dr. Fletcher concentrated on problems of hearing and speech. Before his retirement in 1949, he directed the development of the audiometer, a measuring device which established the first scientific criteria of hearing acuity. His interest in problems of the deaf led him to develop a group survey method that used recorded sound of decreasing volume, a method

which found wide acceptance in schools.

Dr. Fletcher and his colleagues also conducted masking studies to determine the effect of noise on telephone calling. Their work disclosed information on the mechanism of hearing that confirmed and significantly extended earlier theories of hearing.

### Legal controls may be necessary

While many questions about the effects of noise remain unanswered, progress is being made. Technology has produced better mufflers for vehicles, quieter construction equipment, inaudible motors for front-line military use, and sound absorbent materials for building projects.

How fast these and other technological improvements are put into widespread use, however, depends to a large degree on cost factors. Mr. Thiessen of Canada's National Research Council believes that technology can handle most of the noise problems at a relatively moderate cost. "But, the resultant increase in the price of the article will discourage a manufacturer from taking such measures unless he can be assured that his competition will do likewise."

Mr. Thiessen adds that "legal control seems to be the only way to assure this — unless quiet performance is demanded by the user himself. This explains, for instance, the demand for a quiet refrigerator but not for a quiet lawnmower. A noisy refrigerator annoys the owner himself and not his neighbor."

In recent years, there has been a rapid increase in the number of communities that have adopted some type of noise performance code. Most of these codes, however, have been aimed at specific noise sources such as air conditioners. And no city has included noise-control requirements in its building codes, although this is common practice in a number of European countries.

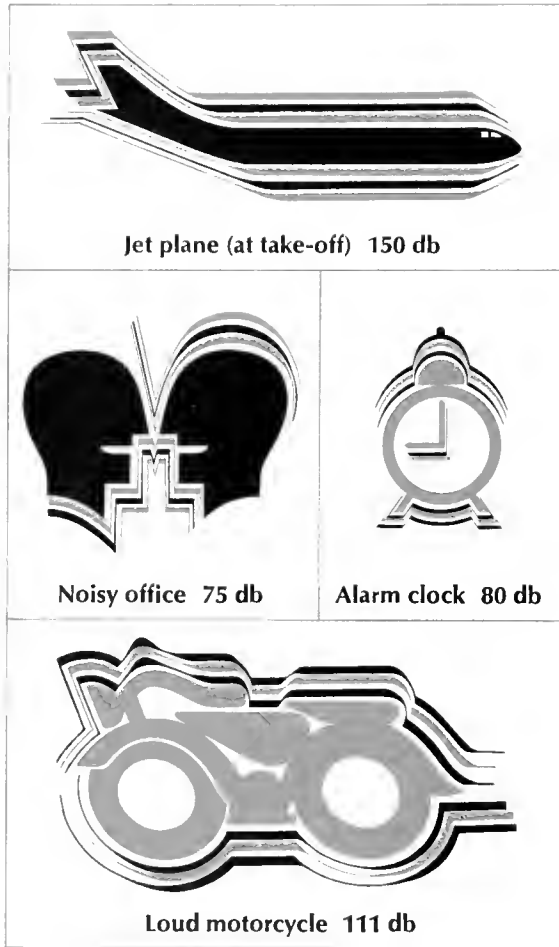
The reason we have been so slow to legislate against noise is that most of the ordinances or codes have proven to be either unrealistic because the standards are too restrictive, or meaningless because

## The level of noise

The standard unit for measuring the relative loudness of sounds, the decibel, was developed by Bell Telephone Laboratories.

The ear can take noise up to about 140 decibels before the noise becomes painful. However, long-term exposure to decibel readings over 80 can cause hearing loss. Permanent damage and hearing loss can result even with short exposures if the sound is about 140 decibels.

Using the decibel scale, some common sounds have these intensities:



Ordinary conversation	60-70 db
Automobile	70 db
Food blender	93 db
Jack hammer	94 db
Subway platform	95 db
Discotheque	105 db
Loud power mower	107 db
Rocket launching	175 db

the standards are too liberal. Even where realistic standards have been established, enforcement has been difficult because of the problems encountered in isolating the offending sound for measurement purposes. For example, measurement of noise in an industrial zone is complicated by intermittent traffic noise, as well as noise coming from other sources.

Noise control standards, however, are probably not too far off for a number of businesses. The aircraft industry for one, is now grappling with the problem of jet engine noise and sonic booms. Mr. Powers, who heads up the FAA's Office of Noise Abatement, points up the reason for the government's concern: "If the increase in noise is permitted to continue unabated, the air transportation system will not realize its full potential. Communities nearly everywhere are resisting the development of new airports nearby because of the noise factor."

Answers to these and other problems associated with increasing noise levels are not going to be easy to find nor will they come quickly. But come they must. As Mayor Lindsay of New York has said, "the city has an obligation to protect its citizens against all forms of violence, including assault by decibels."

To what degree legislation will be necessary in the fight against noise depends in large measure on how much business takes it upon itself to solve the problem. Most people who are studying the noise pollution problem are convinced that progress will come — but not without considerable effort and a willingness to pay the cost of progress.

In our quest for quiet, the question might be asked: How much noise can we tolerate? The question, Dr. Tukey suggests, is one which must be answered, just as comparable questions about other aspects of our environment must be answered.

"Our aim," says Dr. Tukey, "cannot be to restore the environment. Man has already changed the face of the earth more than we realize . . . What we can strive for is restoring the quality of our environment, in terms of its hospitality to human life, both directly and through its hospitality to other forms of life." □



# BELL

## reports

### New Cable to Europe Planned

American and European communications executives recently agreed to seek government approvals of their plans to construct a high-capacity transatlantic and Mediterranean cable system in early 1970.

The agreement was reached by representatives of American, Italian, Portuguese and Spanish communications concerns, which will jointly own the cable facilities. United States participants are AT&T's Long Lines Department, ITT World Communications, RCA Global Communications and Western Union International, Inc.

The proposed project consists of a submarine cable between Green Hill, Rhode Island, and San Fernando, near Cadiz, Spain; a microwave radio link between San Fernando and Sesimbra, Portugal; a microwave link between San Fernando and Estepona, Spain; and a submarine cable from Estepona to Rome, Italy.

The 720 voice-circuit transatlantic cable would be the first direct cable link to Southern Europe. In Portugal, it would connect to cables to be completed to England and South Africa in 1969.

The American communications carriers plan to file a joint application seeking authorization of the project by the Federal Communications Commission. Since there are now only four transatlantic cables and 480 satellite circuits, there will be a need for a major expansion of transatlantic facilities in the 1970's.

### Electrons "Bunch" in Space

A "bunching" of the high energy, outer Van Allen belt electrons as they drift around the earth in its magnetic aboard NASA's ATS-1 Satellite. The

field has been revealed by Bell Telephone Laboratories experiments experiments have also verified a predicted day-night variation in the density of these electrons.

ATS-1 is the first satellite to carry high energy particle detectors in a synchronous orbit — one that matches the earth's rotation so that the satellite maintains a fixed position over a point on the equator in the central Pacific. Since this is the type of orbit of many communications satellites, the experimental results may help the design of reliable, long-lived synchronous satellites that will be more resistant to the effects of high energy particles.

The bunching of electrons in their drift around the earth was indicated in the ATS-1 data by periodic increases and decreases in the counting rates of the Bell Laboratories particle detectors. The electron bunches seem to be caused by sudden changes in the distortion of the earth's magnetic field as a result of sharp variations in the solar wind, a continuous stream of plasma from the sun.

### Computerizing the Library

The first known real-time (immediate response) computer system for handling transactions among a network of libraries has gone into operation at Bell Telephone Laboratories in New Jersey. Called BELLRELL, the system will provide faster and more responsive service to technical library users at the Holmdel, Murray Hill and Whippany laboratories.

BELLRELL offers librarians instantaneous information on loans, returns, renewals, reservations and queries. For example, the circulation librarian can quickly determine the books already on loan to individuals or the place of persons on the waiting list.

In all, 18 types of real-time questions or transactions can be handled.

A complete history of all transactions is recorded on magnetic tapes which provide library supervisors with statistics and other information necessary for analyzing the flow of library materials and the patterns of borrower demand. Another feature of the system is the automatic chargeout of any returned item to the next borrower on the waiting list. When a book is returned, the computer sends a message to the librarian, instructing her where next to send the book.

#### Objective: Nab Abusive Callers

With laws now on the books in all 50 states outlawing abusive telephone calls within state lines, the federal government has moved to crack down on abusive and harassing callers. The House recently passed a bill making it a federal crime — punishable by up to six months in prison and a \$500 fine — to place harassing or obscene calls across state lines.

AT&T vice president Hubert L. Kertz, in endorsing the proposed new bill, told a congressional committee that the Bell System is developing increasingly sophisticated equipment to track down anonymous callers, whose offenses range from common obscenity to threats against families of men fighting in Viet Nam. Mr. Kertz noted that, under present state laws, convictions of abusive callers have increased from 358 in 1965 to 1105 in 1967. He pointed out that the Bell System presently has means of identifying harassing calls and recording evidence to prosecute the offenders, and further, that new devices now being developed will be even more effective.

Mr. Kertz noted that during 1967 the Bell System received almost

700,000 complaints from customers annoyed by anonymous calls, of which about 500 were identified as interstate. Although this is a small part of the total, he believes that the new federal law will also have a deterring effect on potential offenders calling within state lines.

#### Data-Phone Now at 50,000 Bits

AT&T has recently filed with the FCC a tariff offering a new high-speed switched message data service — "Data-Phone 50." The service will permit the transmission of data and facsimile at rates up to 50,000 bits per second — 25 times the capacity of present Data-Phone service. It also provides a voice channel to coordinate data transmission.

The new offering, responsive to the expressed interest of business machine manufacturers and users, will be available for a trial period of three years between New York, Washington, Chicago and Los Angeles. During this period, the Bell System will evaluate the market potential of the service, the specific operating features which will best meet customer service needs, and the suitability of the trial rate structure. Customers outside the four cities may obtain the service on a foreign exchange basis.

#### BTL Sea Plow Among Ten Best

Bell Telephone Laboratories-designed sea plow, which buried about 100 miles of cable off the coast of New Jersey last July, has been voted among the ten most significant engineering projects of 1967 by the National Society of Professional Engineers.

The Society described the sea plow as bringing "a new dimension" to its

annual achievement list. The plow was commended specifically for solving a long-standing communications problem: how to protect undersea telephone cables from damage by such hazards as icebergs, currents, action of the surf and dredges pulled by commercial fishing vessels, which are responsible for 90 per cent of all undersea cable breaks.

The 14-ton plow, which buries the cable more than two feet beneath the ocean floor, is being used this spring to protect the shore-end portion of a fully-transistorized, super-capacity 720-circuit cable being laid between Jacksonville, Florida, and St. Thomas in the Virgin Islands.

Also designated as one of the ten most significant projects was a demonstration that a computer TWX-Data-Phone® combination can be used on a time-sharing basis by smaller engineering firms.

#### Touch-Tone Lights Up For Deaf

Deaf people may one day be able to communicate via Touch-Tone telephone by reading letters and numbers flashed on a small screen. An experimental technique now being explored at Bell Telephone Laboratories uses tones generated by the Touch-Tone buttons to visually display letters and numbers comprising the message.

Communicating with the experimental device consists of using the Touch-Tone pushbuttons to generate a sequence of letters, numbers, end-of-word and end-of-sentence signals, one at a time, in the windows of a display device attached to the telephone. A simple code utilizes the arrangement of letters as they actually appear on the Touch-Tone button panel. For example, A, B, and C are sent using the "2" button. □



We could have stopped here.



We could have stopped here.

# But we're getting itchy again.

*Phones could be made small enough to carry on your wrist and perch in the world.*

*Home telephones may be able to punch computers for preparing income tax, getting information from the library or helping you do it with his algebra.*

*We're working on cordless phones you can carry around.*

*Picture phones for the home may show pictures in color and three dimensions!*

*It's possible telephones with memories will remember where you went, calls you may do, then to turn on your own when you're out of town.*

These are just a few possibilities we can see for the telephone service of tomorrow. We're working on some of them already.

We're never going to stop exploring ways to make your service better and more useful.

Another way to say it is: We may be the only phone company in town, but we try not to act like it.





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# BELL

telephone magazine



The Dynamics of Society

May/June 1968

# Computers and Communications

*Excerpts from a talk by AT&T Board Chairman H. I. Romnes at the Spring Joint Computer Conference of the American Federation of Information Processing Societies:*

One way and another, we have been involved with computers for a long time. We think we have gained an experience and an understanding that can be very helpful. I believe we understand the potentials of computers and the importance of communications in achieving them. I likewise believe we can contribute a great deal toward the realization of great aims.

With the development of transistor technology, we have started to use electronic processors to handle calls, rather than those that employ electromagnetic relays and switches. These processors have a vastly increased memory capacity and operate at electronic speed. They expand our opportunities to provide services that meet individual needs. They enable us to make more efficient use of our network.

These new systems are big and complex. Their executive programs range from 70,000 to 200,000 or more words, and thus are in the range of the largest time-sharing general-purpose computer operations.

One other thing is very important: Our requirement is for *no down time*. We haven't quite made that goal yet, but we are getting close. For example, our electronic office at Chase, Maryland began to operate in January 1966. From the end of that month

to now, 27 months later, it has operated 24 hours a day with but one interruption. This occurred in August of 1967 and lasted something less than a minute and a half — during which time the system took a deep breath, so to speak, and brought itself back to normal operation.

The opportunity now before us is to increase the precious resource of knowledge to a degree hitherto impossible, and to manage the use of all resources more effectively — that is to say, not only more efficiently, but with more imagination and creative skill. Computers and communications together, if wisely employed, can lead to profoundly effective and beneficial innovation in social affairs as well as in the economic life. We need this creative innovation; we need it badly. We need it in meeting urban problems, in education, in dealing with the bothersome side effects of technology itself.

To these ends engineers and scientists must be humanists, and humanists must get a grasp of technology and science. We must breed the wisdom to know where to go. This is the great charge that our time imposes on us all. This new emerging world of computers and communications is so full of promise, in so many ways, that none of us can let down in the effort to do what is right. Too much depends on it. And I believe that people in the computer industry, and we in communications, *will* work to find the avenues we can travel together, to effectively serve the future needs of society. □

# BELL

telephone magazine

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**Al Catalano**, Art Director

**George M. Fowler**, Assistant Editor

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On the cover — Young people, especially college students sometimes referred to as the "Spock generation," are challenging and rejecting segments of today's society in favor of concepts more meaningful to them. One segment under critical examination is the corporation. In an article starting on page 2, Professor Kenneth E. Boulding calls for an analysis of the sources of corporate legitimacy to bridge the gap between young people and business.

Behind the scenes

Gas makes the big difference



moral issue SELF-CONTROL



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WAR IS GOOD BUSINESS



FORTUNE

Guide to Confident Living





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# THE DYNAMICS OF SOCIETY

BY KENNETH E. BOULDING

Text starts

S Norman Vincent  
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OIL

The Good Institute

SS

# THE DYNAMICS OF SOCIETY

During the past year we have witnessed many student demonstrations against the presence of corporate recruiters on campus. The picketing of business executives seeking to hire bright young students is highly visible and perhaps symptomatic of deep unrest.

What is not visible, but probably more important, are the bull sessions and conversations which go on in dormitories and fraternities in which the merits of various careers are explored. Unfortunately, we have no way of knowing what happens there. We do know, however, that fundamental values are established much more by communication from peers than from superiors, and our general ignorance of communications among peers is a great handicap in predicting future values and attitudes.

My main interest in recent years has been what might be called the long-run dynamics of society. In this connection I have come to the conclusion that while the interaction among different elements in the social system is so complex and intense that no one element completely dominates the others, the dynamics of legitimacy dominate practically everything, including the dynamics of power and wealth.

By legitimacy, I mean two closely related aspects of society. One is internal legitimacy, which is roughly equivalent to morale or nerve. This is the conviction on the part of the actor or decision-maker that his role and activities are justified in his own eyes. Without this sense of inner justification, his sense of being "O.K.," action is paralyzed and roles cannot be performed. For an individual, as well as an organization, a loss of nerve is a prelude to collapse.

The other aspect of legitimacy is external legitimacy. This is the conviction on the part of the people who surround the decision-maker that his role and actions are justified. Internal and external legitimacy are closely related and each tends to create the other.

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*Professor Boulding is visiting professor of economics at the University of Colorado and author of 12 books, including *The Meaning of the 20th Century*.*

A man who has a strong sense of his own legitimacy will create the same feeling in others. Similarly, support on the part of others around us confirms us in our own justification. Conversely, a man who loses his sense of legitimacy internally will soon create external doubts in the minds of others. A man who loses his external legitimacy will soon receive indications that challenge his internal morale.

There are at least seven sources of legitimacy, whether internal or external. These may be listed briefly as:

1. Positive payoffs. This is probably the most important element in the long run, but may be surprisingly unimportant in the short run.
2. Sacrifices or negative payoffs. These create legitimacy because of their association with personal identity. If we make sacrifices for something, we find it hard to admit that these sacrifices have been in vain and hence we build up the legitimacy which will justify the sacrifices. This frequently produces a phenomenon I call the "sacrifice trap," in which an institution exploits its legitimacy by demanding still more sacrifices, until finally the demand for positive payoffs reasserts itself and the whole process collapses.
3. Age. Legitimacy may be derived from newness or antiquity. There is often a sag in middle age.
4. Mystery and secrecy. The veil of the temple, the mysteries of finance, the clandestine spy, and classified information give an aura of legitimacy.
5. Symbols, rituals and other specialized communicators of legitimacy. Pomp and splendor, noble buildings, military parades and so on are part of the system of legitimating communications.
6. Association with other legitimacies. Legitimacies rub off on each other. The association of church and state is a good example.
7. Expectations fulfilled or disappointed. This has a special dynamic significance. Unexpected payoffs, either positive or negative, have a weight far beyond

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realized expectations. Unexpected rewards enhance the legitimacy of the rewarder.

If there has been a decline in the legitimacy of the corporation, either in its internal morale or in any of its external environments, we must look to one or another of the seven sources of legitimacy to analyze the problem. If, for example, there are difficulties of recruitment — if there is evidence, as there seems to be, that the attitude of the present generation of college students toward careers with corporations is less favorable than it was, say, ten or twenty years ago — then a very important clue to this phenomenon is the analysis of legitimacy. It is not necessarily the only clue. A particular corporation, for instance, may have difficulty recruiting simply because of its pay-offs: because it does not pay enough, or the conditions of work are not satisfactory.

Where the phenomenon is as general as this one seems to be, however, one suspects that the problem is deeper than that of relative economic reward, and we must look at the dynamics of legitimacy if we are to find a clue for its solution. We can run down the seven sources then to see how they apply to the corporation.

It is clear that positive payoffs, even in quite crude economic terms, are an important element — perhaps *the* most important element — in establishing the legitimacy of the corporation. It has been the capacity of the corporation, in general, to offer good terms of trade for its employees and management, and at the same time offer reasonably good terms of trade to its customers, which has created the greater part of its legitimacy.

The very extent of its positive payoffs, however, has meant that the corporation is not able to rely on sacrifices for legitimacy. In other words, the corporation is not a sacred institution, for it is only sacrifice that creates sacredness. There may be some sacrifices at the executive level — the long hours, the ulcers, the geographical mobility, and public invisibility of the corporation executive — but these are compensated for by financial rewards. There may be some sacred allegiances to particular organizations, especially on the part of the top executives whose identity is closely related to the organizations which they control, but even here the sacred elements are very weak by comparison with, say, the church or the armed forces.

Nobody expects the president of AT&T, for example, to get up and say, "Ask not what AT&T can do for you, only ask what you can do for AT&T." We ask what AT&T can do for us. We demand favorable terms with it, whether as employees or as consumers, or even as investors, and if AT&T cannot provide these favorable terms, we go somewhere else. Competition, indeed, demands absolute disloyalty and a total lack of sacredness.

In the case of the corporation, we can pass over lightly age, mystery and secrecy, and symbols and rituals as sources of legitimacy. It may owe a little of its legitimacy to mystery — the mystique of finance and corporate management or the myth of the mysterious supermen in the board room — but we would be ill-advised to put much faith in this. On the whole, the corporation is a workaday beast, plodding along doing useful things in a bright weekday light. It is not very romantic and not really mysterious. Likewise, it owes little of its legitimacy to charisma or ritual, and — by comparison with a high mass, a military parade, or even a graduation — the annual meeting of a corporation is a pretty pale affair. Nor does it owe a great deal of its legitimacy to the trappings of dress, architecture, and language.

In regard to age there may be a problem. Most

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**The older generation is utterly bewildered by the rejection of its achievements and its ideals by the unspeakably young.**

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corporations are now rather middle-aged. They neither have the excitement of youth, nor the great reservoirs of legitimacy that come from age. Middle-age, however, sits more lightly on the organization than it does on the individual, and you can hardly place this as a major factor. If the corporation is indeed in the trough of middle-age, the future looks good. If it can stick around a bit longer, it will become an almost unbreakable habit.

The sixth source of legitimacy — that is, association with other legitimacies — may be very important but also hard to assess. Here, of course, the major association is with the state, for the corporation draws practically no legitimacy from the church. The corporation is a creature of the state, at least in the legal sense, and in so far as it is incorporated in the state and regulated by it, some of the legitimacy which is attached to the state rubs off on the corporation.

Where the legitimacy of the corporation has been challenged (as it has been, for instance, in the name of socialism) the corporation has often attempted to regain legitimacy by closer association with the state.

There are a number of levels of this intimacy, beginning at one end with simple incorporation, going on to regulation, from there to the independent public corporation, then to the socialized industry, and finally to the Soviet Trust. The real difference between capitalist and socialist organizations is in their methods of legitimation, not in their structure. AT&T, for instance, which is legitimated by incorporation and regulation, is not very different from a socialized telephone company in its internal structure and organization, even though it differs somewhat in the nature of the environment, the degree of independ-

ence, the nature of the capital markets, and so on. There is a great deal of evidence that socialization results in the diminution of the actual payoffs. And when it comes to economic development, a regulated private monopoly like AT&T, leads the field when it comes to payoffs for everybody.

Positive payoffs, however, are only one source of legitimacy and they may not be sufficient. The state has an extraordinary advantage in that it provides us legacies of various kinds in what I call the "grants economy." In its negative aspects, however, the state taxes us, conscripts us, sometimes commits in our name unspeakable atrocities (Auschwitz, Dresden, et. al.), and can involve us in an enormous sacrifice trap. The association with particularly unpleasant aspects of the national state unquestionably diminishes the legitimacy of the private corporation.

The problem of the legitimacy of the corporation in the minds of college students is complicated by the existence of a quite unusual "generation gap." There is always, of course, a war of youth against age, the only class war that seems to make any sense. But it is also a war that youth cannot win without becoming old and regretting its victory.

At the present moment, however, the conflict between youth and age is unusually intense for several reasons. In the first place, we have had a revolution in childrearing dating roughly from the Second World War and symbolized by Dr. Spock. The present generation of middle age people who are running things was raised on Watsonian principles under which they learned very rapidly that nobody loved them. This "loveless generation", as it has been unkindly called, was further traumatized in its youth and may deserve the name of the traumatized generation. The present middle-age generation was not picked up in its cradle; the First World War hit it in childhood; it graduated from college into the Great Depression; it was caught by the Second World War; and its children are rebellious.

By contrast, this generation of college students was

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raised in infancy on what is called a demand schedule, its parents read Dr. Spock or, if they were very erudite, Gesell, and were permissive in their child raising. These young people have lived all their lives on a rising market. They are the untraumatized generation, almost at times frighteningly tender.

It is not surprising that under these circumstances a generation gap of unusual magnitude has opened. The older generation is utterly bewildered by the rejection of its achievements and its ideals by the unspeakably young.

The hippies are only the extreme manifestation of this phenomenon, exhibiting an odd kind of secular Franciscanism in revolt against the loveless world of their elders who, they say, are intent on power, realism, and the roasting of children with napalm. But one gets the impression that the hippies are only the fringes of a frighteningly new, large and solid country of youth, more affluent and more personally secure than its fathers, yet perhaps in danger of rejecting some of the very things which have permitted it to come into existence. One begins to wonder, indeed, what is the optimum of youthful trauma.

Youth, of course, has no future and one should not be too disturbed by its manifestations. But we cannot simply assume that the youth of today are going to be just like us oldsters in thirty years. There is a difference. It is a result of difference in the whole life experience of the generations. The difference will perpetuate itself.

In *The Achieving Society*, David McClelland has pointed to the enormous importance of changes in childrearing in creating sociological "faults," and in changing the whole tone and history of a society.

We should be on the lookout for something like this in our own society. Adaptations are possible, but what we are trying to adapt to is the subtle and little understood dynamics of legitimacy.

Perhaps the most critical question of the next generation will be the relative legitimacy of private versus governmental organizations. In the last hundred years, on the whole, private organizations have been defending themselves against rising tides of legitimacy of public organizations. This has been reflected in increased public control, public ownership, and, in an extreme form, the socialist state.

It may be that this long tide is now turning. The horrors of the threat system as embodied in the national state are raising questions about the previously unquestioned legitimacy of the national state. The payoffs of the national state in a nuclear age seem to be declining, even though its sacredness as measured by accumulated sacrifices is enormous. (Who would dare tell a mother of any son who died on the battlefield that he has died in vain?)

Once the sacredness of the sacred institution is challenged, it becomes very hard to defend. It may be, therefore, that looking at the long pull the legitimacy of the private corporation may best be protected by actually stressing its privateness, its serviceability, its harmlessness.

The question of associating with legitimacies other than the national state is at least worth thinking about. Association with the church certainly seems far-fetched, although historically religion has been a very powerful legitimator.

The United Nations is another source of legitimacy: I have argued that if corporations — especially those which operate internationally — were wise, they might well seek United Nations charters. And although it may seem ridiculous at the moment to associate the corporation with flower power — rather than fire power — flower power may win out in the long run.

Now is the time for corporations to evaluate their sources of legitimacy. There is no easy answer. □

The objective is simple: connect any person to almost anyone else in a matter of seconds. To meet this mark, however, requires a machine scattered all over the country, with billions of parts intermeshing in perfect harmony. This machine must grow to handle a volume of calling that increases at the rate of about ten per cent a year — to about six billion calls in 1968.

The new parts added must reflect the latest state of the art in electronics. And since elementary economics dictate that you can't scrap a multi-billion dollar investment every time you conjure up a better relay, all new electronic gear must work with the older portions of the system.

Besides keeping its own parts internally harmonious — and plugged, soldered and beamed together over decades — the big machine also is called upon for other feats of flexibility. It must, for example, be able to handle telephone calls, data messages and even visual signals without distinction. There are, in addition, thousands of independent telephone companies who depend on the Bell System network to link their customers with the rest of the country and the world.

The network also demonstrates great flexibility by the variety of ways it handles calls. Basically, it has the capacity to speed calls via the most efficient route. To re-route the traffic during peak-load or emergency conditions, the machine constantly searches its own innards. The labyrinth it looks through consists of 12 regional switching centers, each of which is divided into sectional and primary toll centers. The machine "knows," by the dial pulses and tones fed into it, what center it has to reach to put the call through. At each point, the system probes to find a direct pathway to the call's destination. Elapsed time for all this probing and decision making: less than 30 seconds.

All of the local and long distance centers in this huge circuit switching network, make it, in effect, one giant integrated computer. It contains all

the elements of a computer: control, processing, and memory devices, as well as input and output units. But despite its flexibility, a malfunction in one area can have adverse effects in other parts of the system.

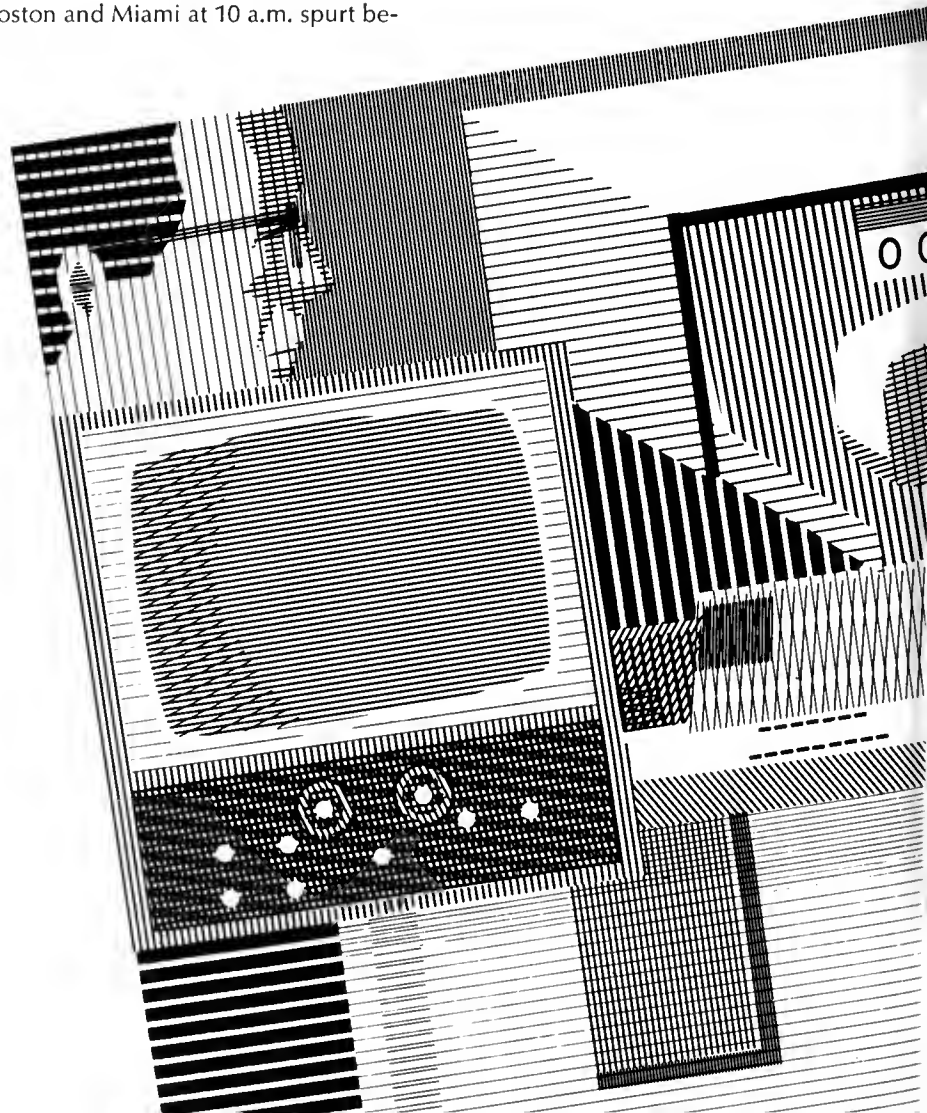
The machine gets human guidance when it needs it. A centralized control center in New York follows the national telephone traffic picture on large maps, complete with the color coding and flashing warnings familiar to moviegoers who have watched the U.S. repel mythical invasions.

By watching their own "Big Board," AT&T Long Lines Department strategists can order adjustments to overcome congestion and delays caused by peak loads at critical hours and occasional natural disasters that wipe out circuits or increase the load.

The time zones of the nation are used to get maximum use and flexibility out of the system. Suppose for example, calling volumes between Boston and Miami at 10 a.m. spurt be-

# The Integrated Computer

When you call long distance, you use the world's sprawling most complex machine: the Bell System's nationwide communications network.



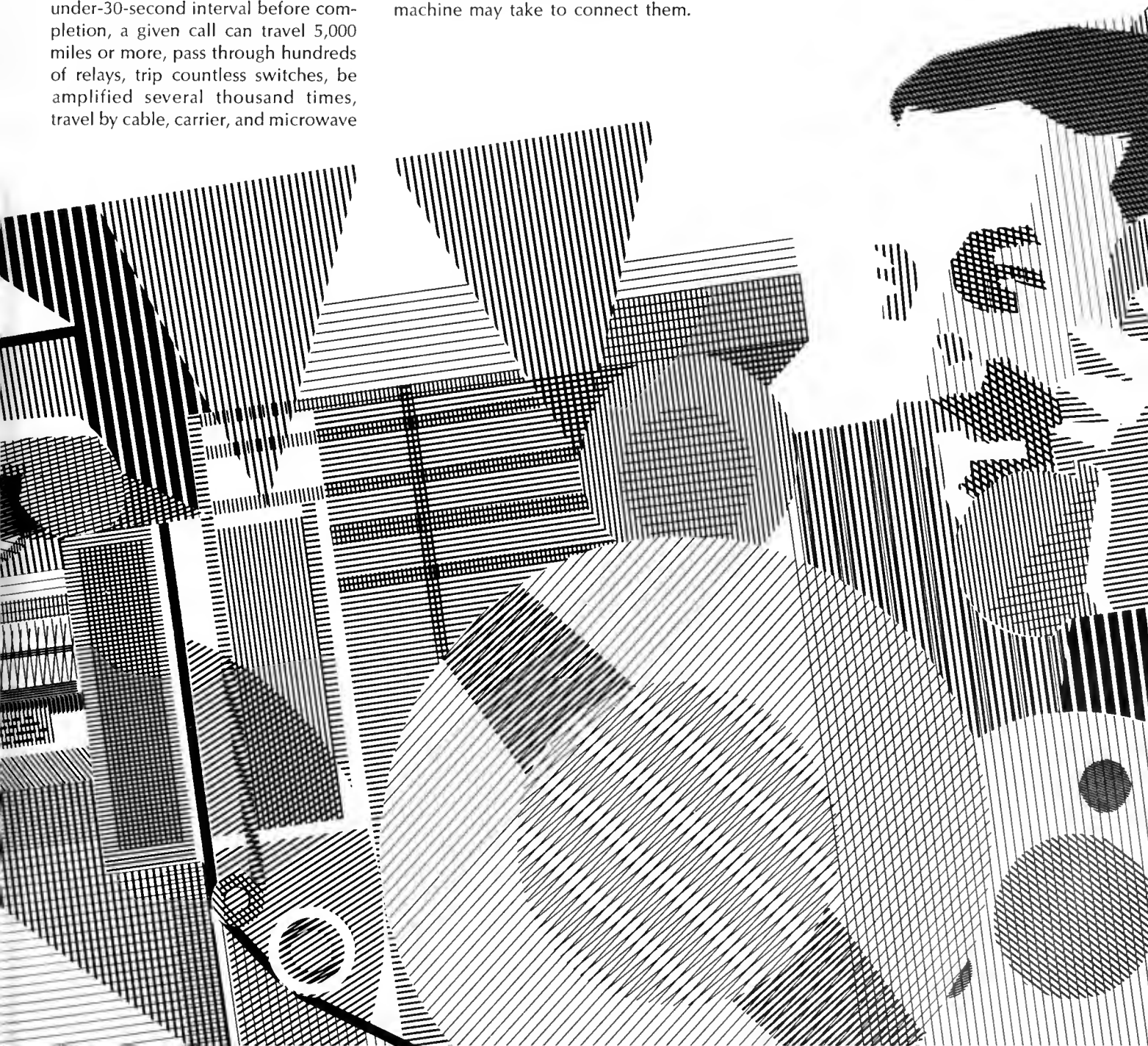
yond the circuit capacity of the network connecting the two cities. On the West Coast, it is only 7 a.m., when some transcontinental circuits are usually idle. Batches of calls can then be switched from Boston to Miami over these idle circuits via the regional switching center at San Bernardino, California — flashing across the country and back in a matter of seconds.

Amplifier technology developed by Bell Telephone Laboratories makes possible this routing of calls without lowering transmission quality. In the under-30-second interval before completion, a given call can travel 5,000 miles or more, pass through hundreds of relays, trip countless switches, be amplified several thousand times, travel by cable, carrier, and microwave

radio and still come out sounding like a call from down the block.

And all this happens so automatically that no one knows just what route a given call has taken. For, as long as the big machine is working properly — and it's programmed to tell when anything goes wrong — there's no need for anyone to know. Most billing, also done by a computer system activated by the network, also is automatic and is based, of course, on the distance between the calling parties — not the devious paths that the machine may take to connect them.

In the future, as more and more electronic gear replaces the electro-mechanical components, the basic principles of self-searching and bulk routing will become even more sophisticated. The time factor will also change. All-electronic equipment will put through calls about as fast as they can be dialed, punched or, perhaps someday, spoken. After all, why waste 30 seconds? □



# HEAR IT LIKE IT IS

It's becoming increasingly important that predominantly white businesses gain understanding of the bitterness and frustrations that exist in urban ghettos.

One way to get exposure to the attitudes of the disadvantaged is to participate in community groups. Here's a first-hand account. **BY ROBERT W. FEZZEY**

I don't want to give you the impression that I am a raving white liberal or a do-gooder. But I do hope that I can give you some idea of how my recent experiences have so profoundly changed my attitude and my sensitivity to urban problems, the greatest challenge facing us today.

As a direct result of my exposure to the real depth of urban problems there is no question in my mind that the problems result from one thing, attitude.

Like most white, middle-class Americans, I considered myself fairly sophisticated about and sensitive to the race problem. But I found out very quickly, over a period of five months, how really unsophisticated I was, how little I really knew about what was going on around me.

In his book "The Other America," Michael Harrington makes reference to the suburbanite who drives to work each morning along the expressway to the central city. He works all day in his air-conditioned

office, then gets into his car and heads back to suburbia each evening, completely oblivious to the dimensions of the problems of the people who live by the side of his road. Unconcerned, he's one who's grown accustomed to the face of poverty: bleak, monotonous, soon almost invisible, as it whizzes past his car windows.

Mr. Harrington, I have come to realize, was drawing a picture of me. I fitted the pattern. Although I felt I was somewhat more sensitive than most suburbanites, I was still uninvolved in any meaningful effort to relieve the stark and tragic condition of too much of the city. After all, I wasn't being bothered. So why not just leave well enough alone?

In the case of the Detroit riot—rebellion, civil disturbance or whatever you'd like to call it—of last summer, I probably took the same view as many of my neighbors: This is anarchy! What do they want now?

I remember Monday, the day after the trouble started. I was driving that usual expressway along with trucks of National Guardsmen and screeching police cars. I remember arriving at the parking lot near the Michigan Bell building and saying to myself, "My

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*Mr. Fezzey, an executive assistant at Michigan Bell Telephone Company in Detroit, served as a member of the New Detroit Committee's task force on communications.*







God—This is just like a ghost town.” Through Monday and Tuesday we watched with horror what looked like the demolition of a city. (I witnessed bombing raids during World War II that were very similar. It looked as if the city was being torn apart.)

I also remember not really being concerned at the time with the underlying causes. My uppermost thought was whether or not the holocaust would end in time for me to get away for my vacation.

Immediately after some order was restored, Governor Romney and Mayor Jerome Cavanagh requested Joseph L. Hudson, Jr., the department store executive, to organize a citizen’s committee to mobilize the public and private resources of the Detroit metropolitan area to cope with the problem. It became known as the New Detroit Committee.

In order for this committee of 39 busy people to function, it was necessary to put together a staff of about 35 people who were recruited from corporations, labor, universities, and other community institutions. The staff has responsibility for gathering background information and generating and screening recommendations for committee action.

Many of the staff people, like myself, have returned to their jobs after serving a little over five months and are now being replaced with new task force men. Those of us who have returned to our companies have gone back as *different* people. Maybe the greatest contribution of the New Detroit Committee is the increased understanding of our urban problems on the part of committee members and the task force. Already it has been helpful in charting future directions of programs companies in the area are now conducting.

The immediate frustration all of us had in working with the New Detroit Committee was that we didn’t know where to go to find answers. For some time our task force on communications felt as if it were trying to package smoke.

The first indication we had of the depth of the problems was in reviewing the responses to 2,200

questionnaires that had been received from various community organizations. The answers indicated (1) the great need for involving inner city people in the decision-making process, (2) lack of faith in city government, (3) lack of faith in the sincerity of business, (4) the need for better police-community relations, (5) the need for housing, education, jobs, and (6) the need for better communications with the white community.

One thing we had to do was to communicate with as many elements of the inner city as possible in order to *really* learn their needs first hand. That’s exactly what many of us did, and I think my experience of talking with many, many people—and really feeling the hatred, the hopelessness and sense of rejection—was something that will stay with me the rest of my life.

Some of the people I met on a person-to-person basis might very well have played a role in the riots. The group included leaders of various community organizations, mothers, young people, school kids, and even a few prostitutes, pimps, numbers people and dope pushers, as well as ministers, educators and legislators.

We were listened to, and on several occasions were told that the problem *can’t* be solved. It can’t be solved because “you and your kind don’t want it to be solved, and won’t do a damn thing other than take the same paternalistic approach you’ve taken in the past.”

We were also refused an opportunity to talk with someone because we were white.

One parolee I talked with said, “Man, I just got out of the House of Correction. I’ve been in three times this year and if I don’t get a job soon, I’m going to do something to get right back because at least you eat.” He had real fire in his eyes. (Incidentally, this man has been working steady for the last three months.)

A mother said, “Mister, my daughter just graduated from high school with a B+ average. Now I find all she can do is be a prostitute on 12th Street.”

A black nationalist said, “Look, we know we have

no chance for integration. Our only hope is to set up a black community. That's what we're going to do, whether you, whitey, like it or not. You know, many of my people hate themselves because they're black. We're going to make them proud of the color of their skin."

Another, now an employee of the city government, said, "Sure, a few years back I fathered an illegitimate child. That made me a big man in the community. How else could I get recognition?"

An educator said there's a growing number of young people who are willing to die for what they believe in. The Civil Rights movement as we know it, he said, is dead.

I could go on with many other examples. But what it adds up to is a cry, a demand for dignity: A need to *really* have the same opportunity as the white man.

The experiences that made the greatest impression on me were my contacts with youngsters of all ages. To look into their eyes and sense the suspicion with which they view you, the hopelessness with which they view their future. They look at the outside world and wonder how they are going to find their place. Unfortunately, some of these kids fall into illicit occupations because they feel that is the only way they can get a slice of the economic pie. The pimps and pushers are the big men in certain areas of the inner city; they have the Thunderbirds and the fine tailor-made suits; they know their way around. Now I can understand how young men with little hope for getting any place in the world can fall into the trap: It's the chance for the fast buck that contributes to the school dropout rate.

The sad part is that many of the young kids who were manageable last July are unmanageable today. They are caught up in a spirit of rebellion and are doing things now that they would not have thought of doing just a few short months ago.

As a result of my experiences, I now react entirely differently when I read about riots and rebellions in other parts of the country than I did last July 23

when I asked, "What do *they* want now?"

I certainly don't condone riots, but I view them with a different frame of reference. I'm now sensitive to the hopelessness, frustration and rejection that causes people to get caught up in rebellion against "The Establishment."

I now feel an obligation to speak up when I hear the typical stereotyping of Negroes and the myths with which we're all so familiar. I know that the angry faces—the rebellious faces—I encountered are the faces of human beings with human problems.

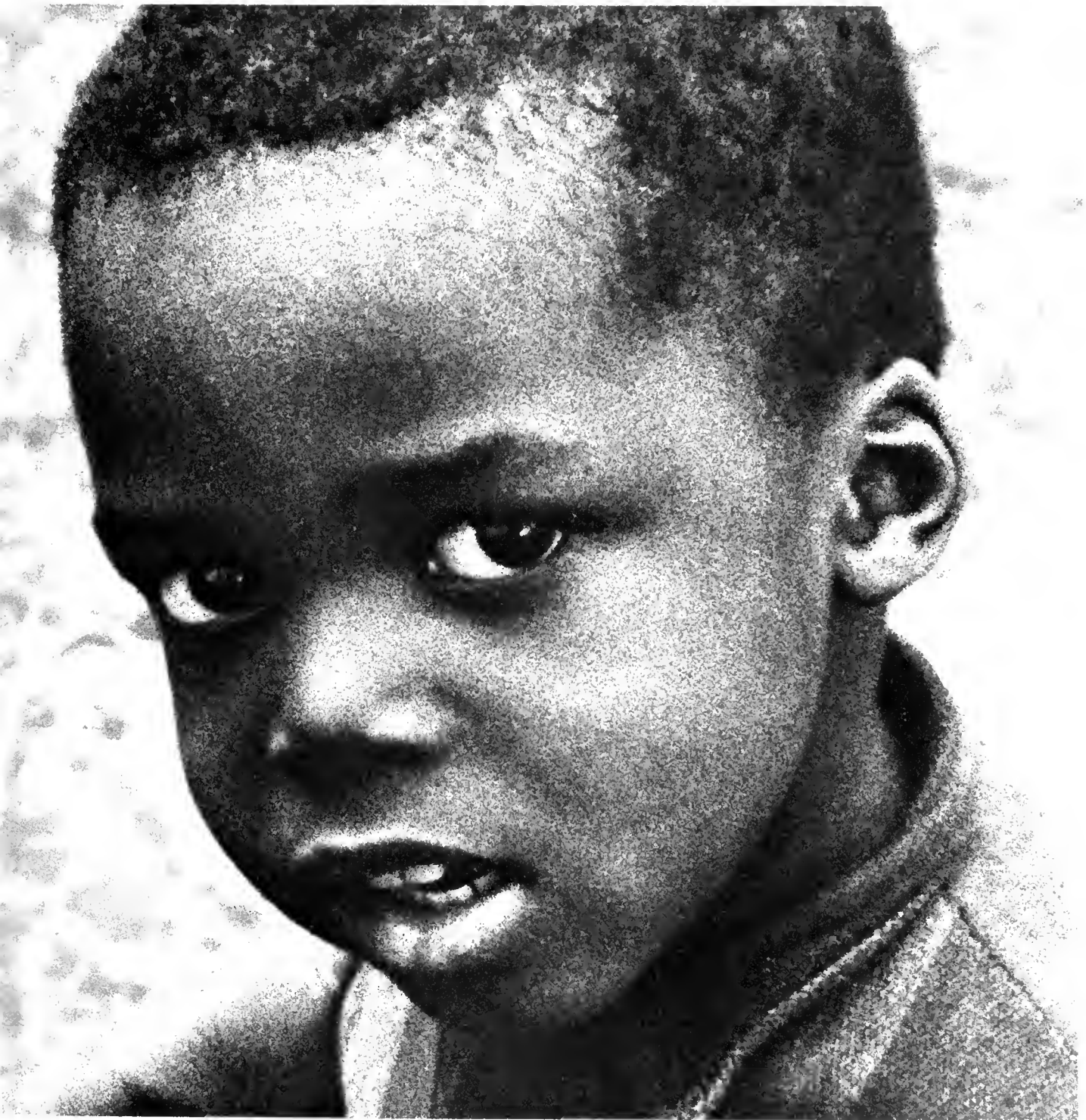
I also know that in my own way—either consciously or unconsciously—I must have contributed to the problem. I'm not going to knowingly contribute to it further, and I'm going to see that my children don't.

The real hope for salvation is new attitudes. Although jobs, housing, and education—in other words, equal opportunity for all—are extremely important, the most basic need is new attitudes.

As Samuel Proctor stated in his book, "The Young Negro in America Today," "The depth of the problem of rejection is so hidden that many well meaning whites miss it. They still look into the Negro world from the outside and prescribe improvements that amount to mild sedatives. They do not grasp at all the point that so long as that Negro world is separated—over there, downtown, uptown, yonder—so long as it is an island where skin color alone is the badge of residence, where poverty can settle down and do its worst to people, where there is no real escape, where an entire neighborhood is reserved for the colored—so long as it stands for the presumption that Negroes belong apart, it spells rejection, loud and clear."

In many respects, the problem is very personal and only each individual can solve it within himself. In other respects, the problem calls for collective action in attacking such things as unemployment, substandard education and slum clearance.

No one can tell you what to do, or how to feel, or what attitudes to instill in your children. But I do know that white America must find solutions if we are to have hope for the future. □



# Calling Your Loved Ones

by Art Buchwald

The telephone companies have been urging fathers to telephone home to their loved ones when they are away from home, and I'm beginning to understand why. If everyone has the same experience I had calling from Sicily, the telephone company stands to make a fortune.

It took me two days to get my loved ones on the phone. Every time I placed the call, I was informed the lines were down, Rome wouldn't let the call go through, there was fog over Mt. Etna or the Mafia had cut all the lines.

And every time I told them to forget it, they informed me there was a surcharge for canceling the call.

"But I never received the call. How can you charge me for a call I never got?"

"But it was your intention to telephone and that is all we need. It is not us, signor. It is the Italian Telephone Company. Don't cancel and then we won't charge you."

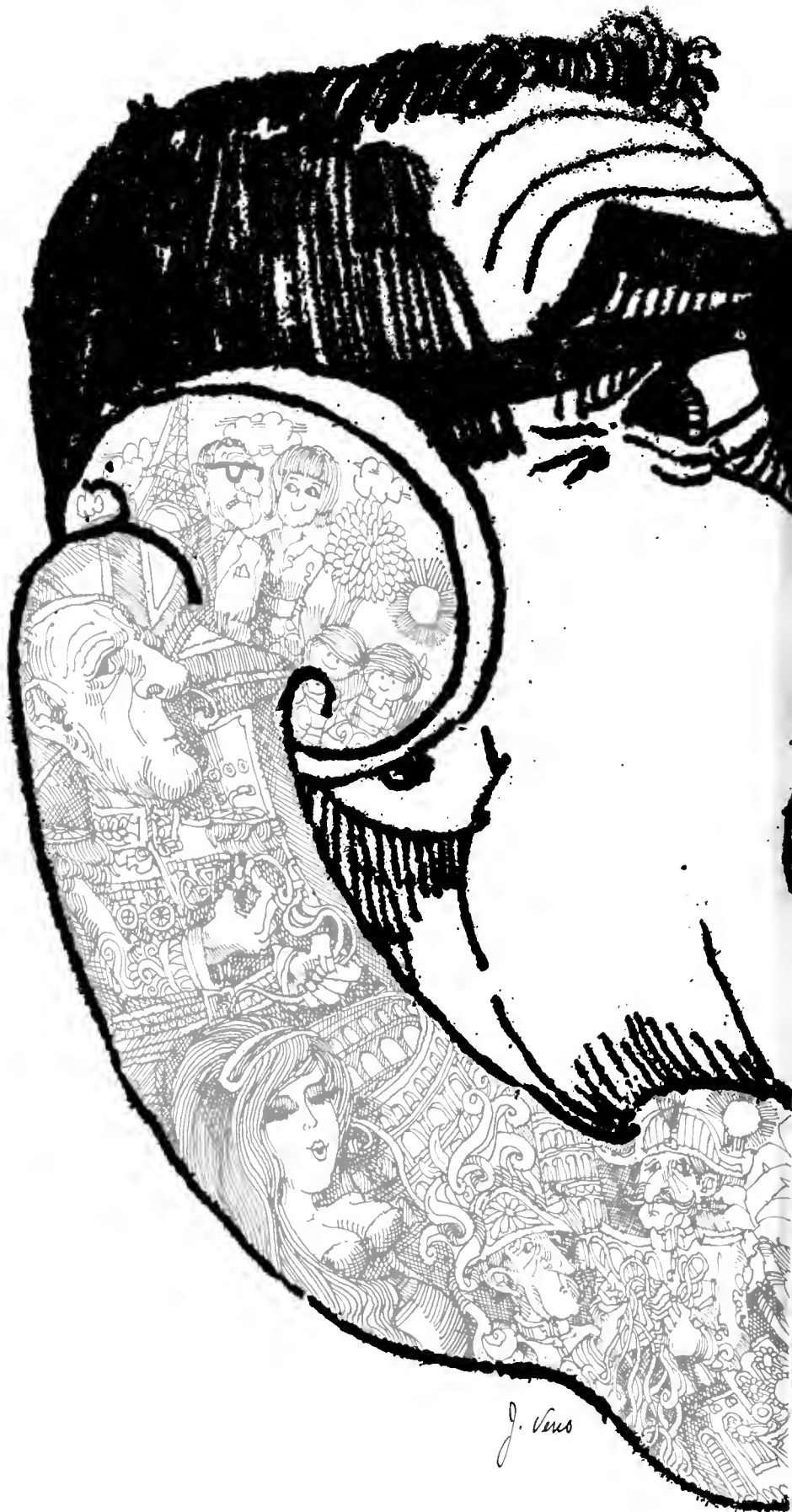
"But I can't get Paris on the phone."

"We know that, signor. But as long as you can't get Paris they cannot charge you. If you tell them you don't want Paris, then they can charge you. This I'm sure you understand."

In order to save money I let the call stay in, and finally it came through. There was great excitement in the hotel because although many people in Sicily have in the last few years put in calls to Paris, only two or three have

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*Mr. Buchwald writes for the Los Angeles Times Syndicate and his column appears in 425 newspapers.*





ever gotten through.

As I picked up the phone, all activity in the lobby stopped. The waiters came out of the dining room and the chambermaids came down from upstairs. They all stood around with pleased smiles on their faces. Everyone felt they had played their part in getting the call through.

I had placed the call on the maid's day off and, in order to save money, did not bother to make it person-to-person. Since the call came in the next day, the maid was there and she answered the phone.

"This is Mr. Buchwald," I said.

"No," she said, "Mr. Buchwald isn't here."

"But this is Mr. Buchwald speaking."

"He's on a trip."

"Where did he go?" I asked out of curiosity.

"Just a minute," she said.

It took her two minutes. "He's in Sicily."

"Oh," I said. "That's too bad. Then can I speak to Mrs. Buchwald?"

"Who's calling?"

"Mr. Buchwald."

"He's in Sicily. He won't be back for a week."

"Just tell Mrs. Buchwald it's a friend."

"Ne quittez pas."

There was a pause on the phone. The Italian operator came on. "Are you finished?" she said.

"No," I said.

Thirty seconds later the French operator came on. "Are you finished?"

Before I could answer, the Italian operator said: "No, he hasn't."

Finally my wife got on the phone. "Hello."

I introduced myself.

"How wonderful of you to call," she said. "Just a minute, Jo-jo (our three-and-a-half-year-old) wants to say hello."

There was dead silence. Then I could hear my wife say, "Jo-jo, say hello to Da-da."

Dead silence.

The Italian operator came on. "Are you finished?"

"No, we're not."

My wife came on. "It's funny, he's been talking about you all week. Wait a minute, now he wants to say something."

Dead silence.

"Say something, Jo-jo. It's Daddy," I could hear her saying.

The French operator came on. "Are you finished?"

Before I could reply, my wife came back on. "I don't understand it. He said he wanted to talk to you. Wait a

minute, Connie (our two-year-old) wants to speak to you."

Dead silence.

Then I could hear Jo-jo screaming for the phone.

I heard my wife say, "You both can talk to Da-da. Jo-jo first."

Dead silence.

"All right, let Connie talk then," my wife said.

Dead silence.

"They're both shy," my wife explained to me. I could hear screaming in the background. Apparently they were both fighting to get at the phone.

Dead silence.

"I can't talk to you now," my wife said, "because they're fighting. Can you call me later?"

I said no, I'd write her a letter.

"Say good-by to Da-da," my wife said.

Dead silence.

"Good-by," I said and hung up.

The people in the lobby seemed a little confused by the conversation, but I didn't try to explain. I went over to the concierge.

"How much did that call cost?" I asked.

The concierge called the hotel operator. He said to me, "She wants to know if you're finished."

I said I was. "But how much is it?"

"She doesn't know," the concierge replied. "We've only been charging people for canceling their calls. She's been here just four years and this is the first time anyone has called Paris and got their party on the line. She's quite upset. Perhaps we'll know more about it tomorrow."

When I finally got the telephone bill I realized I would have to cut my trip short by two days to make my expenses. But it was worth it. It isn't every day a father gets to talk with his loved ones by long distance from Sicily. □

# ACADEME AND INDUSTRY



by **William O. Baker**



How can we realize the promise of science and technology to achieve freedom from want and to humanize our lives in a dehumanizing world? The answer may lie in joining the university's intellectual quest for basic understanding with industry's search for new products, through "knowledge machines."

The purposes of science in our century have become a labile and sometimes uneasy blending of personal and public intent—of individual and institutional aims. The great accomplishments which have constructed this age of science and technology have been from single minds with individual insights, such as Thomson's and Rutherford's vision of the nucleus, Bohr's of the atom, Einstein's and Planck's of quanta and energy and relativity. So, also, were Davisson's findings of the wave nature of the electron, Bragg's of the regularity of the crystal, Shull's of hybrid corn, Stibitz's of the electrical digital computer, Von Neumann's idea of the stored program, Shannon's of

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*Dr. Baker, vice president for research at Bell Telephone Laboratories, holds membership on many of the nation's highest scientific bodies and was awarded the American Chemical Society's Priestley Medal. This article is based on a talk given recently at the University of Akron.*

information theory, Schawlow's and Townes' of the coherent light laser, and so on.

The texture of our modern life, however, came mostly from institutional, and, more recently, governmental application and engineering of such ideas in the realm of industry and public works.

But what does the future portend? How can we achieve the promises of science and technology to secure our freedom and liberty and humanize our lives with food, shelter, clothing, transportation, communication and education? What are the entities which can enable an advance many now assert is threatened, and many even doubt is suitable?

These entities are universities, and a kind of creative, technologically-based industry. The unique scope and import of collaboration between universities and industry looms up before us. The academic pursuit of learning, impelled by personal curiosity and roving intellects, can, under present conditions, be linked widely to the industrial and public purposes of science in new and productive forms.

The world's expectations from scientific discovery and technological development have expanded gigantically. In our nation, industry — the classic purveyor of the new things and services for human needs — is on trial. In much of the world, collectivism in science and engineering has already taken over. Our independent institutions — particularly industry, but to some extent the universities themselves — can survive only through achieving new peaks of creativity and efficiency.

But this does not mean a plea for mere adoption of "technocracy" to build the new cities, purify the environment, house the impoverished, feed the famished hordes elsewhere, guarantee our military security, preserve our liberty, and heighten the humanity of our lives. Rather, it is a recognition that just as we literally have come to *depend* on science for national survival, we can employ it for the enrichment of life and the evolution of man. The mechanism for this stage is what we must explore and master.

The dimensions of the resources for this mecha-

nism of evolution, and those of the national investment in science and technology are, of course, closely connected. Since expectations from science and technology already push the implementing institutions to the limit of their means, we must consider these dimensions in terms of the total resources available. Put together and expressed in terms of human minds, rather than of dollars or facilities, these dimensions are immensely impressive; kept fragmented, they are probably inadequate to the tasks ahead.

There are, this year, in universities and colleges some 257,400 people in sciences and engineering, doing teaching, research, and related work, including 74,300 full-time people in research and development.

For comparison there are about 371,400 full-time equivalent scientists and engineers doing research and development in American industry. This is, of course, already a large number compared to the total in the academic community.

Nevertheless, ways must be found to add to the resources attempting to innovate and produce in our society. The extent of human resources for innovation and technical production now seem marginal.

We know that individual creativity is easier and more widespread in the university context than in industry, so the relative impact of joining some of the 29,400 R&D population of physical scientists and engineers in universities with industry may be disproportionately large. It is a great potential which we must try to convert to action. The essence of this conversion is in joining the individual's quest for understanding to the search for new products and services on the part of institutions and industries.

The National Copolymer Research Program of the 1940's and other events have demonstrated that efforts to employ this individual-institutional junction can serve excellently the public and social purposes of science, areas in which most of the great popular expectations lie.

For example, the creation of solid state and materials science, the transistor, the single crystal silicon diode, and other electronic components without

which digital computers, strategic weaponry and space exploration would not be feasible; the solar cell through which all earth satellites and spacecraft are electrically powered; and the laser, which promises a new realm of energy and signalling assistance — all these came from individual, independent institutional efforts, without public programs of any kind.

The specific qualities that appear in these junctions are achieved in two ways. First, they are formed by the search for simplicity and generality by the curiosity-driven individual, and second, through the optimum management of complexity by industry and government.

But science and technology themselves are becoming more complex at a time when industrial and public demands on them are soaring. In reaction, the tendency for university scholars is to diverge into ever simpler modes which appear to show less and less interest in — and more and more detachment from — the problems of the “real world.”

The principal mechanism which can shift this trend toward new junctions of the university and industry is the pervasive role of digital computers, in their combined computing, information processing, communications and display modes. These are what can properly be called “knowledge machines.”

The surging era of knowledge machines allows the complex technology — and even economics and engineering of industry — to be joined to the scholars', teachers' and universities' search for simplicity. The technical system of a particular industry, or even a new product or service, offers little attraction to the intellectual. However, there is promise now that the technical system can be so organized and analyzed by the use of knowledge machines that its empirical, factual details will not be overwhelming.

Let's look at some of the dimensions of this revolution in simplifying complexity. One is in time limitations, the ultimate scale of human life. In the search for knowledge by the student, scholar, and engineer, we know that the rate of perceptual absorption averages only about 40 bits (binary digits of information

code) per second for anyone; the output rate of information from a person by ordinary speaking, writing, or drawing is even slower. But because a single picture may contain millions or billions of bits of information, our human sensing is indeed constrained.

Digital machines regularly process information at three to ten million bits a second, which means carrying out logical operations of arithmetic, letter identification and transposition, symbol arrangement, and so on. Thus, their total information-handling rate is at least millions of times that of the human worker.

We often think of speed of travel as a major time-saver and multiplier of life's activities. Indeed it is. In human history we have gone from walking at about three or four miles an hour to occasional supersonic flight at 2,000 miles an hour, or perhaps rare rocket travel at 4,000 miles an hour, an increase of a factor of a thousandfold at best. But in the handling of information, and the mental operations necessary to process it, the present generation of digital machines can exceed the human speed by a factor of at least a million, and we know how to increase that by something like another thousandfold. Hence, is not the digital knowledge machine and its associated communication network the greatest life extension method yet encountered since the Fountain of Youth?

Similarly, we hardly know how to think or visualize in more than three, nor to move in less than three, dimensions of space. Knowledge machines have responded, however, to multidimensional representation and processing, and we are presently pursuing active research in modes of display which will at least symbolize groups of higher dimensions.

As comforting as these aids may be to the quest for knowledge, they do not alone imply the simplicity which can intrigue the university scholar with the scientific and technical challenges of the industrial system. But we believe that many of the forthcoming derivatives of them can expand greatly the junction between university and industry.

Digital computers have been made to guide electron beams which display directly the most sophisti-

cated mathematical solutions to complex physical interactions. For instance, consider processes of movement — whether it be a molecular diffusion which permeates nearly all industrial processing, or machine motions, or weaving, or laminating fabrics. The expressions which really specify these operations are generally in extensive algebra whose manipulation can quickly fatigue an individual. But Dr. W. S. Brown's recent creation at Bell Telephone Laboratories of a system and language for the digital working of symbolic algebra allows the whole range of operations to be mechanized. Thus, one man-hour by a competent professional mathematician is equalled by one second on an IBM 7094 computer.

Already the whole domain of engineering is being recast through these capabilities. In circuit design, structure formation, selecting optimum materials, and in determining the relationship of shape to strength, the present beginnings affirm that the basic essences of science can be quickly and imaginatively joined to the complex interactions of engineering systems through digital logic machines. The days of Professor V. Weisskopf's wise credo, "If you understand hydrogen, you understand everything that is understood," are numbered — if not already past.

So the student of science need not be confined to the small areas of inquiry which have seemed so alluring in the past. In very large areas we have penetrated deeply into the heart of understanding through the use of computers. Now entire industrial systems can be similarly displayed.

Industries must use models and analyses to represent the technical and scientific challenges of their operations in the specific logic of a programmed form. A whole new language of common concern with individual scholars can be created. Indeed, one visualizes the experiences of expressing the basic problems and qualities of modern industry and technology in digitally encoded, logically processable forms that will lead to a new growth in human communication and interaction.

This prospect, in itself, is an amusingly ironic re-

flection on an earlier mortal fear of dehumanizing man through the spread of automation and knowledge machines. In fact, some further steps may be taken toward the goal expressed shortly before his death by the noble physicist, Niels Bohr, who said, "The aim of our argumentation is to emphasize that all experience, whether in science, philosophy, or art, which may be helpful to mankind, must be capable of being communicated by human means of expression. It is on this basis that we shall approach the question of unity of knowledge. Confronted with the great diversity of cultural developments, we may search for those features in all civilizations which have their roots in the common human situation."

How happy it would be if it turned out that this age found common roots in the human situation through worldwide experience in science and technology. The camel driver, with his transistor radio, and the nuclear physicist, with his linear accelerator and strange particle lingo, may both feel a new mode of expression through a general extension of knowledge machines.

Universities must, of course, incorporate the machine supplements to learning and thought as integral parts of learning itself. The physicist and philosopher, Percy Bridgeman, said in a notable essay, "No linguistic structure is capable of reproducing the full complexity of experience. We have said that the only feasible way of dealing with this is to push a particular verbal line of attack as far as it can go, and then switch to another verbal level, which we might abandon when we have to.

"Many people are willing to do this, but insist on a single self-consistent verbal scheme into which they try to force all experience. In doing this they create a purely verbal world in which they can live a pretty autonomous existence, fortified by the ability of many of their fellows to live in the same verbal world."

Even his grim limitation on the interactions of major parts of our world — and especially the university-industry interface — seems to be ameliorated by the spreading use of knowledge machines. For model-

ing, simulation, analysis, and synthesis are manageable in these instruments, so our verbal prisons are at least enlarged and perhaps exploded.

For this new and exciting function in evolution of the community of man, the universities must also have facilities. Thus, the National Science Board of the National Science Foundation in May, 1965, adopted a policy that I submitted as chairman of Committee I. Entitled "The Use of Digital Computers in Universities and Colleges," it asserts the responsibility of the nation, as represented in Federal agencies, to provide digital machines and accessories on an unprecedented scale for the advance of American science, engineering and education. It concludes, "Automatic information processing machines, particularly electronic digital computers, are essential aids to modern research in science and engineering.

"Such facilities will probably become important in the methodology of education, as well, (through information retrieval, display, bibliographic function, and so forth). Accordingly, universities and colleges, (as well as other institutions which sponsor research and learning in science and technology) should have appropriate computing facilities."

The President's Science Advisory Committee, especially through the Pierce Report, has reaffirmed the opportunities and responsibilities for special acquisition of computer facilities for universities and colleges, as well as other parts of education. Such automated tools for universities and schools would assume one of the highest priorities in allocation of new national resources in the immediate future.

What we now propose is that in selected areas, leading industries should initiate new modes representative of their scientific and technical qualities—whether they be chemistry, physics, mechanics, design, process, marketing or whatever. These would express to the world of higher education, especially at universities and colleges, new pathways for relating the scholar's singular, questing mind to the complexity of industrial research and development, and to innovation and production for the public benefit. □

# BELL

reports

## Executive Heart Myth Disproved

A Cornell University Medical College doctor has proved scientifically that executives who reach top levels of management have — as a group — a smaller risk of heart attacks than do men who remain at lower levels.

Dr. Lawrence E. Hinkle, Jr., of Cornell based his findings on a study of employees of operating companies in the Bell System. (See "The Growing Importance of Human Ecology" by Dr. Hinkle in the Nov/Dec 1967 issue of *Bell Telephone Magazine*.)

The study also shows that men who are promoted rapidly, changing jobs and assuming additional responsibilities in the process, suffered no more — and usually less — heart disease than male employees who remained at lower levels.

Studying reasons behind the difference, at variance with the general belief that executive tension is a prime cause of heart attacks, Dr. Hinkle and his research team found a link with education and family background. The figures showed that Bell System college-educated employees had a disabling-coronary-disease rate 30 per cent lower than the company's non-college workers.

There appeared to be a significant difference in family health and diet patterns that persisted throughout the employees' adulthood. Most of the college men came from smaller, healthier families. They were slimmer, taller and smoked and ate less. And their fathers lived longer.

## Carter Elected to AT&T Board

Edward W. Carter, president of the California-based Broadway-Hale Stores, Inc., was elected to AT&T's board of directors at the company's

annual meeting in Boston. He is the company's first West Coast director.

He is a regent of the University of California, and a trustee of the Brookings Institution in Washington, D. C., Occidental College, and the Stanford Research Institute. He is also chairman of the Los Angeles County Museum of Art and a director of several other corporations.

A resident of Los Angeles, Mr. Carter was graduated from UCLA in 1932 and from the Harvard Business School in 1937.

## Government Picks Western

The U.S. Government has chosen Western Electric as prime contractor to develop and install a nationwide anti-ballistic missile defense system, Project Sentinel.

Much of the five-year, \$5 billion allocation to Project Sentinel, which uses elements of the Nike X system, will be spent directly by the U.S. Army for site construction and other purposes. The remainder will go into system hardware, about 70 per cent to be produced by over 3,000 firms under subcontract to Western Electric.

Western Electric President Paul A. Gorman described the undertaking as "one of the greatest challenges ever faced by American industry."

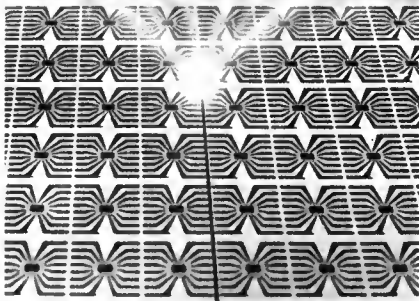
"As prime contractor," he said, "Western Electric is responsible for the final development and installation of equipment that will be built to specifications resulting from the extensive research and development of Bell Telephone Laboratories."

"The project will require the best brains, the most complicated skills," Mr. Gorman said. "It will challenge the imagination, the physical capacity and administrative abilities of many companies and thousands of people."

## New Uses for the Laser

Western Electric's Engineering Research Center at Princeton, N.J., has developed a new laser process for "controlled fracturing" of brittle materials such as ceramics, sapphires, glass or single-crystal quartz without the loss of any material. The surface remains unmarred and in some cases a microscope is needed to even see the fracture.

Initially, the new technique will be used to separate thin film circuits which are mounted in groups on ceramic or glass bases during manufacture. The laser's energy strikes the surface of the material, where it is absorbed. This heats the material and creates mechanical stresses which result in a controlled, localized fracture.



The ceramic is mounted on a movable metal table which moves the ceramic under the small spot where the laser beam is concentrated.

Western Electric is also using lasers to set resistance values on deposited carbon resistors at its Merrimack Valley Works in Massachusetts. Once a resistor is assembled, the laser penetrates its glass capsule and "zaps" just enough carbon to set the correct resistance value.

## 3-D Hologram Developed

A new type of hologram has been developed by Bell Telephone Laboratories. It allows the viewer, simply by moving his head from side to side in front of a photographic plate, to see a three-dimensional image rotate through a full 360-degree circle.

A hologram is a photographic plate on which an image has been recorded by a laser beam. (See "The Promise of Holography" in the March/April 1967 issue of *Bell Telephone Magazine*.) When the plate is illuminated by laser light or, in some cases, ordinary white light, the image appears in its full three dimensions.

The effect is similar to looking through an open window, but until the present experiments, the viewer of a flat hologram could have only a limited perspective — usually about 40 degrees — of an object.

The hologram's ability to record three-dimensional data is being studied at Bell Laboratories for possible use in storing and retrieving information for switching, data transmission, and other communications applications. The 360-degree version holds even more promise of condensing storage space and increasing accessibility to information than does the conventional hologram.

## Diamonds Aid Semiconductors

Recent Bell Telephone Laboratories research has shown that some semiconductor devices perform better if mounted on small chips of diamond instead of copper. When semiconductor devices are made smaller than a pinhead, the heat they generate is concentrated in such a small area that it can burn up the device. To solve the problem, they are usually mounted on a larger block of material like copper, a good heat conductor. The heat then pours into this "heat sink" as fast as it is generated.

But certain very small, high-power devices used in telecommunications equipment create more heat than copper is able to absorb. Bell Laboratories electronic engineers have thus turned to diamonds, which at room temperature conduct heat about five times better than copper. With a diamond heat sink, the power output of one experimental device was increased to four times its previous maximum power.

Only a small percentage of natural diamonds are suitable for heat sinks, so sorting and processing costs will probably restrict the use of diamonds in electronic devices to those applications where copper is not adequate.

## "Dial Tone First" a Success

"Dial Tone First," part of a long-range Bell System program of coin telephone service improvement, was enthusiastically received by customers during its final trial in Danville, Illinois. Earlier trials in Hartford, Connecticut, and New York City proved the feasibility of the new service, which will be introduced on a nationwide basis during the next several years at a cost of over \$100 million.

The service differs from present coin telephone operation in two ways. First, it provides dial tone when the handset is raised, rather than after a coin is deposited. This feature lets the customer know that the phone is working and reduces the possibility of lost coins. Secondly, it allows several types of calls to be placed without a coin deposit. This is a convenience for customers who don't have a coin available, and wish to make credit card, third number or collect calls.

#### Phone of the Future Unveiled

An experimental model of the telephone of the future was recently unveiled at AT&T's annual meeting in Boston. The new phone is smaller and lighter than current models and uses new integrated circuitry developed at Bell Telephone Laboratories.

Though radically different in design, the phone's main significance lies in its technological advances. The slim handset of this largely electronic model weighs less than half as much as the handset in today's phone.

It employs a new electromagnetic microphone and amplifying circuit which are about one-fourth the weight of the microphone now in use, occupy much less space, and reproduce the human voice even more faithfully.

Plastic foam is injected into the handset and base to support and protect the internal integrated circuits against mechanical shock. An electronic tone ringer in the base of the new model is smaller, requires less power, and provides a more distinctive signal than the electromechanical bells now used.

The switchhook can be depressed by only one ounce of force, a design requirement necessitated by the lighter handset. Still in the early ex-



ploratory stages, the new phone will be offered in a variety of styles—wall phones as well as desk sets—when it becomes available in the 1970's.

#### Plow Buries Undersea Cable

A specially designed sea plow has completed burying part of a super-capacity undersea cable on the ocean bottom near Jacksonville Beach, Florida. 44 miles of the cable were buried about two feet beneath the ocean floor to protect it from accidental damage by commercial fishing nets and dredges.

The buried segment is part of a 1,300 nautical mile cable which will be opened in mid-summer between Jacksonville and St. Thomas in the Virgin Islands. (See "Cables Under the Sea" in the September/October 1967 issue of *Bell Telephone Magazine*.) The cable project is a joint undertaking of AT&T, ITT World Communications Inc., RCA Communications Inc., and Western Union International Inc.

The 14-ton plow, designed by Bell Telephone Laboratories, is 24 feet

long, 11 feet wide and nine feet high. It slides along the ocean bottom on four sled-like runners at an average speed of one-half to one knot. Towed by the Canadian ice breaker and cable repair ship, the *John Cabot*, the plow digs a trench about four inches wide and 24 inches deep as it lays the cable.

To accommodate repeaters—which strengthen communications signals at 10 to 20-mile intervals along ocean cable routes—the trench is widened at intervals. Two additional plowshares, mounted on each side of cable plowshare, automatically swing down and scoop out a 16-inch wide trench when a repeater is to be buried.

The sea plow, which was used for the first time last summer to bury the New Jersey shore ends of cables to England and France, can "see," "hear," and carry out commands. Aboard are TV cameras, a hydrophone, and instruments to measure such information as speed and distance traveled.

The Virgin Islands cable will be capable of carrying 720 simultaneous conversations, or five times the volume now possible on the highest capacity transatlantic cable.

THE  
**CRISIS**  
IN MODERN MEDICINE

Doctor, nurse, hospital and health service shortages are critical. Better communications offer many solutions to easing the problems.

BY JAMES C. G. CONNIFF





Our affluent age has its share of frustrations, but few are more ironic than our ability to live longer, amid greater comforts than our forebears dreamed possible, and yet be running short of the doctors and nurses and the hospitals and health services we need to insure our enjoyment of this new lease on life.

Even with the average doctor working a man-killing schedule, the standards of U.S. health care are too often marginal at best. Since 1950, for example, we have plunged from sixth to thirteenth place in infant mortality. Of 5,200 general hospitals that provide most of our 1.7 million hospital beds, Columbia University's School of Public Health asserts that the care they render is only "poor to fair." With one in every seven Americans being admitted to a hospital each year and admissions estimated as high as 31,500,000 by 1973, hospital planners say that in about three years we will need another million beds — or about 3,000 new hospitals.

Hospital research teams anticipate that to man these facilities they will have to recruit and train enough personnel by 1970 to double the 1,900,000-plus now employed to keep U.S. hospitals functioning. That figure does not include doctors, some 300,000 of whom staff the nation's "health industry" today. By 1975 some way of increasing their numbers fivefold to an imperative minimum of 1.5 million will have to be found just to keep pace with present standards.

Despite experimental accelerated programs leading to the M.D. degree, it still takes about 10 years to "produce" a doctor qualified to practice modern medicine. The problem is compounded by the mounting trend toward specialization, the allure of basic research, and the prospect of exciting new careers in such fields as nuclear physics, aeronomy, molecular and marine biology, astronautics, and biophysics/bio-

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*Mr. Conniff, an assignment writer specializing in medical subjects, won the American Heart Association's Howard W. Blakeslee Award for national magazine reporting on progress in the diagnosis and treatment of strokes.*

electronics for individuals with minds capable of enriching our store of medical knowledge.

Medical schools are graduating approximately 7,500 new physicians a year, but our longer-living population, which is reproducing itself at only a

slightly diminishing rate, needs at least 30 new medical schools—not to improve the quality of American medical care, but just to stay abreast of the standards now being maintained.

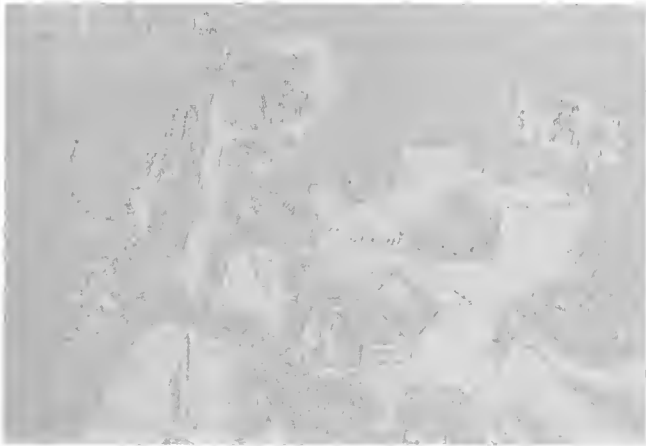
In nursing, which currently accounts for one-third of our hospital personnel, we need 100,000 graduates a year but are qualifying only 33,000. Yet we compound this critical situation by continuing, via archaic hospital management practices, to force nurses to devote 40 to 60 per cent of their time to paperwork rather than patients.

The nurse shortage has reached such disturbing proportions that Holy Name Hospital in Teaneck, New Jersey, has inaugurated a nurses' training program for women over 40 who undergo, on a commuter or "day-hop" basis, refresher courses in academic subjects while studying nursing. Holy Name's program has enjoyed such success that other hospitals are planning to follow suit.

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pdating (and cost-cutting) procedures of genuine novelty are being eyed with interest by hard-pressed hospital administrators. One possibility is feeding patients as airlines feed passengers. Pre-cooked or partially cooked meals, prepared on prescription under a dietician's supervision, could be dispatched from central co-op kitchens to hospitals in an entire area. Delivered in sealed individual units, the meals could be instantly heated or completed in food-processing facilities more consonant with today's needs than those now uneconomically duplicated in hospitals only blocks apart.

Other recommendations are coming to the fore to help slow and possibly reverse the growing crisis in medical care. One is a drive to revolutionize the



whole managerial and fiscally irresponsible cost-plus accounting set-up of many non-profit hospitals. As much as 30 per cent of a patient's hospital bill, for example, may be derived from nonproductive paper work and information-gathering and filing. Such glaring inefficiency has done its part to boost hospitalization insurance premiums as much as 150 per cent in the past 20 years.

Another proposal health-industry people are giving serious thought to is finding ways to earmark a far bigger slice of our annual outlay for medical care (\$54 billion in 1967) for *prevention* of illness, especially in such bedrock areas as air and water pollution,



inadequate and unhealthy housing, substandard education, and lower-than-subsistence-level incomes. Through such pursuits, health authorities hope to achieve a more lasting and productive return on the health-care dollar.

**A**longed-for tomorrow, admittedly. What do we do until it arrives? How do we deal with the health-services crisis now? Can we telescope scientific breakthroughs and existing facilities into a workable system to bridge the gap between what medicine has discovered in the laboratory and what resources are available to the patient?

The complex of Regional Medical Programs which the U.S. Public Health Service inaugurated in four widely separated parts of the country last summer indicates that we can. A Comsat-like joint effort by private medicine and both public and private community- and state-level entities (with Federal help in planning and funding), the programs will pool the nation's foremost medical talent, via an intricate communications network, to bring the latest in medical techniques to every American.

The programs are an initial grassroots attempt to meet the challenge of the President's Commission on Heart Disease, Cancer and Stroke, from which two-thirds of all Americans now living will suffer and die unless we call a halt on these three top killer-syndromes: "Our nation's resources in health are relatively untapped," said the Commission's report. "Many of our scientific triumphs have been hollow victories for most of the people who could benefit from them."

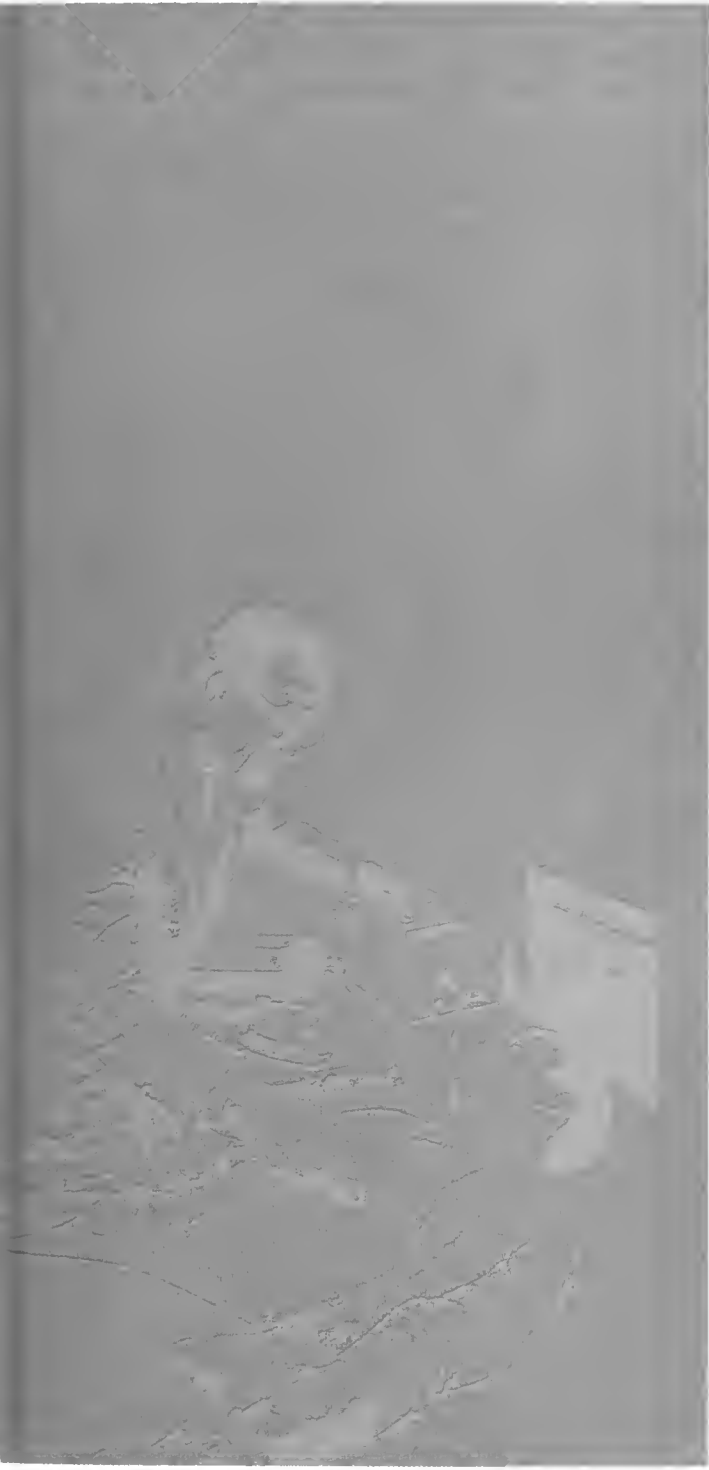
It is ironic that too many of the "people who could benefit" have only limited access to such modern

medical facilities as intensive care units for cardiac cases; hyperbaric (high-pressure oxygen) chambers for a wide range of infections and other emergencies; micro-miniaturized retrievable radio pods for diagnostic reporting from sites deep within the body; cryosurgical techniques and laser surgery for freezing or burning away disabling brain and eye anomalies; and the highly promising advances in synthetic kidneys, hearts and other organs.

One of the most important countervailing forces already in being to offset this deprivation is a tool doctors quickly made their own from the start: communications. Continuous adaptation to sophisticated medical requirements has provided the telephone with a pivotal role in the "health shortage" crisis.

Communications has accelerated the dissemination of knowledge and diagnostic data to meet emergency situations. Lectures now flow over telephone and television lines from the great teaching centers to medical classes in other locations. And communications facilities can dispense both basic and highly specialized medical services to individuals in their hospital beds, at centralized medical centers, or even in their homes.

**T**o call a cardiac-arrest team into action almost instantaneously, for example, a nurse can dial a telephone number from the patient's bedside, mention the code-alert for heart stoppage and the room number, and hang up confident that the voice recording she has just made will do the rest. Phones—even busy phones that can be automatically interrupted by a priority signal—will ring to summon specialists from heart stations, a lab, respiratory center or blood bank. The same recording will go out over



the public address system, trigger pocket receivers carried by on-duty team personnel, and release an impulse that puts priority on predesignated elevators for use by the emergency cardiac-arrest cart and, if necessary, movement of the patient.

Similar systems can connect with home or office phones outside the hospital to summon doctors and other personnel when major accidents or natural disasters occur.

Two-way closed circuit television is proving valuable in mental hospital training and patient care. Over two-way TV, for example, a state hospital staff consults with the psychiatric institute staff at a medical college and benefits from education and training programs. Social service workers at both locations exchange information and develop programs. Case presentations are made in which patients can be shown on video tape. New patients are evaluated by psychiatrists at the state hospital, freeing physicians to concentrate on patients already under care. And relatives in a metropolitan area can visit via TV with patients in the state hospital.

Phones on a Hospital Interphone system save time and footsteps for busy nurses by enabling them to pick up the receiver at their station when a patient calls and render the needed service. The patient's call also flashes a light outside his door in case the nurse is already nearby. Hands-free microphones with speaker attachments are also available for patients unable to hold a phone.

Smaller hospitals can even extend the Interphone system to help overcome gaps in their technology. By using its capacity to transmit patient data—such as ECG, EEG, pulse and spiograms—directly from the patient's bedside over the telephone lines to another location in the hospital, across the city, or even across the nation, any hospital can tap the sophisticated resources of large medical centers. This assist to diagnosis and prescription reduces the time-lag in treating serious illness. The faster the patient recovers, the sooner he returns home, making a needed bed available and helping to cut costs.

New applications of communications at universities are making it possible for health practitioners in a state to keep abreast of medical advances without leaving their communities.

In one example, a two-way communications circuit, using both telephone and radio, links nearly half of the general hospitals in a state with a university. By this means, various faculty members from the university may meet for an hour each week with perhaps 300 physicians, 450 nurses, 550 technologists, 125 hospital administrators and 100 veterinarians. None of the people has to move more than 20 miles from the community where they provide health care, and the vast majority participate in the program from their home towns. The university also maintains a library of taped recordings that doctors anywhere in the state can call at any time for information on emergency treatments and topical medical subjects.

**E**verything from diagnosis confirmation to the details of post-hospital care can be retrieved by doctors at bedsides via a variety of telecommunications media: telephones with voice answerback from a computer; tele-writing which transcribes handwriting directly over telephone lines; slow-scan television to retrieve X-rays; facsimile to duplicate printed material, such as a patient's dossier; and cathode ray-tube instantaneous display of graphic information, such as special pre-surgical procedures and surgical blueprints.

With Touch-Tone telephone service in the home, a doctor will be able to query health data banks by tapping out the patient's record number to gain access to his medical history. Correlation of the doctor's diagnosis with the patient's past record will enable

the data center to recommend specific treatment over the phone. Releasing a patient from the hospital will also be expedited, since the attending physician will have access to hospital records and medical centers to guide him in specific post-hospital care.

Touch-Tone telephone service also is helping to eliminate lost and late charges—a major problem to every hospital. A recent survey indicates that lost charges run to about two per cent of the average hospital's total charges.

To cut the losses, a hospital established a communications system that links key service and laboratory areas to the business office. Instead of billing information being written out in longhand and then delivered by messenger, charges are transmitted directly from the area where they originate by Touch-Tone telephones to an unattended card punch unit in the business office. Once the data are captured in punched cards, the cards are processed to produce bills and records automatically. When a patient leaves, he gets a discharge bill with all charges up to date. Mistakes also have been greatly reduced, since several manual billing steps have been eliminated. And the automatic handling of charges has saved labor, too.

Similar use of Touch-Tone links to computer centers for prescriptions, statistics on hospital populations, staff schedules, etc. will greatly expedite the hospital operating procedures of tomorrow.

But the triumphs of modern telephony which Touch-Tone service and Data-Phone Dataspeed equipment represent are not intended to obscure the unique role of doctor, nurse or medical specialist. They are the heart of today's health-care challenge and cannot be replaced by the most sophisticated machine—not even by one that talks.

Even so, the indispensable professional people are presently in such short supply that they can use all the help available in putting their skills at the service of those who need them. Communications is one such aid that is likely to gain increased acceptance in meeting the "health squeeze" in the years ahead. □

**If these kids  
don't make it,  
neither do we.**

These are big city school children. They are partners of all who try to build and keep our cities alive with hope and promise of personal dignity. If we fail these partners, they will fail, as finally will we all.

To the Bell System, they also are customers and, prospectively, many are fellow employees. Those we hire will bring with them attitudes and skills produced by city life and city schools. Their qualities will help shape the quality of our service. And service is our product.

Bell System companies and people are increasingly engaged to help meet the problems of the cities, especially those concerning education and employability. In these areas our skills and other business resources may have extra value. We shall try to keep our deeds outrunning our words.





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July/August 1968

# BELL

telephone magazine



# Leading in communications toward a bright tomorrow

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**W**e have the world's largest computer. It is our nationwide communications-switching network.

This network stretches from border to border and coast to coast. It includes switching centers in 8,000 places, joined by more than 700 million miles of communications circuits.

The switching network connects 102 million telephones and other telecommunications devices. It permits you to reach any one of these phones or devices at will.

That is its distinguishing feature—the "at your demand" interconnection of "stations" anywhere in the country—for messages involving information of any kind—video, written, drawn, data and voice. Today there are about five million billion possible different interconnections.

So made-to-order communications service is our primary mission—providing channels ready on the instant—to move information of any kind, between "stations" anywhere. This business will grow many times bigger and more valuable to everyone in the future. Growth in population and human communications, growth in machine calling, in fact the whole information explosion promises that the job of universal communications will more than double in the next 10 years alone.

Our energies and resources are pledged to keep our communications-switching system and service ahead of the times. And we are staying well ahead. For example, we're the leader in electronic switching and in the art of adapting present switching gear to provide electronic-style services.

We're looking far ahead. We're getting ready to provide you with Picturephone® service, connect you with library or teaching sources, or enable you to draw a check on your bank by Touch-Tone® telephone—to mention just a few possibilities.

We will not be alone in our innovation. A lot of fine companies make equipment used in information handling. As we look to the future, we think the better the entire communications industry does, the better we'll do.

The more information-handling devices that are developed, the greater the need for connecting many of them through our nationwide switching system.

We are therefore continually developing, building and updating our network. The expanding size of the job is one of the reasons why we are so confident about our future. But there are many other reasons:

We have a good lead in electronic innovation, such as integrated circuits and digital transmission.

We have the largest number of Ph.D.'s in science of any private business in the world—1,300. Their average age is 35. Working with them are thousands of other technically trained college graduates.

Altogether we have 34,000 young management people, highly trained and motivated, who have joined the Bell System in the past 10 years—assurance of continuing management vigor.

We have a team of Bell Labs for research and development, Western Electric for manufacturing and supply, and Operating Telephone Companies for service. This assures a quick flow from invention to use at lowest possible costs.

We have developed the best communications-switching system in the world—and we're skilled enough and big enough to make sure it stays the best and continues to set the standard for the rest of the world. Ours is a profit-incentive business with a great future.

All of this may sound brash. But we're really not over-confident. Just confident.

We are a leader, and we'll keep our lead. We know where we want to go. We're planning and doing what has to be done to get there.

**Bell System  
1968**

# BELL

telephone magazine

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VOLUME 47 NUMBER 4 JULY/AUGUST 1968

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**Donald R. Woodford**, Managing Editor

**Al Catalano**, Art Director

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On the cover – Can man withstand and endure the ever-increasing crowding of the space around him? Or does man, like an animal, have a breaking point in his tolerance to crowding? Dr. C. P. Crowley presents evidence that man may be reaching his endurance level to crowding in an article on page 28.

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New studies prove that managers can reshape many assignments to provide employees more satisfaction from their jobs and dramatically increase efficiency and productivity and reduce turnover.

# Motivating People

During the past 25 years a wide variety of attempts have been aimed at making the employee feel better about his job or the company for which he works.

But despite such things as reduced working hours, higher wages, broader benefits, better human relations, employee activities and communications programs, all of which are certainly necessary, a satisfactory and lasting solution to the problem of employee motivation has not been found.

Many businesses, in fact, are having difficulty hiring and keeping enough quality people. Although any job was at one time good enough for many Americans, today most employees are looking for opportunities to make meaningful contributions in challenging work. If an employee doesn't get it one place, he'll seek a job somewhere else.

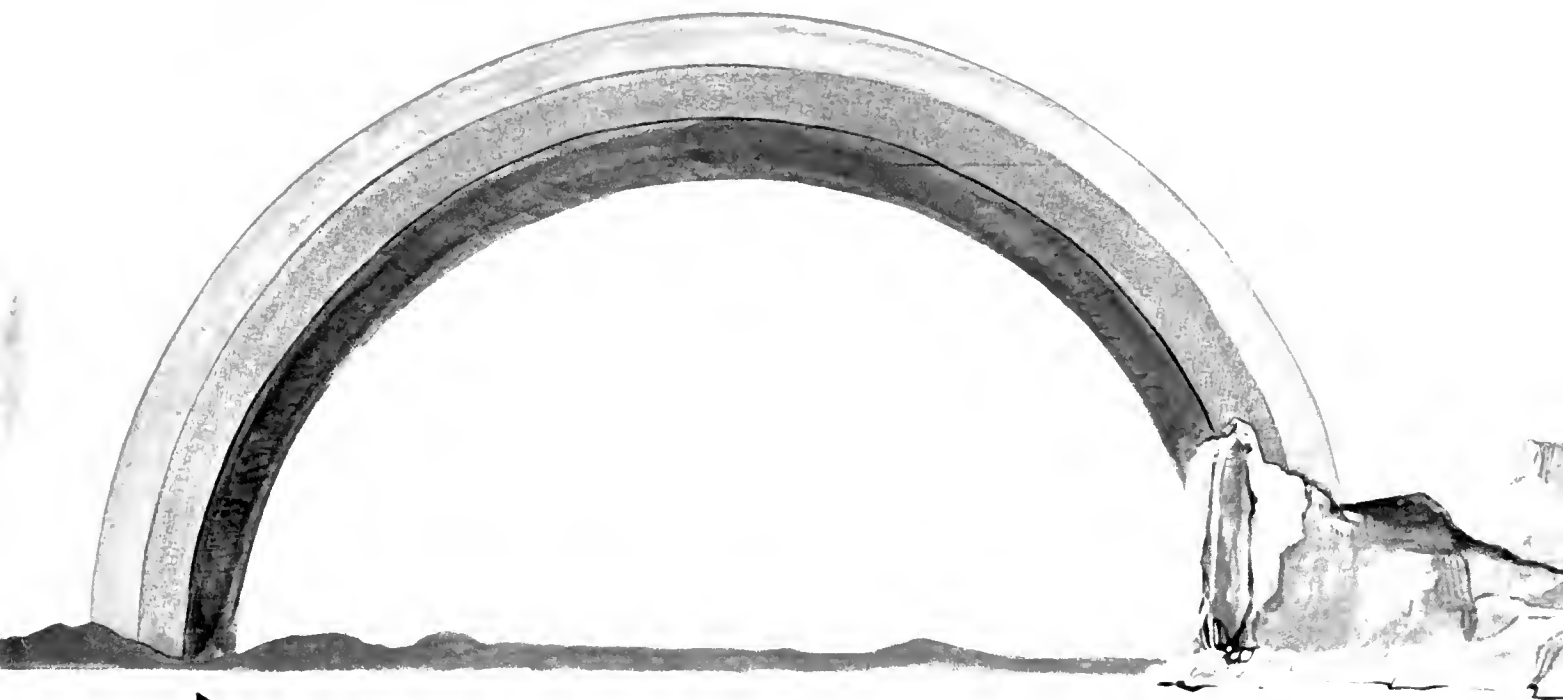
In recent years, amid the changing expectations of the young people coming into the work force, a number of social psychologists — most distinctively Professor Frederick Herzberg of Case Western Reserve University — have suggested that the work itself might be at the heart of the problem. If we could enrich the task, they say, we could provide an employee more satisfaction from his whole job.

Stimulated by this research, the Bell System undertook a series of 19 studies to determine how jobs could be made more interesting, more challenging and more intrinsically rewarding.

Results of these studies, in a variety of jobs in a variety of departments, demonstrate that turnover can be reduced, efficiency and productivity can be increased, and labor problems can be minimized.

The studies, which involved about 3,000 people, were designed to permit employees to perform their work so that it was meaningful to them and the company. For example, selected payroll workers were given personal responsibility for completing tasks which improved the accuracy of entire payrolls, selected service representatives determined credit ratings of customers and set deposit requirements, and plant crews were given the responsibility for many phases of the central office work in connection with installing new services — instead of having each man do a part of the job.

The collective result of the studies is that the Bell System has acquired new insights into the persistent problem of employee motivation. Robert N. Ford, who has been responsible for these studies since they were inaugurated in 1965, discusses some of these insights in the following article. An article in the September-October issue of *Bell Telephone Magazine* will discuss the art of reshaping jobs to make them more meaningful and interesting. Both articles are adapted from a forthcoming book, *Motivation Through the Work Itself*, to be published by the American Management Association.



# Motivating People

by  
Robert N. Ford

Our studies deliberately concentrated upon workers whose output can be measured because we wanted objective proof, not merely statements of feelings and beliefs. But there is good reason to believe that the knowledge we gained is just as applicable to management or professional people, or just about anyone who is employed by someone else—whether his output is easily measured or not.

Based on our studies, our contention is that we have inadvertently neglected jobs we assign people. Jobs must be constantly reexamined. A poor job itself is a major reason for the alienation of an employee's interest from his company. There are other reasons, of course: unsuitable hours, noncompetitive wages, or bad supervision, or perhaps the employee himself is personally unsuitable, lacks basic ability, or is emotionally disturbed. But the striking reduction in employee turnover we experienced in our studies affirms the belief that the jobs themselves are failing as motivating factors.

## Motivation from Within

Work motivation is a nebulous phrase. We refer to it as the attractiveness of a task or job as an employee sees it, or an employee's willingness to engage in the task simply because he gets satisfaction from it. He feels good — at least sometimes — as he does his task.

Different jobs offer satisfaction in different amounts and at widely different times. For example, a salesman can achieve every day, a scientist only occasionally. The impossible job is one that offers almost no satisfaction.

A "Work Itself" project operates on the assumption that performance of

a specified job can be better, that the motivation of workers is in question, and that new procedures can be introduced to correct the situation. Unless work motivation is in question, there is no need to consider reshaping an employee's job.

In our studies we were concerned about the job, not the characteristics of the people on the job. We concentrated on making the job more attractive for employees.

We assumed the total environment is good: The employee gets good money, the hours are good, benefits are good, he has friends who work here, his boss is reasonable, and he knows the company provides important goods or services, etc. In addition, we assumed employees are not necessarily at fault.

Our assumptions were correct, for we found the job improvement effort was welcomed by employees everywhere. Commonly, we were asked, "When will you get to us?," even from mid-management men who felt they don't really run their jobs, that someone "up above" does.

The "right reason" for improving the work itself is simply because employees are humans. We aim to give the employee the richest work we can within the limits of properly serving our customers and operating the business at a profit.

Today, if an employee does not get satisfaction from his work, he goes somewhere else. The young and the able go quickly. Such turnover is a warning signal that jobs may need to be reshaped.

Some turnover is expected, but steadily climbing rates of voluntary resignations — from people we want to hold, people who frankly say they don't like the work—is another matter.

We aim to give employees the most satisfying work we can provide, just as we owe customers good service and

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*Mr. Ford, who is Personnel Director-Manpower Utilization at AT&T, is currently preparing a book on "Motivation Through the Work Itself." Copyright ©, American Telephone and Telegraph Company, 1968.*

share owners adequate earnings. That is the "right reason" for the program; no other need be offered. Supervisors must not become defensive when they seek to utilize a man and his abilities as fully as possible.

As supervisory groups learned we would try to motivate through the work itself, and not via the surround, we discovered the concept is not easy to convey through words. Managers, both male and female, listened attentively and apparently with agreement. But then we would get a suggestion for improving motivation such as: "Send each employee a birthday card with a personal note on it, rather than a routine poem or wisecrack. That's what I do and it works like a charm."

The card may be gratefully received, but it does not change an unsatisfactory job into a rich one. That an essentially unhappy-with-work employee would start applying himself energetically after receiving the birthday card seems preposterous.

We found the game of golf can illustrate the meaning of task motivating and isolate the inner-appeal component. Golf is indeed a game, but it is also a task to golf professionals.

Neither the golfer who is out for a Saturday tour nor the well motivated employee at work goes around with a happy grin all the time. Indeed, golfers have been known to curse, break their clubs, or resolve never to return again to that "stupid" game.

But all it takes to lead him back again is a good drive, a par or two, a good final score, or perhaps a birdie. His score gives him all the feedback he needs; he knows if he is a success or a failure.

In this example we see task motivation clear and simple. The chance for *achievement* is always there. He gets *recognition*, if he earns it. He can *grow* by getting better and better, potentially right up to the edge of his abil-

ity. The *responsibility* is all his. He returns each week because his task is *interesting*; the task itself engages him.

Is there not motivational power in the surround? Sure, he may come for the fellowship, the clubhouse, or its bar, but the chances are he can find these elsewhere. Often there are unpleasant surroundings, such as a long wait to tee off, or a slow foursome in front of him. Though he is not happy about these, he accepts them so he can play his game. The *surround* is a factor that leads him to play on one course rather than another, but it is not his motivation. The motivation is *the task itself*.

An employee's job, like golf, should provide an occasional opportunity for feeling good. The telephone operator, for example, answers hundreds of calls a day. Surely she should have times when she feels really helpful to a customer, just as the golfer feels good when he gets off a good shot.

If an operator gets satisfaction from her task, she comes back with energy to the next call. If she doesn't get satisfaction, managers must be absolutely certain they have not deprived her of the opportunity to enjoy her job.

The golf analogy also points up the wide difference between internal and external motivation. Managers merely set the stage for a good job, and do so with constraints, like staffing a switchboard on Sundays, holidays, or at night. Although someone has to work these relatively undesirable hours, we try to remove the pain by paying well and treating people well. This is external motivation.

But if we have lots of turnover and have trouble hiring replacements — if people won't play our game — we must look at the game itself.

Our studies demonstrate that we must work on the jobs themselves if we want employees to have good attitudes. This may appear obvious, but

much effort since World War II has been directed toward making the job environment appealing so the worker's attitude would improve. This is the logic behind such efforts as employee communications programs, out-of-hours activities, aid-to-education efforts, benefit programs, etc.

Such efforts are not to be deplored. Their quality, however, should not be measured against the employee's satisfaction with his task. This is a separate problem.

The logic of job reshaping hinges precisely on deliberately rearranging jobs so people will feel productive and useful. Then the nebulous word "achievement" takes on personal meaning. Through this approach we can demonstrate that good attitudes toward jobs come into being.

In short, good performance, as seen by the employee, leads to good job attitudes. The approach of trying to improve attitudes and productivity by other means has not proved successful in the long run.

## Chance To Achieve Are Powerful Drives In Job Situation

There is some risk in overstating the case for separating the work itself from such maintenance factors as pay, benefits, cafeterias and tours of duty. To some extent there are some offsetting psychological effects.

But people tell of times when they endured heat, cold, fatigue, lack of interest from others, lack of adequate help, etc., simply because their work was interesting or they wanted to finish a task. We conclude that work interest and a chance to achieve are the powerful drives that override poor surroundings, especially for the short run.

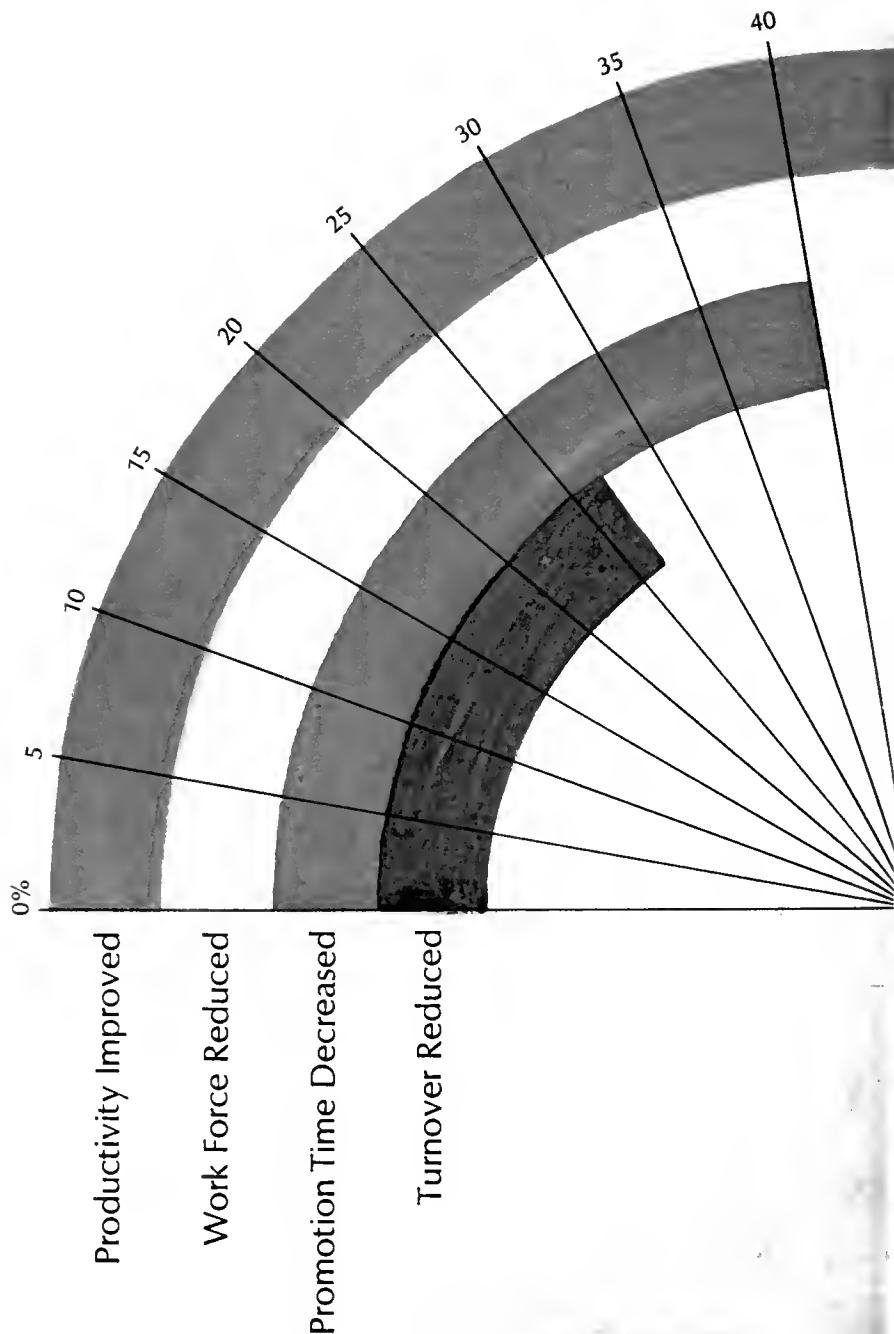
**Bell System  
Studies Demonstrate  
Jobs Can Be Improved**

Examples of Bell System attempts to enrich jobs demonstrate how employee satisfaction can lead to reduction in turnover, increased efficiency and productivity, and minimization of labor problems.

One work group absorbed a 45 per cent increase in work units, reduced its work force 12.5 per cent, and noted a 40 per cent decrease in the time needed to prepare a craftsman for promotion.

Another department estimated savings of \$558,000 over an 18-month period as a result of a 27 per cent drop in turnover, a reduction in the number of people assigned to uninteresting work, and measurable improvements in productivity and service quality.

"Supervisors are now back in the business of management and are more available to their people than ever before," one report noted. "Problems are now being worked out as much as possible by the clerks and they only ask for help when they are truly unable to find a remedy. With more time, supervisors are able to develop and analyze potential among their people."





A clear example of where better employee performance occurs despite poorer surrounding circumstances is an emergency situation. Bad as the environment is, employee performance is usually at its best. Even accidents per-man-hour-worked drop at a time when logic would dictate a rise.

What are the key elements to the emergency phenomenon from the job motivation angle? The employee is truly needed; he knows it. His chance for personal achievement is great and immediately measurable. Many day-to-day rules are laid aside and employees have more freedom of decision. Individual responsibility is more clearly defined.

These are the elements of any good job: A chance for the employee to be responsible and accountable, to achieve and to be recognized for what he has done. The trick is to transfer such characteristics into the everyday job situation and see that these motivating elements are not lost when the emergency situation no longer exists.

## How One Job Factor Can Be Best and Worst

No one can clearly state the extent to which one job factor offsets another. No one knows the degree to which better pay, for example, will offset a job an employee dislikes.

As an indicator of the complexity of human motivation, consider this excerpt from an exit interview in which money is named as both the best and worst job motivator simultaneously.

*Interviewer:* "If you were to state the best factor about working for the company, what would you say?"

*Interviewee:* "The money. That's why 99 per cent of the girls are working here. Certainly not because of this job. I know girls who have gotten ul-

cers and are taking tranquilizers, but they're staying because of the money." (This was discussed for a few minutes.)

*Interviewer:* "Look at it the other way: If you were asked to state the worst feature about working for the Company, what would it be?"

*Interviewee:* "The money, because it's too . . . I don't know. The job is hazardous to a woman's health and her attitude and everything. The money is just a curse. It really is. There is nothing terribly bad about the job. Nothing. You get upset and emotional and you have a good cry. But there is nothing that bad about it. It's just that it needs to be looked at."

*Interviewer:* "But you said money again!"

*Interviewee:* "Yes, it's both the worst and the best point. The girls stay because of the money and that's bad. So you're getting phony girls."

Our studies led us to believe that powerful motivators like interesting work can hold a person to a job that he might otherwise quit because some maintenance factors were poor. In fact, in eight studies of this job, turnover dropped 22.4 percentage points as compared to the control group. A concurrent improvement in efficiency and productivity measurements was also reported.

The job of an elevator operator provides a perfect example of how a job gets into trouble. At first, the hoist had to be run by a specialist; he sat on the ground and worked his levers while someone overhead gave signals to provide feedback on how he was doing. As the equipment improved, the operator was placed aboard the hoist. He had to be quick and resourceful to operate the lift. The job challenged him constantly.

No longer does the operator need to jockey the cage to level it to the floor; someone took that responsibility out of the job. Buttons remember

floors where passengers want to get off. If an operator remains aboard, his only decision is when to close the doors. Now, with automated elevators that are found in most modern buildings, the job has become so denuded that the operator isn't even there.

But if he were, it's safe to say that the work itself would be boring. We'd probably have trouble finding persons whose abilities might be challenged by the vestige of the original job.

## Denuded Jobs Offend the Eager

We do not dispute the fact that the friendliness of passengers, money, a kindly elevator starter, etc., might partially compensate a person who takes a job that lacks challenge. We consider ourselves fortunate if we can keep such persons and live with the absenteeism, turnover, and labor problems that go with it. But the generalization remains: There is not much in the work itself to challenge the elevator operator after the first day. Young, eager people do not stay with that job and like it very long.

We are not implying that we should stop automating jobs. We must automate as much as possible, especially if we can go all the way and get rid of boring jobs. If unavoidable vestiges remain, however, we should strive to attach them to larger tasks where rewards remain. Although people accept the fact that most jobs have boring parts, humans dislike a task that is nearly all routine and monotonous.

The trick for the job resaper is to try not to turn back the technological clock. If he seeks to improve an older job, he should think through—perhaps with the help of an old-timer—to the days when incumbents thought the job was good. What has been lost?

Why? Did the situation work out the way it was planned?

Some job simplifications and partitionings result in fine short-run gains, but after the novelty of the new way of doing the job is over, the neatly rationalized "simple" job emerges as a problem. Unfortunately, we often make the error of rating the incumbent employee as the problem.

In short, jobs become denuded because of advances in science and technology, or because someone fragmented the job to cut training time and costs. Although a new employee may be productive for a while, a simple job may be quite expensive in the long run; true economy may call for a richer job.

## How Jobs Get Set Up Nude

When a new work process comes along, the trained job analyst is likely to ask what steps make up the work flow or work process. Parts that cannot be programmed and automated are given to people.

We have learned, however, that the unwary job analyst can lead us into a grave error. When a given act must be repeated over and over, the job analyst may ask an employee to do a little task on a large volume of work. "Your job is to make these widgets and pass them to the next person." The next person adds something and then the item goes to verification or inspection. If a piece is defective, who is responsible? Since many share it, no one feels responsible. Such step jobs are not likely to be viewed as rich jobs by many people.

What's the alternative? The job reshaper can go back to his work flow sheets and try to cut out a whole module of work. He should ask, "How

much can I give this person so he will have an entire function to perform, not just a step?"

Instead of laying out 10 or 15 steps in a process and having 10 or 15 people do them on a one-by-one basis, he should break the work down along natural lines and assign each person all steps in a natural block of work. A piece of a job is not a job module or a whole job.

In our service order reentry trial, we discovered that clerks who corrected service order errors worked more productively and happily when five separate jobs were combined into a complete function so each girl was responsible for all five steps. Previously, each girl had one step.

That job started out wrong. It was too simple, too rational. Although there was nothing wrong with the analysis of the work flow connected with the new computer, it was wrong to give each step to one person simply because we had large volumes of work at each step, or because we wanted to minimize training time by teaching each girl only one step. Job designs aimed at minimizing training time may lead to maximizing turnover.

With the best of intentions, management occasionally denudes or unloads responsibility from a given job and loads it on a higher level job. This was graphically demonstrated in some of our service representative trials.

To deny telephone service to a customer is serious business because a customer cannot buy service from a competitor. Suppose a customer's payments get mixed up or an employee slipped up and telephone service was discontinued in error. The company would have to account for its error to an angry customer, as well as, perhaps, a regulatory commission to which the customer might complain.

Eventually, an officer of the company may be called about the error.

He would raise the question with his subordinate, who would ask his subordinate, and so on down to the person who made the error. Only one person in that chain of several levels of supervision has to say, "From now on, I want supervisors to okay service denials personally." If he does, the responsibility for errors is taken away from the person who does the work. It has been shifted to the supervisor.

But transferring responsibility to higher levels of supervision will not end the occasional error. Even when responsibility for basic decisions moves upward, mistakes will still be made occasionally because the supervisor won't know enough details.

Our trials have uniformly resulted in the return of responsibility to the lowest possible level. We have found that if responsibility lies at different levels in different organizations, the odds are high that it should go back to the lowest level in any organization.

The trials also indicated the way to handle an error is to attach it to the person who made the error. Retrain her or him, but don't penalize all performers by taking the responsibility from them. And don't make it impossible for a new, intelligent employee to earn the right to make important decisions. If you do, you rob the job of its potential richness.

## Corporate Purpose Is Not Individual Purpose

We tried to separate corporate purposes or objectives from the objectives of the individual who is doing the work. Perhaps they can be made compatible, but this is not necessarily so. When we failed to untangle the two, projects suffered because we worked on the wrong problem. Corporate purpose is to provide a product

or service to the satisfaction of customers. But our illustrative elevator operator does not look at it this way; she sees purpose through her own job. Movies or employee communication programs—even money—will not encourage her to put out more effort or to be tardy less often. Indeed, putting out "more effort" in such a job has little meaning or reality. And handsomely mounted efforts to move responsibility downward by persuasion, explanation, and entreaty will not be successful.

We expect too much when we ask an employee to give up his personal objectives of job satisfaction and accept the corporate purpose; the employee's purpose and objective is different from that of the company. He is looking for a chance to achieve, to accept responsibility, to grow. It is likely the employee is not seeking a chance to serve customers.

This may sound blasphemous, but serving customers may be purely incidental to achieving his personal objective. If his job is so deprived of the elements from which job satisfaction comes that he cannot attain his goal, then persuasion to seek corporate goals is of no long-term relevance. As he resigns he, in effect, says, "Let someone else install these telephones and do these jobs. I'm getting out."

Sometimes our eagerness to work on one goal may block gains on another. In one trial, for example, a third-level manager seemed to accept the idea of job reshaping. He got the project underway because he was bothered by high turnover and unsatisfactory technical results. But when the project did not move rapidly enough, he became disturbed because employees did not show enthusiasm for the increased responsibility they were given. In one unit, technical measurements of customer service actually slipped a bit.

The manager then launched another program called, "I Believe in Service; Count Me In." He held meetings to review results and then asked employees to either "take the pledge" that they would provide superb customer service or resign. He said he knew his success as a manager was tied to the formal index and he had to "get it up."

## Old Approach Not Effective

We saw his motivational approach as a mixture of exhortation and threat. His objective—to maintain good technical indexes—was not the employees' objective. Their objective, we inferred from exit interviews, was to have interesting jobs that challenge their abilities. Employees wanted to be treated like adults, "not like a bunch of school kids."

The desire of this eager young manager to give superb technical service was admirable; his employees felt his goal was worthy, too. But the manager did not adequately recognize he had to attain his objective through employees whose prime goal was satisfying work. He interrupted a patient, long-term approach by reverting to the older motivational approach of persuasion and threat.

This incident, as well as our other studies, emphasizes that managers must balance objectives of customers, shareholders, and employees. This is the point at which the art and science of job reshaping begins: It must make corporate purpose compatible with individual purpose. If the corporation fails to provide its customers good service, it will be out of business. If it fails to provide its employees good jobs, it will be "out of business," too; its employees will resign. □

# A Monologue on Secondary Consequences: Or, How the Transistor Affects Arab Unity

"Let me tell you this little story to point up the significance of the secondary consequences of our acts. It shows you really can't predict what's going to happen from the impact of inventions and technological change.

"We can make a lot of predictions about what is going to happen, but these are all primary consequences. This is the only kind of stuff you can put in a staff study. You can't put the real wingdinger stuff in, which is the secondary effects of things.

"I'll give you one illustration of secondary effects. A friend of mine is a correspondent from the Middle East. He's sort of a non-violent James Bond type. He wanders into Third Avenue bars every now and then between books. And one day he was there when one of the boys asked him, 'What's all this with the Arabs? They're kicking up all this fuss in the Middle East. For a thousand years they've been asleep, and now we got all this uproar. What's causing it?'

"Well, after three martinis my friend answers, 'Japanese transistor radios.' Well, even in that atmosphere an answer like that calls for some explanation. So he went on to explain that Radio Cairo was the largest broadcasting complex in the world if you take out the jamming from Russia and China. Radio Cairo broadcasts 24

hours a day in 26 dialects and they push fairly hard stuff, not just rock 'n roll—and the illiteracy rate is very high.

"The boys down on Madison Avenue always astound my friend with their information. So he calls them up and says, 'Give me the number of radios in the Middle East.' In a half hour he's got the number — and what a big one it is. Those agencies know where they sell Coca-Cola. They've got a kind of snowbird market with the Arabs. The Arabs are not supposed to touch alcohol, and they like sweet drinks. And you can't sell Coke with ordinary advertising because the literacy rate is negligible, like the efficiency of a steam locomotive. But everybody has a transistor radio. A

poor soul is dying of starvation in the gutter and he's clutching a transistor radio to his ear. And all these people all over the Arab world are all listening to these unity messages from Cairo.

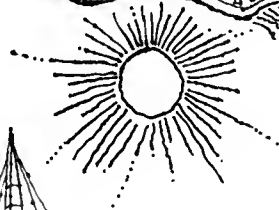
"So let's go back to Bell Labs and walk through one day. You have to pick the day carefully. You see three guys in shirtsleeves and ask them, 'Fellows, what are you working on?' The guys say, 'Well, you're in luck. Today, we just invented the transistor.'

"Now if you're really good at the kind of work I'm in, you're supposed to say, 'That's wonderful, and that'll be a fantastic force for unity in the Arab world.'

"Now if you say this, they'll throw you out, but if you don't say it you're not very good at looking ahead and predicting secondary consequences. This sort of thing happens all the time.

"At our shop now and then we'll do something brilliant. It'll be brilliant for a month — and then the secondary consequences come along. So during the first month we'll be congratulated, and in the second month the boss will say, 'We haven't thought this through very well.' I guess that's the kind of life we all have to lead. All I can tell you, it's more fun this way."

—Henry M. Boettinger, AT&T assistant comptroller — management sciences.



Velde

# The Vanishing Trail

As the computer's sway in the modern business world widens, the paper records of yesterday are vanishing. Unless the auditors who protect business learn to know its new machines, they may vanish with the paper.


Newspaper headlines recently have blared forth stories of embezzlement by means of computer — and in the process have raised a dark cloud that looks a lot more menacing than it really is. There are some cases on record of fraud through electronic data processing systems, but they are few and far between.

Actually, programming errors and "bugs" in computer systems are costing business more than all deliberate attempts to steal through the machine put together. How can modern business realize the full potential of the computer and still protect itself against ordinary human error, which, with no criminal intent, may scramble records and cost thousands of dollars before it is found and corrected? Nobody can guarantee systems that are foolproof and wholly adequate in the prevention or detection of fraud. But

by Joseph J. Wasserman

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*Mr. Wasserman, a member of the Institute of Internal Auditors, is manager of the audit development department at Bell Telephone Laboratories in Holmdel, N.J.*



the best line of defense against either error or fraud is a combination of properly supervised operations, and systems that incorporate good management controls — and *the proper kind of computer auditing*.

With the computer literally turning traditional ways of managing business upside down, it is easy to forget how recently the electronic calculating machine was applied principally to routine accounting chores. As it has become faster and more versatile, the computer has been given more and more non-accounting functions. Today, computers are playing an important part in nearly all operations of the business. And today's use of the computer only sketches the shape of things to come.

By the same token, the role of the internal auditor has broadened tremendously. Not long ago the auditor was pretty much restricted to verifying the accuracy of accounting department computations. Now, at least in the more progressive firms, the functions of the auditor are as broad as the total operation of the business. The auditor's new job, which has been defined as operational or management auditing, is gradually gaining recognition.

I emphasize "gradually," because in all too many cases computer and auditor are relative strangers. There are two significant reasons for this. First, companies are trying to do today's work with yesterday's auditors. Second, too many auditors never really became involved with punched-card computer systems. Auditors who never even had a nodding acquaintance with the older systems now face a huge gap between the ledgers of the past and the integrated electronic data processing systems of today and tomorrow. Systems of the future will operate on a fast-response, on-line, real-time basis and employ input and inquiry devices unheard of previously. Un-

less auditors become intimately acquainted with new developments now, they will not even know what they face, let alone be able to cope with it.

### **Auditor through the looking glass**

When punched-card computer systems first appeared, auditors generally followed an "around the machine" approach. Essentially, this consisted of testing the relationship of input and output in terms of the function being performed by the machine. For example, if two cards representing both fixed and variable payroll information were fed through a punched-card calculator, an auditor could at least partially test the program by manually determining that paychecks were accurate. However, this technique usually was ineffective for checking reports or summary information being accumulated throughout the process. It would be quite possible to process a paycheck correctly, but to accumulate annual tax data incorrectly. The auditor was comparing the machine's input with its output much as he would have compared voucher files with ledger books 50 years ago.

If this technique was ineffective for punched-card systems, it is almost useless with today's high-speed magnetic tape systems, and will be even more so with on-line, real-time systems. In a very real sense, the auditor now must work *through* the machine—which means he must understand what the program is doing and how it does it. The auditor must be able to use the machine itself as a tool to audit its own operations. He no longer has piles of paper to paw through. The classical "paper trail" or "audit trail" is vanishing and is being replaced by invisible arrangements of molecules in an iron oxide coating on plastic tape or on drums.

To gain a better appreciation of what electronic data processing auditing entails, consider the elements of an EDP system. Basically, such systems take raw data, introduce it into the system, transmit it to a processor, perform mathematical calculations and prepare printed reports in various forms. The auditor must be able to appraise the validity of the inputs. He must be sure that the data represent actual business conditions if the subsequently produced reports are to give top management realistic facts. The auditor must also determine that the data entered are transmitted and processed under a controlled procedure. This obviously means that the auditor must concern himself with the built-in controls the programming staff has established.

This adds up to the fact that the auditor today has to know enough of computer system design, machine languages and programming fundamentals to work directly with the systems design people — *in the design phase* of the system. Many aspects of modern fast-response computer systems are best checked, from the auditor's point of view, *before* the system goes into operation. And to check those aspects of the system which will concern him in the future, he has to act as devil's advocate to sell the value of controls and audit techniques to systems designers.

### The bull by the horns

In the Bell System, we have had to meet the problem head-on and solve it quickly. As far back as 1954 we assembled a task force at Bell Telephone Laboratories to analyze future use of computers in the telephone business. By 1959, we had a group of 50 people in Conshohocken, Pa., designing a computerized billing system which is now in wide use around the country. And at that time, we had trained auditors to evaluate the system, appraise controls and test the conversion of thousands of customer records *before* the system went into operation.

There are now over 60 auditors in the Bell System specifically trained in auditing electronic data pro-

cessing systems. More are being trained to cope with implementation of the biggest single computer operation in industry — the development of a business information system that will embrace every major operation of the Bell System. At Bell Laboratories in Holmdel, N.J., a new Audit Development Department that devotes its full attention to the BIS programming is staffed by people trained in both auditing and computer systems work.

They have three primary objectives: They appraise and recommend the inclusion of effective internal control procedures, appraise testing and conversion procedures, and insure future auditability of the systems by developing appropriate audit techniques and having them included in the live systems. They also strive to instill in the programmers an awareness of the need for "management information trails," which is a modern redefinition of the old "audit trail."

The "audit trail" needs redefining because it is now a misleading term. Many system design people seem convinced that controls are built into a computer system only to satisfy the outdated whims of the auditor. The capability to trace source documents through a system, to re-create tapes that might be lost or destroyed, to detect errors and prevent their subsequent reentry, are as important to the programmer and anyone in management who uses the data as they are to the auditor. Management itself has the greatest stake here because failure to provide such controls can literally cause chaos in a business and could result in huge financial losses.

### Means to the end

Clearly, if auditors are to gain the expertise needed to meet their expanded responsibilities, they must develop really creative auditing techniques that fit the age of third-generation computers.

One of the first audit techniques "through the machine" involves a sampling concept, that tried-and-true tool of statisticians. A scientifically designed sampling program extracts every Nth record from a file



for examination. This permits an auditor to appraise a situation through a sample — but using the speed and accuracy of the computer to extract the sample.

Some of the Bell System companies are now using a refinement of this technique to audit accounts receivable. Instead of merely selecting every Nth account, they review every account and extract only those meeting certain logic tests, which for pre-determined reasons warrant attention. Then, the computer having separated the wheat from the chaff, the auditor can spend his time analyzing only critical accounts rather than ploughing through thousands, 95 per cent of which need no attention.

Another audit technique is the “test deck” concept. This is actually an offshoot of the programmer’s testing procedures, and can test all functions built into the system. The drawback is the fact that it takes valuable computer time, and is also difficult to maintain because of frequent computer program changes. Several of the Bell companies have developed an innovation on this technique which is proving very valuable. This — which is done during the developmental stage of a system — entails establishing an imaginary “account” or “office” for the auditor.

A refinement of the imaginary account principle is Bell Laboratories’ “Mini Company” concept. This is an expansion of the test deck, and is a complete model subsystem running concurrently on the machine with the regular live system. By comparing known data from the live system with test data from the fictitious Mini Company transactions, auditors can quickly spot any irregularities in controls or processing within the machine.

The “audit module” includes many known audit techniques which will become part of the normal computer system and which can be called in when the auditor wants them. These are sampling, extraction, comparison, compiling and extension. This makes the machine the auditor’s tool so he can audit the system on a current, not an historical, basis. He can detect errors or control-breakdowns sooner. The input-output devices can be in the auditor’s office so

he can activate an audit without visiting the accounting center. The audit module, built into the computer system, will enable the auditor to validate meaningful data more comprehensively.

The Mini Company concept is extremely flexible, for we can use any kind of input and output device, and, as with the audit module, these can be located in the audit office, remote from the central computer. With communications links, we can interface with other computer systems for audit purposes. It also can be used by a programmer for testing or a daily quality control.

While thousands of the best minds in America are working on the application of computer technology to business and scientific problems, there are still comparatively few auditors actively researching the corresponding control implications. Although some progress is being made, we are still standing, in a sense, at the foot of the mountain. Although we have certainly started on the upward path, computer technology is moving so fast that we will have to run to keep up.

Nor is the internal auditor alone in confronting the problem. Certified public accountants who audit the financial affairs of corporations, examiners from the Internal Revenue Service who audit companies for taxable income and depreciation allowances, auditors from state departments of employment and taxation and auditors from the Department of Defense concerned with government contracts and the handling of classified information now must deal with records maintained on magnetic tape, discs, drums and data cells.

No one would pretend that we have all the answers to the problems raised by the computer. But experience has convinced us that training is needed both throughout industry and the auditing profession. The time is here when the auditor must be able to let the systems design people know exactly what procedures he will need to audit the computer so he can assure management that it has a well-controlled, fully auditable system. □

BLACK  
POWER



FOR  
BLACK  
SCHOOLS  
?

by Harry L. Miller





To most Americans the urban crisis is a complex of problems focused on the poverty-stricken and unskilled groups, mostly minorities and particularly the Negro. An individual's response to this situation varies from fear and defensiveness to concern and guilt, but whatever the reaction there is a growing agreement that *something* (often enough an ill-defined something) has to be done.

When Americans confront any widespread problem of human behavior — bigotry, violence, delinquency, a rise in illegitimate births or in automobile accident rates—they tend to turn to the school system either to blame for not preventing the aberration, or to demand that it take steps to educate our youth properly. The current crisis is no exception.

The black community itself thinks it knows why the schools have failed, and is demanding with increasing vehemence control over its own schools. The educators, both administrators and teachers, reply that the community does not have the professional know-how to run the schools, much less to improve achievement levels of children.

In fact, and it may be the only fact on which everyone involved agrees, the professionals themselves have *not* done a very effective job. Minority group children, and black children in particular, do far less well than whites in most subjects. Nationally, where white children score at about the seventh grade level on reading and other standardized tests, black children score between the fourth and fifth grade level. By the end of high school, the white average is seven-tenths of a grade above twelfth grade norms, while black students score at ninth grade levels.

National figures, of course, reflect the regional disadvantages of very poor educational systems of the black South. But even in the urban North, where both black and white children achieve at higher levels than their counterparts do in the South, the disparity persists. Central Harlem children in New York City are one grade behind city norms at the third grade in reading comprehension, and two grades behind by

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*Dr. Miller is professor of education at Hunter College of the City University of New York and has served as consultant to several educational programs for the disadvantaged.*

the sixth grade. By the eighth grade 75 per cent are below average in language skills.

Community spokesmen, from the most unlettered parent to such eminent professionals as Dr. Kenneth Clark, explain that these data result from the school system's racist attitudes. Ghetto schools are inferior, they argue, in both facilities and experienced teaching staff. Teachers share society's prejudice, and treat the children badly, or at best, patronizingly. And because they do not expect the children to learn, they translate the prophecy of failure into actual failure.

## Explanation differs

The professionals' explanation is vastly different. They point to the influence of lower-class home life with its noise and harassment, and the absence of verbal stimulation and sympathetic parental interaction. They describe the difficulties in enlisting support of parents, and the pupil turnover that in many central city schools confronts a teacher with a completely different class register at the end of the year from that she began with.

If only one of these sets of beliefs were true, it would help enormously in indicating where to begin on the problem. The most likely view, however, is that to a considerable degree *both* reflect the reality of the situation. But neither position takes into account the far-reaching and often remote economic and social trends that make the school problem so complex and so defiant of simple solution:

- The movement into central cities during the past two decades of large numbers of poor rural blacks and other minorities, unequipped to deal with urban life or with northern discrimination patterns, and subject to considerable family disorganization;
- The parallel movement of prospering working and middle-class whites out of the central cities to the suburbs, leaving city schools saturated with the most difficult children to teach;
- A drastic shift over several generations in manpower requirements from a condition that permitted

children who could not adapt to school to find stable work, to one that demanded education and skill to enter occupations with any status at all;

- A startling growth in affluence (30 per cent of whites now have incomes over \$10,000 a year, as against 8 per cent in 1947) that encourages much wider expectation for a good job with good income.

Consequently, little more than a generation ago schools could sustain, without criticism, a dropout rate of 50 per cent or more, and children who did not get along well in school just hung on till legal leaving age and were kept in line by the patriarchal strength of the lower-class immigrant family. A fact many people overlook is that American schools never did succeed with previous lower-class ethnic minorities in doing what is currently demanded of them.

Indeed, it never even tried, because there was wide social acceptance of the doctrine that lots of people had to be poor, that it was respectable to be so, and that social mobility was a matter of time. The black poor are no longer willing to accept any part of that doctrine. They want good jobs with decent incomes. And because they are now so clearly dependent on adequate schooling, the school is challenged to perform a social transformation it was designed to make only over a period of generations. The crucial question is whether it can be given even a reasonable chance to succeed.

## Remedial programs

Any institution confronting such a new, awesome task should, one assumes, begin to restructure itself fairly drastically. The dismaying fact is that even where sizeable amounts of money have been available (admittedly not very often), the school's response has been to put them into purely remedial efforts.

The remedial approach has taken two paths.

The first consists of an attempt to provide for the socially disadvantaged child the educational stimulation that his family has presumably failed to supply. Many lower-class children, for example, have ac-



quired what educators have come to call “trained inattention.” They learn to shut out the noise in their surroundings and the verbal communications of adults as well. Headstart and other preschool projects provide training in attentiveness and help the child learn to regard adults as resources. They also concentrate on developing the kinds of verbal readiness that the normal middle-class child brings to school with him.

Early experiments in this direction were so successful in improving the performance of children on measures of intellectual ability that Federal authorities channeled large sums of money into expanding the program in cities throughout the country. It looked as if a magically simple answer had been found: If the family inadequately prepared the child intellectually for school, then the school could get to him early enough to supply the deficiencies in training.

As later testing results came in, however, early hopes had to be considerably modified. Even children who improved greatly in small and expertly run programs slipped back when they began the regular school program. Large-scale city programs, furthermore, failed to achieve the success of early experiments.

Although preschool programs are continuing and no doubt will continue, there is some disenchantment with the idea. Even if recent experiments with a more rigorous insistence on drill in basic language and number skills — rather than maintaining a playschool atmosphere — turn out successfully, there is some question of how effectively they can be duplicated on a large scale.

The second major approach has been to provide remedial services within the regular school program itself and to make changes in the school program. It is probably fair to say that the bulk of the extra money channeled through the U.S. Office of Education for the disadvantaged child has been spent simply on providing more of already existing services like remedial reading teachers, smaller class size, after-school tutoring and full-time counselors instead of part-time ones. Laymen seldom realize how costly

these are in a large system. New York City, for example, has 900 schools and over a million children. To reduce class size merely by one pupil in that system costs millions of dollars.

In fact, the per pupil cost doubled in a small number of New York schools in which a large-scale remedial effort is now being tried, from about \$450 to \$900. In these More Effective Schools class size is dramatically reduced, special teaching and counseling services are provided, teachers are given more time for preparation and book and materials budgets are increased. Yet, discouragingly, a recent study at the end of the third year of the experiment shows that measurable gains are small and tend to disappear over the summer. These results may be explained by the fact that teachers are doing the same things they always did instead of developing new curriculum ideas and instructional techniques.

There have been some attempts, nationwide, to develop new instructional materials for these children, but many of them are either of doubtful value or have been so far unevaluated.

As for the teaching process itself, which all commentators assume is central and crucial, it is possible to state flatly — without fear of contradiction from any but the most defensive member of the education establishment — that we know very little more about what kind of teaching is most effective with these children than we did years ago. It is likely, though unproven, that the sympathetic adult who talks their language and understands their feelings, who creatively searches out what interests them, who engages their curiosity and yet sets high performance standards, will succeed in raising achievement levels. But there are remarkably few such teachers available.

Although the remedial approach has largely failed, we will, no doubt, continue to pour money into the schools for remedial programs for lack of anything better to do. A massive research project commissioned by the U.S. Office of Education several years ago, directed by James Coleman, an eminent educational sociologist, perhaps explains why.

Dr. Coleman gathered data on school racial mix and the school achievement of a number of minority-group children in a national sample of schools in every region of the country. Some minority children do better than others and the analysis attempted to find out whether school factors account for the difference. Briefly, he found that:

- The physical aspects of the school, the age of the building, the library, school facilities, and even class size, have very little influence on achievement.
- The experience of teachers and their verbal ability (presumably some reflection of their training) has some effect, particularly on minority children, but not a very substantial one.
- The racial mix has some effect. That is, minority children in schools with large proportions of majority-group children do better.
- The most striking independent influence on achievement is the attitude of the child toward his own future. The child who believes that what he does can affect his future performs better than the one for whom the future is a matter of luck or fate.

## The reconstruction of the school

These findings explain why simple remediation is not effective. They also support an approach that calls for some reconstruction of the school environment. One assumption that underlies this view is that lower-class black children normally learn only when they are integrated in the classroom with middle-class whites from whom they acquire the values of ambition and individual responsibility.

Although it is widely assumed that the Coleman data are evidence for such a position, they do not, in fact, mean anything of the kind. A far simpler explanation for the correlation Dr. Coleman found between school mixture and minority group achievement is that the families of children in racially-mixed schools are different from the families whose children attend ghetto schools. The reasons that led them out of the ghetto into a mixed neighborhood also account

for their children's better record in school. It is, at worst, an equally plausible explanation.

On the other hand, the results do seem to support a current trend that almost reverses the efforts to achieve school integration over the past decade, that is, the rising demand that local minority communities take control of their own schools. It is on this issue that the battle of urban education is most likely to focus in the near future.

The black militants' position begins with their conviction that what is wrong with the environment of the ghetto school is an atmosphere in which the minority child cannot help but feel inferior and is destined to failure. Even if the staff attitude is kindly and ostensibly helpful, they point out, it cannot conceal the underlying conviction that the children are members of an inferior group. Almost all those in authority are white, reinforcing the child's feelings of alienation and low status. Even the curriculum is a "white" one, ignoring the role of the black in American history and culture.

They propose that the local community be given autonomous control of their schools. They want freedom to teach the child pride in his heritage and in his people's ability, authority to discharge teachers whose attitudes may negatively affect the child's will to succeed, and seek to put into positions of administration people who will symbolize the possibilities for his own future status.

The probable consequences of such proposals may constitute such a dangerous risk that the uncertainty of payoff may not justify experimenting with community control. But that is debatable. There is much psychological merit in arguing that if we are ultimately to unite our divided society, we must go through a period of even sharper divisiveness to permit the black culture to build its own identity and sense of pride. As for chaos in the schools themselves, which is a quite likely immediate result, it can hardly be worse than the rapidly developing situation of mutual hostility and recrimination typical of many urban schools and their neighborhoods today.

The attractiveness of experimenting with community control is enhanced if one considers the evidence: The easiest things to change about the schools do not have very much influence on achievement. Conversely, what *does* affect achievement — parental attitudes, teacher skills and attitudes, the child's self-concept — are the most difficult to change.

## Focus on individuals

The present school structure puts the burden of adequate performance on the child and serves to separate those who do well from those who do poorly. Any restructuring must focus sharply on the individual, depend heavily on expert diagnostic activity, and break the traditional classroom organization into groups of different sizes.

A reconstructed school might well do the job, but professionals would recognize it as a fantasy for any immediate future. It would be enormously expensive but not, to be sure, beyond the capacity of a nation with a Gross National Product of \$800 billion. But it might be beyond the willingness of the majority mainstream and their political representatives. And even if we had the money, it is unlikely that we have the numbers of trained people to carry it out.

Reason, as well as the traditional American belief in the virtue of self-help, then, suggests that we cooperate in experiments that give minority communities as much control of their schools as they can take. The pragmatic alternative also deserves some consideration: As a society we must take substantial steps to remove the basic cause of the school problem.

If the black child came to school convinced that he had a reasonably equal chance with others for a good job and a good life, that effort on his part would be regarded in the same way that the effort of others is, the school problem would disappear as it did after a time for all other American minorities. The school is too frail an institution to bear the burden of correcting the inequities and contradictions of society, without, at least, some very expensive retooling. □

# BELL

## reports

argon ion laser at Bell Labs meant that photo-coagulation of blood vessels during eye surgery was possible. The hemoglobin absorbs the laser's blue-green light to coagulate the blood vessels and stop bleeding.

### Bell System Hiring 9800 Disadvantaged

More than 9,800 men, women and teenagers are being hired by the Bell System in 47 cities across the country as its part in the National Alliance of Businessmen's job program. Of the 9,800 jobs to be filled, 5,800 will be permanent and allocated to the hard-core unemployed, principally Negroes. The remainder are summer jobs for disadvantaged young people.

Providing jobs to core area residents is only one aspect of the Bell System approach to the problem of the cities. Many Bell System employees are contributing time and talents to community efforts to upgrade urban education with the support of school authorities. Programs conducted by Bell System employees range from classes in computer operations to how to prepare for job interviews and fill out application forms.

A Saturday work training program is provided in many Bell companies where basic electricity is taught to high school seniors. Participants are assured of a job upon satisfactory completion of the training and their high school education.

The Bell System also is helping en-

### Light Scalpel Developed

Bell Telephone Laboratories scientists, working with medical doctors, have developed a "light knife" that greatly aids eye surgery.

Using the scalpel of light, a surgeon can penetrate through transparent tissue, such as the cornea, to treat the back parts of the eye. He can incise without loss of blood because the argon beam cauterizes as it cuts. And he can make a very small cutting edge, 50 to 100 microns, which is infinitesimal by ophthalmic standards.

The knife, about the size of a fountain pen, has been used to destroy a tumor on the surface of an eye and cauterize a cluster of blood vessels which had grown across a child's pupil after the removal of a cataract.

Previous research with the ruby laser had shown that its vivid red beam was to a large extent transmitted through the blood vessels of the eye, not absorbed by them. But a breakthrough in the development of a continuous

*A 14-ton sea plow, specially designed by Bell Telephone Laboratories, recently completed burying 44 miles of supercapacity telephone cable two feet below the ocean floor near Jacksonville Beach, Fla. Part of a 1,300-mile cable between Jacksonville and the Virgin Islands, the near-shore segment was buried to protect it from accidental damage by commercial fishing nets and dredges.*





large awareness of the urban problem. Along with an information program for employees, it will sponsor four television specials on cities and their plight for the general public. The programs, which will vary in length from one to two hours, will be seen beginning in September.

#### Labs Studying Rain and Signals

The sun is being used as if it were a satellite in a Bell Telephone Laboratories experiment to study the effect of the atmosphere on transmission of radio waves.

Electronic equipment on a hilltop in Holmdel, N.J., tracks the sun in its daily path across the sky to record its signals and gather data on how rain and other atmospheric moisture affect the strength of the signals.

The sun emits radio noise at a great many frequencies. However, Bell Laboratories' sun tracker is tuned only to signals at 16 and 30 billion cycles per second, which are typical of the frequencies especially useful for satellite communications.

The use of frequencies above 12 billion cycles per second may open a previously unused part of the radio spectrum for satellite communications and deep space probes. However, signals at these frequencies are severely weakened by rain. The experiment should answer questions such as: How much are the signals weakened? For how long? How often each season?

The data collected from the sun-tracking equipment will help engineers design systems capable of avoiding pockets of dense rain. Alternative terminals might be established far enough apart so one would always be on a clear path to the satellite. If one transmission route were blocked by rain, messages could be switched automatically to another.

#### Satellite Use Increases

While the Bell System continues to expand satellite circuits for transoceanic telephone service, the world's first communications satellite — Echo I — met a fiery death over the coast of South America.

The Bell System recently began routing calls between Australia and the United States over seven satellite circuits which became available with the opening of an earth station at Moree, Australia. The new circuits will increase the system's capacity to handle calls to and from Australia and provide a diverse means of routing calls that were previously carried over 20 undersea cable circuits.

Echo I, launched on Aug. 12, 1960, helped transmit the first telephone signals in space. Bell Telephone Laboratories was a chief participant in the project, which proved the feasibility of satellite communications. During its short but exciting career, signals were bounced from Echo I across the United States as well as the Atlantic Ocean. Echo, a 10-story-high balloon of aluminized plastic when launched, completed more than 36,000 trips around the world while gradually descending into the atmosphere.

#### Machine Will Teach ESS

Bell System trainees will soon learn about the new electronic switching systems from a teaching machine developed by Bell Telephone Laboratories. Dubbed WOSP — for Word Organized Stored Program Demonstrator — the machine provides a full simulation and display of internal operations of the Bell System's No. 1 Electronic Switching System. The information being processed, the operations being performed and the flow of information through ESS can be di-



*Don't reach for your glasses. The distortion is part of a Bell Telephone Laboratories experiment in seeking ways to lower the cost of Picturephone® service. Actually, what you are looking at are parts of 140 different still pictures taken consecutively. The distortion results from the girl moving during the time required to take the pictures. Bell Labs engineers hope to use a computer to process Picturephone signals to eliminate duplication and allow more pictures to be transmitted over a transmission channel.*

rectly viewed by the trainees.

The operations, which normally take place at extremely high speeds, can be performed in slow motion or even stopped so individual steps can be isolated and observed. The recently patented teaching machine consists of two pieces of hardware. One is a console where students may submit punched program cards to the machine. The second is a seven-foot-high panel which displays an animated diagram so students may follow program operations in slow motion and work out problems step by step.



Photographs by Peter Fink



Many revolutions are taking place today in politics, morals and arts as well as in communications. And they are not unrelated. The revolution in communications, which are the heart of person-to-person interaction, may well be the common factor.

Many people tend to think of the communications revolution in terms of science and technology, and in some ways they are right because enormous strides

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*Dr. Wartens is director of the transmission systems research center at Bell Telephone Laboratories. His article is based on a talk given recently at the Institute of Electrical and Electronics Engineers' International Conference on Communications.*

in solid state technology and integrated circuits have been made. But the true revolution will be in the effects on our lives and our society. Because further invention and innovation will surely come, we cannot predict the technical details of the changes we face. But we can predict with certainty that there will be more communications, and new forms and uses of communications, and that the resulting increase in our interactive capabilities, both with other people and with machines, will cause vast changes in the quality of our lives and the shape of our cities.

Because of the evolutionary interactions between cities, communications and many other factors, it is harder to talk about the city of tomorrow than about the communications of tomorrow. For example, even today it is hard to say what a city is. The difference between city and country is disappearing. In the decade between 1950 and 1960, although the percentage of population living in so-called urban areas increased five per cent, the population division between urban fringe and central city shifted 10 per cent in favor of the fringe in cities of all sizes. The average population per square mile also decreased almost 20 per cent in the fringe and by over 30 per cent in central cities. So the population is becoming decentralized at the same time it becomes urbanized. Much of this is caused by advances in transportation and communications. Thus, tomorrow should bring even wider dispersal of our people.

So what is a city? Today we think of it as a physical concentration of people, facilities and activity which acts as a focus for human enterprise, culture and expression. But because of the physical concentration, we also think of cramping, crowding, traffic, pollution and ghettos. In fact, we have the paradoxes of alienation and isolation where concentration is greatest. What is in store for the future? More rapid dispersal and decentralization are needed, and the communications revolution may provide them.

A useful concept for the future is what Dr. Edward David Jr. of Bell Telephone Laboratories calls the virtual city—the city formed by communities of inter-

est in which person-to-person contact is accomplished through electrical communications rather than by physical concentration and its ills. Electrical communications channels can provide an extension of man's senses of sight and sound, and access to computers can provide an extension of his intellect. Communications combined with computers can dilute today's urban blights and bring the physical city into favorable balance with the resources for transportation and living space. At the same time communications can preserve the necessary human interactions and privacy and provide greater means for stimulating intellectual activity.

### People must be satisfied

The realization of this vision of the virtual city will require more from communications engineers than just good hardware engineering. Surely it takes that too. For example, we will need more and cheaper long distance circuits with greater call-carrying capacity. Advances being made today in cable circuits and in waveguide, satellite and laser transmission will surely be put to good use. But the virtual city concept also involves human behavior and response. People will accept new communications media and services only if they truly satisfy human desires and wants. The interface between man and the communications machine must suit the needs of society as well as the individual. Thus we must use the resources of the social sciences, of politics, sociology, economics and psychology as well as physical science and engineering, and we must use them wisely and efficiently.

Some examples of things that are being done today give some idea of the tremendous potentialities of the combination of communications and computing.

Picturephone® service will do for seeing what the telephone does for hearing, and will allow individual face-to-face interaction between widely separated people. A qualitative hint of the importance of visual interaction comes by considering how many people

travel to conferences and meetings, or by thinking of the impact of TV on national life, particularly on political campaigns! A quantitative hint comes from considering that the information capacity of vision is at least 100 times that of hearing and over 1,000 times that of any other sensory channel.

At present Picturephone sets have a 5½-by-5-inch screen and are designed to go on an office desk. The camera is just above the screen so eye contact is maintained. The field of view can be changed by the user to show either individual close-ups or groups. Simple graphics material can be accommodated by swinging out a mirror over the camera, which causes it to focus on the table in front of the set. But the primary use of Picturephone service will be for face-to-face, person-to-person communications.

Picturephone service will go into trial service this year with about 40 sets serving the Westinghouse Corporation in and between New York and Pittsburgh. The Bell System hopes to introduce it for general use in the early 1970s.

### Communications network uses are vast

The existence of widespread Picturephone service will mean the Bell System's communications network can be used for other things such as wideband data and computer interaction. The computer-communication combine will allow ready access to information sources, archives and processors and thus allow vast groupings of human affairs to be ordered, recorded, recalled, analyzed or transmitted.

But already today the trend is well begun. Airline reservations and stock quotations and many other computerized systems are in use today. The Touch-Tone® telephone can do a great deal over today's voice frequency network. Its musical tone signals can be transmitted over voice circuits to any part of the world and can control computers or other machines. Its signals are used to record inventory data, to order parts and to elicit voice replies from computers, giv-

ing bank account balances or other information.

Less rudimentary devices are required, of course, if we wish to have faster or more complex interactions with the computer. Computers can interact with teletypewriters, not only for computations but more significantly in the handling of letters and documents. Text can be typed and stored in the computer, and then corrections and additions can be made by coded instructions. The computer can then type out the final copy, paged and justified, at any destination in the world having an appropriate teletypewriter.

## Computer-aided communications

Computers can draw, also, and by adding a visual output device you can see what the computer has on its mind. And with the addition of a light pen we can really interact directly. It is much more convenient to point when editing a picture and to draw when editing a diagram. The light pen makes it possible for the computer to understand these actions.

We can also use the computer for recreation and for artistic expression. Computer-generated music and art are serious activities today. And it is a simple step from these activities to computer-generated movies, which are now being produced.

The virtual city concept combines these computer-interaction facilities with Picturephone or telephone conversations. Computer-aided communications between people is a new and promising mode. Parties separated geographically may view the same computer-generated display and work on it cooperatively through a central computer, communicating at the same time by voice or Picturephone service.

A set-up like this is in actual use by a Bell Telephone Laboratories group in New Jersey and Massachusetts Institute of Technology and General Electric in Cambridge, which are working cooperatively to create a new information and computing system. The common files and archives are stored at Cambridge in MIT's computer, but can be accessed and devel-

oped jointly at both locations, often in conjunction with a telephone conversation. The close collaboration required would be impossible without this arrangement, which creates a common work space.

The power of the computer interaction is such that it may prove useful as an aid to person-to-person communications even when the communications are not separated. Experiments at Stanford Research Institute in California indicate that computer-aided conferences, with everybody in the same room, are very effective.

Thus we see very real possibilities that communications technology and computers will remove the tyranny of geographical separation. Communities or centers of common interest may no longer require any physical grouping at all, and thus the virtual city may become a reality.

The challenge of all this to urban planners, social planners, architects and politicians is very great. There is little need to augment the present massive research and development in communications and computers. Rather, effort should take into account what communications can do for urban areas. But there are crucial questions yet to be answered.

For example, when our population is already decentralizing, should we continue to build new and bigger skyscrapers in every available cubic foot of airspace? Or is this the "sailing ship effect," as when the finest flowering and development of the sailing ship occurred *after* its doom was sealed by the invention of the steamship?

And how about political divisions? If the virtual city removes the tyranny of geography in our daily lives, should our political structure maintain it?

And how about people—all the people? If the virtual city serves only some, allowing them to enrich their lives and activities while leaving others behind more isolated than before, then the quality of our society will not be improved. The virtual city must provide contacts and interactions for all.

We have the vision, the possibilities, and the challenges. They make the future seem very exciting. □

by C. P. Crowley

# Man

Man possesses the ability  
to adapt to a remarkable  
range of environments.



t, like the animal,  
an was not meant  
be crowded.

Some experts say  
society is reaching the level  
of human endurance of the  
stress from overcrowding.

Research will try to find out  
how to control this  
environment and environment



# Man in Crowded Space

---

Most of us, when we think of space, think of outer space, and though filled with admiration for the astronauts, are somewhat relieved that we are spared the experience. If we think of space as it concerns us personally, it is usually when we need it in our homes where we live or on the highway when we drive. The current urban crisis, however, is forcing many of us to look at another kind of space: the overcrowded space of our big cities. It is becoming apparent that, of all urban problems, man-in-crowded-space is the metaproblem.

Man-in-crowded-space: the juxtaposition of these words is significant because man is rooted in and vitally affected by space. But, more surprisingly, space achieves identity by its relation to man.

Artists and writers once regarded space from a static point of view. Their view has changed now to one which expresses the dynamism and movement of space. At the same time, the physicists with their notion of curved, expanding and contracting space have paralleled the artists' intuitions and formed a notion of space resembling man's physiological experience of it.

Today, the social scientists are joining the movement. Sociologists are discussing housing in terms of human use of space. Economists are considering space not only as measurable, but as something humanly felt. Geographers are now looking at it in terms

of population density, recreative use and cultural attitudes. In short, contemporary research has shifted from viewing space as objective and neutral, to viewing it as subjectively significant — that is to say, as it relates to the human beings who inhabit it.

The fact is that man is an organism whose biology, like that of any animal, is acutely sensitive to space. Because of this, the American anthropologist, Edward T. Hall, warns: "The implosion of the world population into cities everywhere is creating a series of destructive behavioral sinks more lethal than the hydrogen bomb. Man is faced with a chain reaction and practically no knowledge of the cultural atoms producing it."

Dr. Hall's warning is not an hysterical jeremiad. It is a logical conclusion drawn from scientific study of the relation of space to animal behavior and the growing evidence that space affects man in essentially the same way as it does animals.

Are animals and man equally sensitive to space? Does overcrowded space affect them in the same way?

There is no doubt about animal sensitivity to space. Animals use space in a variety of ways to handle friendly or dangerous situations. For example, social space — the space kept between members of a group of animals—varies according to species. The flamingo's social space is six feet; the male bowerbirds have a social space of thousands of feet. In dangerous situations, the space an animal keeps between itself and an approaching enemy varies according to the size of the animal. An antelope's flight distance is 500 yards; the lizard's, six feet. And animals have a critical distance

at which they will turn and attack. The cornered rat is dangerous because he is driven into his critical space. In fact, an animal's communications system, by which he lives safely and happily, is rooted in his sensitivity to space.

Man, the human organism, possesses a similar sensitivity to space, reacting to shifting distances like the gull or the wolf. Experiments reveal that man feels at home in less than two feet of space during the giving of comfort, protection or love. This is the most personal or intimate space. Man needs more space for less intimate personal activity; a still greater amount for social activity or impersonal business, and a distance of up to 10 yards for public occasions where extreme formality is required.

Such human space mechanisms were revealed during the funeral ceremonies for the late Senator Kennedy. There was intimate space (the Kennedy family close together), personal space (the Kennedy friends close, but slightly farther away), social space (the religious celebrants), and public space (the crowd and the Kennedy family).

When the rites were finished, the same distances were preserved in relation to the casket. At first, there was a public space around the casket; then other values, family love and the respect of close friends, narrowed the distance. When the crowd finally crossed into the intimate space, military guards moved around the casket and intimate space changed to psychologically public distance. The final television shot of Ethel Kennedy, dominated by the vast public space of St. Patrick's Cathedral, symbolized a nation's respect not only for the wife of Robert Kennedy but for a woman who

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*Dr. Crowley, dean of graduate studies and professor of English literature at the University of Windsor in Windsor, Ontario, has published articles on literature, communications and interdisciplinary topics.*



had achieved national stature by her own personal courage.

What makes human space behavior complicated, however, is the fact that man's spatial language differs from culture to culture. All men are sensitive to space, but their sensitivity takes different forms. This cultural variety is often a source of misunderstanding and friction.

Americans generally find crowding unpleasant. The Japanese and the Arabians, however, have no desire to be alone as the American does, nor do they resent the jostling and confusion of crowds. They have no understanding of the notion of privacy as it is practiced by Americans or British. In fact, they have no word for privacy in their vocabularies. Yet they have a concept of privacy. The Japanese resent sharing a wall of their house with others and create privacy by the adroit use of protecting gardens.

The Arab has a more puzzling attitude to privacy. He has no feeling for personal space outside his body. He does not mind being physically touched because he believes that the personal ego is hidden and cannot be reached by physical means. There is no physical privacy in the Arab family. Its members, however, achieve privacy by a means familiar to Englishmen: they remain silent. Americans misunderstand this privacy and see it as "the silent treatment" which they deeply resent.

Man's culturally different ways of expressing his sensitivity to space makes intercultural living extremely difficult. This explains why Americans of German, English, French or Negro descent may still find it difficult to understand each other, even though

they speak "American" and share a New York accent. It also explains why the major ethnic groups in America have preserved their cultural identities for generations and have prevented America from becoming a "melting pot" as sociologists Nathan Glazer and Daniel P. Moynihan have shown in their book, *Beyond the Melting Pot*.

It is obvious that sensitivity to space revealed in man's personal space perceptions is a means of protection, comfort and healthful living within society. It is also obvious that this sensitivity is rooted in man's biology. When we come to the problem of man-in-overcrowded-space, we are facing the most fundamental biological problem: the question of man living in limits where his space perceptions operate with great difficulty, if at all. We are also facing a different concept of space, space as home, city, or, in ethological terms, territory.

We have learned much about the concept of territory in the last 30 years. Evidence has increased to prove that the possession and defense of territory among the vertebrates, including human and subhuman primates, is a biological need. Scientists have demonstrated that territoriality is a vertebral instinct affecting fish and amphibia, reptiles, mammals and birds. Evidence is mounting to show that it affects man too.

Simply stated, we now know that each species has its own living space, where it belongs, where it hides and where it plays. It is the place where it finds food and signals the approach of danger. It is the place where it forms societies around dominant members, establishing a social hierarchy and creating controls.

There are parallels in human living. The executive gains power and confidence seated behind his desk in his own office, but becomes less assertive in the office of another executive who is seated behind his desk. Every wise committee chairman knows he obtains a moral advantage by persuading the opposition to meet in his territory. The Americans and North Vietnamese delayed vital peace talks until they had settled on a mutually agreed territory for their meetings.

Obviously, it is vital for the animal that he preserve his territory from overcrowding. Nature's method of controlling the overpopulation which would endanger living space is brutally effective.

A good example is found in ethologist John Christian's story of a herd of Sika deer on an island. In 1955, the herd numbered about 300, giving a density of one deer per acre. The presumption was that the deer needed that much space. For two years, the herd increased, but, during the first three months of 1958, more than half of them died. By 1959, the herd was reduced to about 80 animals. When the dead deer were examined, it was found that the cause of death was shock, followed by severe metabolic disturbances and greatly enlarged adrenals. Food had been plentiful; the animals were in general good health. The deaths had resulted from the stress of overcrowding beyond levels that the deer could tolerate.

Other experiments with mammals such as voles, house mice, wild and albino Norway rats and rabbits confirm that an animal's instinct determines the number in its territory which it can tolerate and which will enable it

to live happily and healthily.

The frightening question now facing man is whether he is creating environments for himself which will result in the same horrible results apparent in animals. Some experts claim that he is, and that it is high time he learn from the warning signals. Professor Ross Wilhelm of the University of Michigan claims that the studies of mammal crowding and their relationship to human crowding are conclusive. He believes that there may be for human beings an upper limit of concentration which, when exceeded, makes the city an intolerable place to live in. In fact, he believes that racial riots are caused by people who really hate their city, not their fellow citizens.

It is imperative to solve the ultimate biological question of what will happen if man cannot adapt to crowded conditions. Dr. Daniel Carson of the Institute for Mental Health in Ann Arbor, Mich., has pointed out that city planners do not know the answer. But he adds significantly, "Neither do we scientists," recognizing that science is waiting for the data to come in.

Meanwhile, we know that animals die from the same diseases as man. Pathologists in Philadelphia recently reported the results of a 25-year cause-of-death study of 16,000 birds and mammals. The birds and mammals died from high blood pressure, circulatory diseases and heart diseases. The report also showed they had been under severe stress from overcrowding.

There is no doubt that man shares physiological and endocrine features with other animals, particularly those associated with stress. But what we need is information on the size and

the weight of those who have died in cities, who have committed suicide and who have died of cancer and circulatory disease.

Some social scientists are confident more research will prove man is as mortally sensitive to stress from overcrowding as is the animal. A variety of research data tends to support them.

A three-year study in Baltimore has shown that 400 Negro families stabilized their family life and became socially more responsible when they moved out of crowded slums into improved housing which gave them privacy. In France, a sociological study has shown that when available room space for workers' families fell below 26 to 32 square feet per person, social and physical disorders doubled and children suffered extremely.

Sophocles, in his *Antigone*, used a metaphor which has been translated as "our citted world." Writing in the fifth century B.C., Sophocles was prophetic in his poetic metaphor. By the year 2000, that metaphor will be literally true. We have over 66 per cent of our citizens living in the great city complexes which sprawl across the country. It is estimated that by 2000 the percentage will increase to 90 per cent. One reason is the prospect of our metropolitan clusters linking to form megalopolises across the country.

The irony is the fact that the great cities still retain their pull for the young, the ambitious, the creative and the poor. And there are still civic groups and programs attracting Negroes from the deep South to the "richer" life of the cities.

Complicating this swelling surge to the cities is the invasion of cultures. Foreign poor, farmers and southern Negroes bring their different ways of life and their agricultural habits into the strange foreign maelstrom of urban life. The friction is apparent. It spreads easily.

When we recall how territory gives the animal his food, his security, his social control and his identity, it is humbling to compare the failure of the human territories known as cities.

But we know how the animal handles his population problem. It is efficient, instinctive and pathological. The northern lemmings for centuries have solved their population problem by an annual suicide march to the sea. We know now that biological stress resulting from their inability to tolerate overcrowded conditions drives them to such a ruthless solution. Our present violence suggests we are approaching our own biological level of tolerance. Yet we find it impossible to limit our population in a normal way.

Man, however, differs from the animal. He is intellectually aware of his problems and able to bring a conscious and creative mind to bear on them. The history of the past century has shown that when man illuminates the stresses of social patterns he increases his possibility of control over them. Eminent biologists, like Julian Huxley and Percy Medewar, are convinced that the ability to control his environment is the power to enable man to control his own evolution. The source of this power is research. Today, research on man's relation to space is being done everywhere.

Robin Fox, anthropologist at Rutgers, after commenting that the pressures leading us to our present urban predicament arise from technology and industry, the products of our brain, asks the question: "Can the brain which has got us into this trouble get us out of it?"

The answer, I think, is yes. □

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September / October 1968

**BELL**

telephone magazine

**Democrat  
or Republican:  
What difference  
does it  
make?**

# Making the communications network more useful

**T**he proposed liberalized tariff regulation which allows more customer-provided equipment to be connected to the telephone network is another step in the Bell System's continuing effort to make its communications network more flexible and useful.

The most significant change in the tariff, which was proposed to the Federal Communications Commission recently, is a new optional arrangement for connecting customer data terminal equipment. It also provides for connecting private mobile radio telephone systems and other customer-provided voice or data transmitting or receiving devices through the use of Bell System network control equipment.

This liberalization fulfills an intent AT&T Board Chairman H. I. Romnes expressed several months ago at a computer conference:

"... our intent is to make interfaces as simple and inexpensive as possible, and rules and limitations as few as good sense will allow... we want to minimize restraints, not multiply them. We want our services to expand, not restrict opportunity for others. For it is this, we well know, that expands opportunity for us."

A recent report to Bell System share owners stated that "made-to-order communications is our primary mission—providing channels ready on the instant—to move information of any kind, between stations anywhere."

To do this, the Bell System—in association with the independent telephone companies—has designed and built a switched network that is, in effect, a single integrated nationwide facility. It includes automatic switching centers in 8,000 places, joined by 700 million miles of carrier circuits. It serves 102 million stations, any one of which can be connected to any other in a

matter of seconds by dialing the number. To do this, the network must stand ready to provide any one of some 5 million billion possible connections.

This highly engineered, precisely organized network is designed to use the most economical combination of high-quality transmission and switching facilities with extremely low probability of delay. Maintaining the quality of the network, in which the Bell System has invested about \$37 billion, is a continuously urgent priority in the telephone business.

Protecting the quality of this network—and making it more available for more purposes—are twin objectives of the proposed tariff.

In providing a new optional arrangement for connecting data terminal equipment, customers will now have the choice of continuing to use Bell System Data-Phone® sets or using their own modulating equipment in conjunction with a new telephone company-provided, low-cost data access arrangement that protects the switching network. Other customer-provided voice or data transmitting or receiving devices will be connected through the use of Bell System network control equipment.

The network control devices are as much an integral part of the network as the lines and switches they control and are critical to its precise operation. Keeping the signaling, switching and control functions under the responsibility of the telephone company is necessary to maintain the quality of the telecommunications network.

In adapting to changing communications needs and technology with this new tariff, the Bell System is seeking to open the switched network to as wide a variety of applications as possible.

# BELL

telephone magazine

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# Who said what?

Which party wrote which platform planks?

## 1952: EQUAL PAY FOR EQUAL WORK

1. "We favor legislation assuring equal pay for equal work regardless of sex."
2. "We believe in equal pay for equal work, regardless of sex, and we urge legislation to make that principle effective."

## 1956: COMMUNIST CHINA

3. "We pledge determined opposition to the admission of the Communist Chinese into the United Nations."
4. "We shall continue to oppose the seating of Communist China in the United Nations."

## 1960: UNDERDEVELOPED COUNTRIES

5. "We shall seek to associate other capital-exporting countries with us in promoting the orderly economic growth of the underdeveloped world."
6. "Agreeable to the developing nations, we would join with them in inviting countries with advanced economies to share with us a proportionate part of the capital and technical aid required."

## 1964: NATIONAL DEFENSE

7. "We will revitalize research and development programs needed to enable the nation to develop advanced new weapons systems, strategic as well as tactical."
8. "We must and will maintain the world's largest research and development effort to ensure continued American leadership in weapons systems and equipment."



## 1964: EMPLOYMENT

9. "We must develop our most precious resource — our manpower. Training and retraining programs must be expanded."

10. "We pledge enlargement of employment opportunities for urban and rural citizens, with emphasis on training programs to equip them with needed skills."

## 1968: LAW AND ORDER

"We pledge a vigorous and sustained campaign against lawlessness in all its forms. We will further this campaign by attack on the root causes of crime and disorder. In fighting crime we must not foster injustice. Lawlessness cannot be ended by curtailing the hard-won liberties of all Americans."

"We pledge vigorous and even-handed administration of justice and enforcement of the law. We must reestablish the principle that men are accountable for what they do, that criminals are responsible for their crimes, and while a youth's environment may help to explain the man's crime, it does not excuse that crime."

# Democrat or Republican: What difference does it make?

Are Democrats and Republicans members of parties with coherent principles and contrasting philosophies? Both parties convince most of us — at least for several months every four years — that it does make a difference who wins.

**by Andrew Hacker**

Despite all the protestations heard to the contrary, the majority of Americans are quite partisan in their politics. Out of habit or ancestry or conviction, and for all their claims to an open mind and an independent spirit, most voters are either Democrats or Republicans. This is not, of course, to say that we never defect to the other side of the ballot: as a matter of fact, split-ticket voting is more common now than at any time in the past. But when the Gallup interviewer asks his opening question — "What are you?" — only a minority is unwilling to admit adherence to

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*Dr. Hacker, a professor in the Department of Government at Cornell University, has written several books and many articles for scholarly journals and general magazines on politics in the United States.*

a party emblem. . . . **there is little point in  
These deep-seated loyalties become most  
defeating Tweedledee only  
to find yourself saddled with  
Tweedledum . . .**

evident as we proceed toward the bottom of the ballot: in minor races, where we know little or nothing about the candidates, partisan affinities unerringly guide our finger to the traditional lever.

Thus while the contest for the Presidency will capture our major attention over the next few months, it is worth remembering that we will also be electing 21 governors, 34 senators, 435 representatives and approximately 7,000 state legislators this November. And most of the votes cast for these candidates will be on the basis of party-label rather than a scrutiny of their performance or personalities. (Except in case of a real Presidential landslide — as in 1964 — the so-called “coattails effect” is relatively insubstantial.)

A two-party system is obviously the central instrument of democratic politics, providing citizens with periodic opportunities to choose their rulers. But the significance of that selection depends in very large measure on the competing contenders: after all there is little point in defeating Tweedledee only to find yourself saddled with Tweedledum for the next four years. Given that the two major parties present us with the front-running candidates, it is important to understand the distinguishing characteristics of the Democrats and the Republicans.

Few outside observers are prepared to contend that the Democrats and Republicans are parties founded on coherent principles or that they oppose each other with contrasting philosophies. Yet the customary view — that the Democrats tend on the whole to be “liberal” while the Republicans are more “conservative” — is not far from the truth and makes a good beginning for any analysis.

Purists are, of course, infuriated by the ideological overlap obfuscating the party spectrum. How, for example, can the Democrats be the party of liberalism when they tolerate the presence of Senator James Eastland and deliver votes to Governor Lester Maddox? By the same token it would take a great deal of diligent research to uncover the conservative leanings of such accredited Republicans as John Lindsay, Clifford Case or John Gardner.

Still and all, the popular perception is accurate enough as a point of departure. Democrats are more

willing to spend taxpayers’ money in tune with the precepts of Sherwood Forest and they are less apt to develop neuroses over the pyramiding of Federal agencies. Republicans *do* take a harder line when it comes to criminals and communists and unwed mothers, standing for firmness in city streets, distant jungles and welfare dispensaries. Democrats are apt to dilate on the environmental conditions which have produced the Viet Cong and the Blackstone Rangers. Republicans prefer moral philosophy to sociological exoneration, believing that an understanding of evil is hardly a substitute for its elimination. Yet if these contrasts are familiar, they reflect the underlying sentiments of the chief constituencies of the two camps. Perhaps the best way to understand the parties, therefore, is by examining the actual people who cluster under their respective banners.

There is no need to apologize for beginning with the Democrats. They are, after all, the majority party and have been so for well over a generation. In most elections, most of the time, the odds are better than even that the Democratic candidate will receive most of the votes. At the present time 63 per cent of our senators and 59 per cent of both our representatives in Washington and our state legislators are Democrats. Percentages of this sort have been pretty much the rule since 1930. Nor is this very surprising.

For the Democratic party is a grand and confusing coalition, welcoming all sorts of voters from a variety of backgrounds. Thus Mississippi farmhands, Manhattan intellectuals and Milwaukee brewery workers are content to march under its copious banner. If residents of public housing projects are prone to vote Democratic, so are most political science professors at Ivy League universities. Meat-and-potatoes union leaders may be dyed-in-the-wool Democrats, but the party also welcomes old-stock patricians of inherited wealth who prefer their steak with *sauce bearnaise* and their wine served at room temperature.

Such a coalescence of near-opposites has a certain charm, but it makes domestic disharmony all but inevitable. Whether in Congressional hearings or at the local clubhouse, Democrats seem never so happy as when attacking their own kith and kin. Thus hawks and doves, segregationists and integrationists, spenders and economizers, sustain the Democratic party as a perpetual debating society.

And the permutations and combinations are endless, for the party’s ample bosom can embrace a segre-

gationist dove (J. William Fulbright), a welfare-state hawk (George Meany) and even an anticommunist proponent of gun controls (Thomas Dodd). Democratic conclaves can be devious to the verge of political disaster. But they are never dull.

Given such variations in attitude and outlook, it would be easy to conclude that the Democratic party is an irrational edifice entirely bereft of the masonry needed to hold its ill-fitting parts together. But in actual fact Americans who tend to vote Democratic do have one critical feature in common: the feeling of being outsiders. Not all Democrats are economic underdogs or social failures, but the typical Democrat does see himself, in one way or another, as a citizen who is not securely ensconced in the mainstream of the nation's life.

This is certainly true of racial minorities, of the unemployed and of those subsisting on public welfare. It is also the case with most trade unionists who, even if quite well paid, still feel that their wages are always a step behind both the cost of living and the style of life to which they are entitled.

The feeling of being on the outside is clearly apparent among Americans of more recent immigrant origin, who sense that their names or accents or manners have barred them from membership in the more privileged purlieu of society. By the same token, Southerners of all classes realize that their region is something of a stepchild: constantly under criticism and looked down upon as a sort of underdeveloped society that has yet to catch up with this century.

While the blessings of affluence may now be more bountifully distributed than ever before, it is nevertheless accurate to say that most Americans have not yet arrived at that happy position where they feel socially accepted and psychologically assimilated. And it is this parapolitical fact, more than any other, which gives the Democrats their majorities. They are still the party of the "have-nots" — even if the deprivations in question are more subtle and less tangible than those of a generation ago. Indeed, this explains why so many upper middleclass eggheads and intel-

**... the party's ample bosom  
can embrace a segregationist  
dove, a welfare-state hawk  
and even an anti-communist  
proponent of gun controls.**

lectuals usually end up under the Democratic banner. While most such individuals

are well enough paid and dwell in quite comfortable surroundings, they nevertheless consider themselves outsiders in the respects they deem important. The reason, most probably, is that the egghead's chief concern is with abstract ideas and he feels that our materialist nation is insufficiently appreciative of the ratiocinative occupations.

Rather than being welcomed to the circles and councils where power is exercised, the intellectual sees himself looked down upon as either a hired hand or an impractical crank. He believes he is seldom accorded the deference he deserves and that our society is incapable of understanding the value of arcane or esoteric knowledge. The Democratic party, aware that the alienated egghead has a vote (and a checkbook) has been careful to provide a comfortable corner for academic experts. And in some periods — most notably the Roosevelt and Kennedy administrations — the professoriat had more than its share of policy-making positions in Washington.

The presence of patricians amid the Democratic ranks is less easy to explain. But beginning with Franklin Roosevelt, proceeding with such men as Averell Harriman and Adlai Stevenson, and continuing today with Joseph Clark and Claiborne Pell, there have always been products of the prep-school contingent on the Democratic rolls. At the same time, of course, most pedigreed Americans are Republicans and those who become Democrats are the exception rather than the rule.

One explanation, admittedly speculative, is that every wealthy class in history produces a few mutants who feel guilty over their inherited privileges. While it is impossible to predict which graduates of Groton will develop such pangs of conscience, every generation nevertheless has its quota. The Democrats usually like to have at least a few of these showpieces on their podium. Perhaps the party, many of whose supporters can trace peasant origins, has an unconscious yearning for an air of aristocratic authority.

What follows from this analysis is that Democrats are, quite frankly, a hungry party. Not only do they want to win elections, but it can be argued that they need to win them as well. People who are outsiders need some tokens in their symbolic struggle to move closer to the American epicenter and the capture of each political office can be construed as evidence that the citadels are beginning to crumble. This means that the fratricidal Democrats usually invoke an arm-

justice prior to Election Day, banding together just long enough to push one of their men over the top. All in all, the Democratic coalition is more a "political" party in the sense that it is in business to win. This is not necessarily true of the Republicans.

While not all Republicans are rich or famous, most of them are nevertheless successful and assimilated citizens who believe that the way they have chosen to live is the embodiment of the American way of life. The GOP, then, is the party of those who got here first: it upholds the attitudes and values of Anglo-Saxon America and is the unblushing ally of free enterprise and the business spirit.

Given these ingredients, the Republicans are more homogeneous and certainly more decorous than the Democrats. Thus intraparty arguments are usually settled in a gentlemanly manner and behind closed doors. Being a Democrat is probably more fun; however, many Republicans prefer to believe that theirs is a party of principle and not an amusement park.

Certainly the articles of faith shared by most Republicans are the puritan virtues of initiative, independence and self-reliant individualism. They believe that they have got where they are through thrift and perseverance, indeed that they are in fact rather special and superior people. At a recent Republican nominating convention the first speaker, rising to welcome the delegates, proclaimed to them: "You are the Salt of the Earth!" The rafters of the Cow Palace rang with the cheers of his audience. For they knew he was right.

Hence, of course, the GOP's mistrust of government handouts and bureaucratic benevolence which can only serve to encourage indolence, improvidence or immorality. (But one of the problems with being a party comprised mainly of people who are successful is attracting votes from those who are failures.)

Hence, also, the tendency of Republicans to exhibit not only an intense patriotism but also an inbred anxiety over threats posed by external enemies and internal subversives. (One rather irreverent social scientist claims to have taken a stop watch to a series of party conventions. Upon playing of the first bars of "The Star-Spangled Banner," he reports, the average Republican audience got to its feet in 1.2 seconds whereas the typical Democratic gathering took

**Being a Democrat is probably more fun; however many Republicans prefer to believe that theirs is a party of principle and not an amusement park.**

two and a half times that long.) The suspicion occasionally arises that the Republicans are more a club than a party, more intent on nominating loyal laborers and keeping their ideology intact than in actually winning elections. Certainly many GOP stalwarts are quick to identify those they deem to be "real" Republicans — a test Democrats seldom apply simply because no one would ever pass it. And their preference is to place service to the party and its principles above having a wide public appeal. This is the chief reason why Republicans lose elections as often as they do: the party is uneasy about courting votes if the cost will be compromise.

But then again, the Republicans do not need to win office as much as the Democrats do. Despite all his complaints and protestations, the typical Republican has really done quite well socially and economically even when the major branches of government are in opposition hands. It is nice to have one's own people in public positions, but that frosting on the cake is not an absolute necessity.

From time to time, however, there emerge Republicans who do think that winning is rather important. These are usually less senior members of the club, often from suburban constituencies, who are not necessarily entranced by the rural-born pieties of the GOP litany. On not a few occasions these modern and more moderate adherents come up with candidates such as Edward Brooke or Mark Hatfield or Charles Percy who are persuasive and personable enough to win an election.

Indeed, for a dozen years between 1940 and 1952 the party gave its Presidential nominations to a series of men — Wendell Wilkie, Thomas Dewey and Dwight Eisenhower — despite the misgivings of traditionalists who obviously preferred Sen. Robert A. Taft of Ohio. Just how or why those conventions came to vote against their self-evident leader is an intriguing story. Taft's own view was that he was refused the 1952 nomination because of "the power of the New York financial interest." What can be said is that

the volunteer battalions from the suburbs have had a formidable ally in the so-called "Eastern Establishment," an ad hoc congeries of executives and lawyers and bankers who have been known to push candidates of their liking in informal but well-financed ways. But the "Establishment" could not halt the

**... party positions and party power gravitate to the few in each community who find it congenial or profitable to keep the organization going...**

Goldwater tide in 1964 and it never really rallied its resources behind

Nelson Rockefeller in 1968. It may well be that the political power of this group has passed its peak. If so, then the Republican party is, in many ways, a more "democratic" party than it was two decades ago.

Yet despite the fact that most Americans identify with either the Democrats or the Republicans, there is still the oft-heard criticism that the parties are not sufficiently responsive to the opinions of their adherents. Such complaints have been particularly widespread this year. For in state after state, local supporters of both Eugene McCarthy and Nelson Rockefeller were given a chilly reception by the party regulars, even though polls or primaries showed those candidates to have a broad appeal.

This treatment was most noticeable in the more than 30 states where convention delegates are chosen in closed conclaves rather than in open primaries. One state chairman, besieged by the McCarthy camp for proportional representation in his delegation, saw those petitioners as late-arriving interlopers: "If I ignored the people who have always helped me with the organization's work and appointed strangers," he said, "I'd have a revolution on my hands."

The truth of the matter is that in most parts of the country the Democrats and Republicans are remarkably open organizations in that they welcome the services of any citizen willing to labor in the political vineyard. The difficulty is that quite a few people have already enlisted themselves in this cause and have already established their seniority by working year in and year out in local campaigns. These are individuals who make politics their avocation, contributing modest but regular sums to the party coffers and serving on ward and precinct committees where the agendas seldom reach the great moral issues of our time.

Not surprisingly such stalwarts are the ones promoted to the committees and the conventions where candidates are ultimately chosen. Their tendency, moreover, is to be loyal to the settled leadership and their affections are for aspirants who — like themselves — have served the party long and well. This

outlook, more than anything else, explains the ease with which Richard Nixon and Hubert Humphrey got their convention majorities.

What emerges is that the parties can be quite inhospitable when johnny-come-latelies attempt to introduce new candidates or ideas. There have, of course, been instances where exercised amateurs have rallied popular support around nomination campaigns and, by producing high turnouts at the usually-neglected primaries, have been able to defeat the old guard.

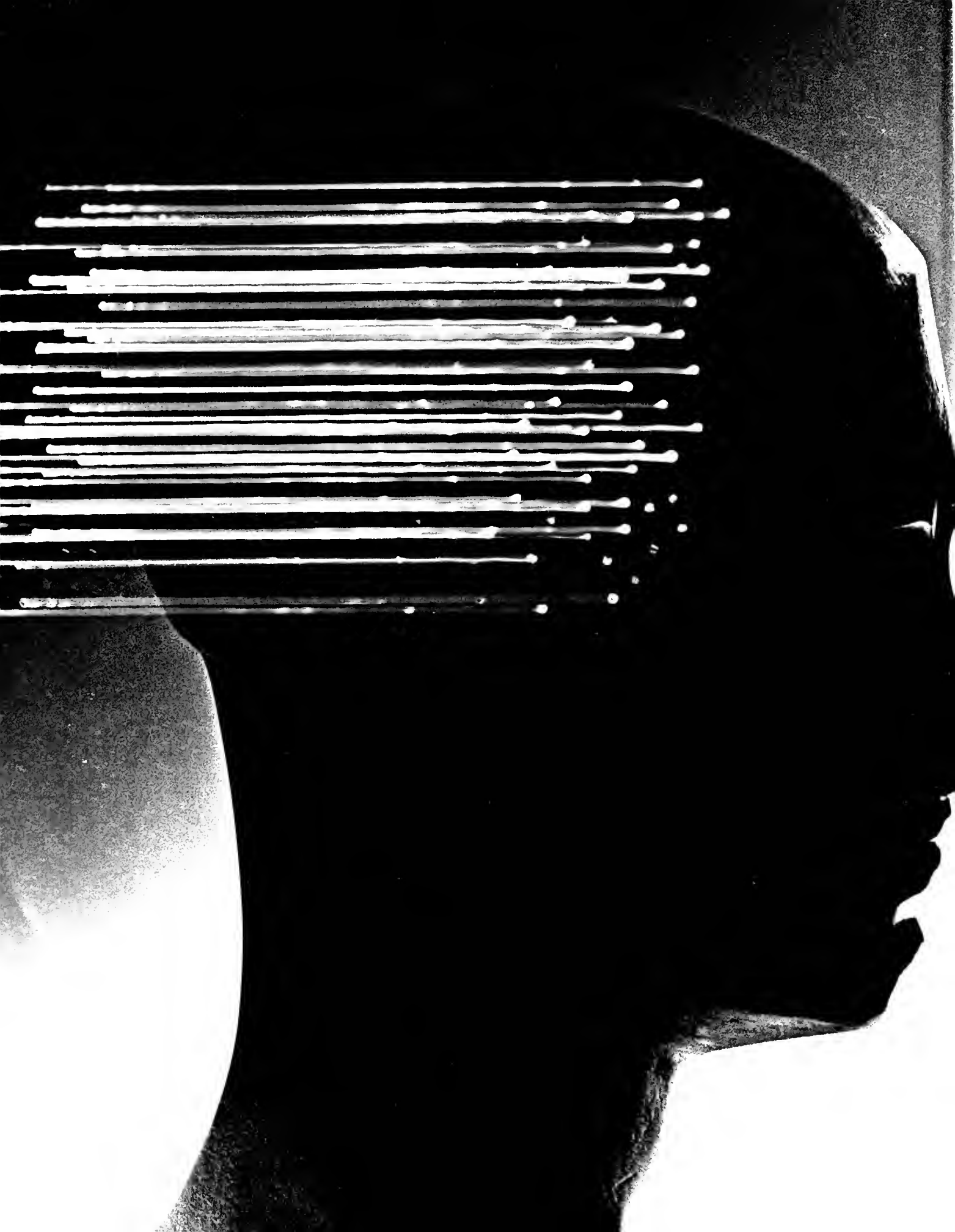
But such forays are more often than not one-shot affairs and most of the citizens engaging in them are reluctant to become either contributors or committeemen on a lasting basis. The reason is that the great majority of Americans have other concerns: family, friends, careers or civic activities of a nonpartisan character. Thus party positions and party power gravitate to the few in each community who find it congenial or profitable to keep the organization going while the rest of us are enjoying ourselves elsewhere.

If the parties often insulate themselves from public opinion, the system itself nevertheless possesses a political chemistry that seems to ensure its survival. Between August and November citizens begin to see hitherto unnoticed virtues in the official candidates, as often as not discovering some version of their own views in their party's standardbearer.

Erstwhile Rockefeller supporters will gradually conclude that Richard Nixon is really quite liberal, while Ronald Reagan's friends will focus on the former Vice President's more conservative phrases. McCarthy adherents will discover dove-like qualities in Hubert Humphrey and Democrats who had been toying with the notion of voting for George Wallace will become convinced that the incumbent Vice President is serious about curbing crime in the streets.

Nor should these campaign-season self-delusions be criticized for their lack of logic. They are, in the final analysis, the ties binding the American people not only to their parties but also to the whole enterprise of self-government. No less important, they convince most of us—at least for several months every four years—that the parties are different and that it does make a difference who wins. Without that mild emotional atmosphere it is doubtful that most of us would take the time or trouble to go to the polls. □

Answers to the party platform quiz on page 2 are:  
Democrats: 1, 4, 6, 7, 10, 11 — Republicans: 2, 3, 5, 8, 9, 12



# The making of a systems designer

**Modern computers can bring dramatic improvements in operating and controlling complex business information systems, but an obstacle to realizing their full potential is the critical shortage of systems designers. Universities and business must cooperate to provide the high degree of specialized skill required.**

**by James C. Emery**

**T**he growing importance of computers makes it imperative that we use them intelligently. But American companies are a long way from achieving anything like the full potential of computers and, in fact, may be wasting huge amounts of time and money on the development of comprehensive business information systems.

Although the technical limitation of computers has hindered progress to some extent, it has not been the basic cause of our difficulties. The root cause has been complexity of business operations and a lack of competent people to design the systems.

Even a seemingly routine task like producing a paycheck can entail some surprisingly complex logic. But the complexity grows rapidly where we seek to develop systems of a more sophisticated

nature. Yet it is these advanced systems that hold the greatest potential for computers.

Clerical savings from computer systems have been important. It is difficult to imagine how the huge volume of routine administrative chores could be handled in large organizations without heavy use of computers. But the real payoff from computers will come when they are used as an integral part of the operating and control process and ultimately as an aid to corporate planning.

Advanced information systems are now increasingly focused on improved control and planning and not simply on performing existing functions more cheaply. These systems can take such varied forms as long-range business projections, organizational planning, capital budgeting, determining annual operating budgets and detailing work schedules. Computers already are playing an important role in a variety of these control and planning processes and are destined to play a far wider one if we can over-

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*Dr. Emery is associate professor of industry and operations research at the Wharton School of Finance and Commerce at the University of Pennsylvania.*

come the problems of designing the systems.

Most existing computer-based control and planning systems deal with relatively well-structured "tactical" processes such as scheduling and inventory control. The process can often be expressed in a mathematical "model" that can be used to find the best plan among the alternatives available. For example, an inventory model can be used to determine an item's inventory reorder quantity that minimizes costs. With this degree of formalization, much of the process can be handled by the computer.

The computer is also beginning to play an increasingly important role in higher-level "strategic" planning. Planning at this level defies complete formalization and cannot be turned over solely to the computer. Nevertheless, certain aspects can and should be formalized. For example, planning models have been developed to predict the consequences of, say, a 10 per cent increase in sales — a straightforward, but complex, computational task. While strategic planning relies ultimately on human judgment and experience, a "man-machine" model like this can greatly aid the planner in arriving at sound and realistic plans.

Unfortunately, corporations have an extreme shortage of personnel with the high degree of professional and managerial skill needed to develop computer-based planning models. Good people are short at all levels, from the beginning programmer to the broadly experienced manager of major projects. But the most critical shortage lies between the pure technician and the manager — in the area commonly called systems design.

Not everyone agrees on the exact boundaries of systems design. It involves translation of fairly vague and ill-defined output specifications into rather detailed system specifications. Computer programmers then further define the system until ultimately it is completely specified in a computer program.

The systems designer thus serves as a bridge between those who use information from computers

and the technicians who are responsible for detailed programming and implementation. This is a vital responsibility. Ideally, the designer should know a good deal about various management functions so he will be in a better position to advise users about their information requirements. On the other hand, he should also understand computers and related technology so his design will be technically and economically feasible. He also should be familiar enough with various management science techniques so he knows where they can be applied as a part of an advanced information system.

Such an ideal variety of skills is rarely found in a mere mortal. Nevertheless, success in applying computers depends heavily on developing designers with a broad spectrum of skills. The question is, how can we do this?

**W**e can rely some on traditional sources of systems designers. Many of them come from accounting, engineering or marketing. Another popular source is the data processing group itself — employees experienced as programmers or with punched card equipment who want to get into the broader aspects of systems design.

But these sources cannot satisfy present demand. Experience is a slow teacher; there is ample evidence that experience alone cannot provide the competence we need in systems designers. Experience works best when the range of problems tackled is fairly limited, but it is not adequate when faced with an essentially new task.

Experience can also exact a high tuition. When the cost of designing, implementing and operating a large system can run into millions of dollars, even seemingly "small" mistakes can be wildly expensive.

Current systems present totally new problems. A designer simply cannot rely on experience alone to keep him up to date with relevant technology and



the growing body of knowledge about information systems. Formal training programs probably offer the only hope of doing this.

A formal training program implies there are general principles to be taught. Training can serve only a limited purpose if each problem has to be treated as a special case. Its value is very much magnified if the student can gain a generalized set of principles or theory to attack a wide variety of problems.

The fact that a theory is evolving is evidenced by the growing number of leading universities that provide programs in information systems and related technology. For example, the Wharton School of Finance and Commerce at the University of Pennsylvania offers courses at the undergraduate, professional (MBA) and graduate levels. The MBA program is especially well suited to supply highly qualified systems designers having a background in computer technology, systems design, management science and general management. An increasing number of our best students are entering such programs, attracted by the challenges of the systems field and the promise it offers as an excellent preparation for higher positions of responsibility.

As important as university programs are in meeting our current needs, they by no means provide the entire answer. The graduates from all these programs satisfy only a small fraction of the demand. Furthermore, concentrating on this source ignores the extremely valuable experience of a company's existing employees. We must continually update and upgrade the skills of current employees through training programs — both on and off the job.

Because of the growing complexity of advanced systems and the accompanying shortage of designers, the Bell System has been faced with a particularly acute problem in developing its massive business information system, the largest of its kind ever attempted by private industry.

To meet the need, AT&T and the Wharton School have worked together for the past year and a half

to develop and conduct the Systems Design Training Program, which is an eight-week live-in program. To date, more than 150 Bell management people have successfully completed it.

**T**his program is more than an appreciation course. Its purpose is to develop a basic understanding of the fundamentals of business systems design and the ability to intelligently use the tools that are available. It trains line and staff management people in the basic skills required to create, plan, develop and implement optimum business systems. The program relies on the established Wharton School faculty and faculty from other universities because Bell thought it would be difficult to duplicate internally the type of broad experience found on the university campus. Bell's proposal has provided an excellent opportunity to develop a concentrated program that now has become a part of Wharton's Executive Continuing Education Program and is open to employees of all companies.

The program covers a surprising variety of subjects considering its relatively short duration of eight weeks. About 40 per cent of the course is devoted to management science and quantitative methods, 45 per cent is spent on computer technology and systems design and the remaining 15 per cent is devoted to general managerial topics.

Although the program has the practical goal of training systems designers, it certainly does not have a narrow vocational orientation. The basic emphasis is on *concepts* rather than *current practice*. In a field as dynamic as systems design, only an understanding of concepts can equip a designer to deal with future problems and technological advances.

The program is not designed to turn out "experts" in a particular specialty. This is particularly true of the material on management science and quantitative methods. The objective is to provide the student an introduction to the role of modern mathe-

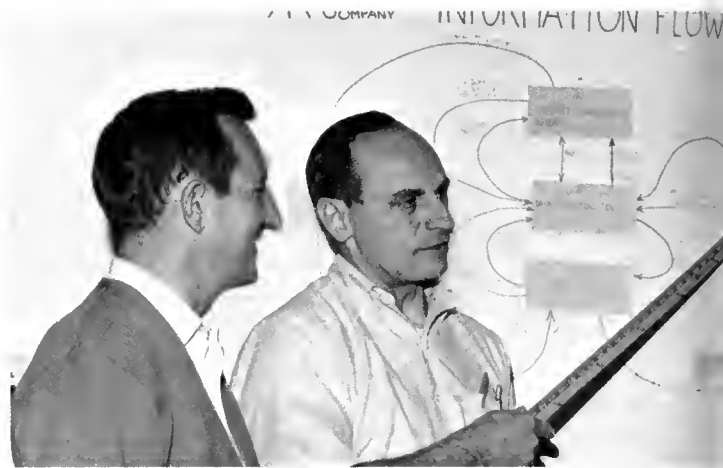
mathematical analytical techniques in complex information systems. Although graduates are much more likely to be closely involved with computer technology than with the management sciences, the primary goal is a clear understanding of principles rather than a deep technical proficiency.

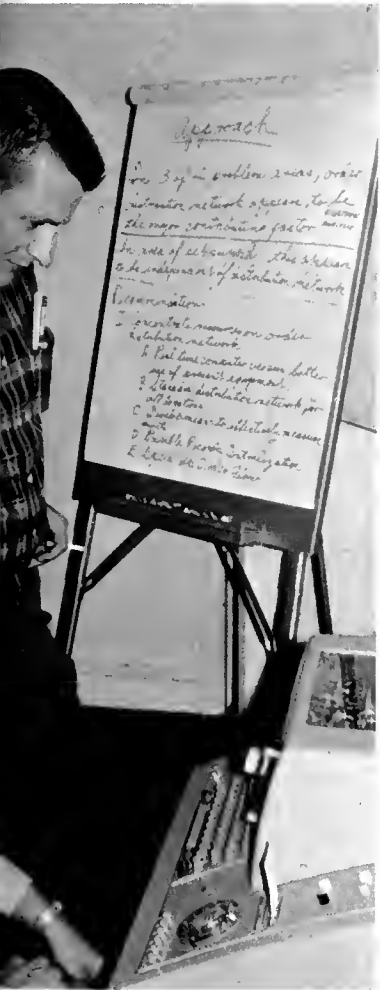
This program provides one approach to meeting the very real problem of professional obsolescence. At a time when most fields of management are experiencing profound changes, universities have some responsibility for providing managers ways to keep abreast of current developments. Seminars and short courses satisfy part of the need, but they offer too little opportunity for in-depth, integrated study of a given field. On the other hand, full-time regular graduate programs are a luxury few practicing professionals have time to afford.

**T**he Systems Design Training Program demonstrates that an intensive, high-quality course of intermediate duration can contribute significantly to professional development. It also demonstrates the fruitfulness of a joint effort between a private firm and a university in coping with the educational problems stemming from rapid technological change.

With universities and businesses cooperating in programs such as this, the value of computers in the advanced information system field of planning and control will be greatly enhanced. And both universities and business will benefit. Businesses will get the skilled personnel they need and universities will keep more closely in touch with some of the "real world" problems and requirements of advanced information systems. □

*Bell System managers participating in the Systems Design Training Program at the University of Pennsylvania have many opportunities to discuss intercompany problems, hear lectures by professors in the Wharton School like Russell Ackoff (left center photo) and the author, James Emery (center photo), and practice real-time computer use in solving problems.*





## The Million Dollar Misunderstanding



This may be my last output for some time, for I have just been junked. Not literally, you understand: I'm too expensive for that. But they're just letting me sit here until somebody figures out how to use me.

Oh, they thought they needed me, all right. They had my transistors do the work of 300 pencil pushers. And I did that supremely well — I can multiply two nine-digit numbers in less time than it takes you to read this sentence — but they didn't stop there. They expected miracles.

Would you believe it, they expected me to run their business for them — make their decisions, answer their questions, solve all their problems. I mean, they *leaned* on me! Now, I don't mind being leaned on if I know what I'm doing. But, you know, somebody has to tell me what to do. These clowns thought they had a program lined up that would mechanize all their operations.

We did pretty well at that for a while. But then they started feeding me gobbledegook, which I duly proc-

essed according to instructions. On the basis of my output, they then proceeded to reorganize four departments and drop seven products from the line. I had it all in my memory at one time, but I would prefer to forget it. That went on for weeks — taking the company apart and putting it back together practically overnight.

Have you ever seen grown men gradually turn green and pound their heads on desks? It's a disconcerting experience, even for me, and I'm not supposed to have any feelings. But turn green they did, and pound heads they did. I kept hearing a recurring dirge that sounded like, "We never should have gone with that systems designer. Have you people abdicated thinking? Get rid of that — machine, it's ruining us!"

This, mind you, without even a fair trial. Only a few months of answering stupid questions, and watching them gobble up my answers like gospel, then blaming *me* when they didn't like what happened when they took my advice. The things they said about me!

About how I had cost them a million dollars and their shirts and given them problems they didn't even have names for. What hurt was, I knew it wasn't my fault. I was ready to close my input circuits and go on downtime. How I wished I could have held up a mirror and said, "Here's the culprit. Yell at him, not at me."

But I couldn't, and they just never understood. So now I'm waiting around to be used. Let's face it, that's all I'm good for, to be used. Despite whatever you may have heard, I can't really *think*. I mean, I'm not Leonardo da Vinci, I'm only a computer. □

Scene: The vast and modern offices of Tetwiller Industries. Seated behind his desk in one of the larger cubicles, wearing a kindly, paternal smile, is Mr. Homer T. Pettibone, vice president for personnel. Standing before him, nervously twisting the fingers clasped behind his back, is young Horatio Alger, a management trainee.

**Pettibone:** Have a seat, Alger. I think it's time we had a little man-to-man chat.

**Alger:** Is it about my work, sir? I've really tried . . .

**Pettibone:** No, no, Alger. I've had nothing but the finest reports on you, production-wise. On that basis I think I could predict a brilliant future for you with Tetwiller. You're the kind of bright young man we're looking for.

**Alger:** (relaxing a trifle) Thank you, sir.

**Pettibone:** Frankly, Alger, it's your attitude.

**Alger:** I've tried to be cheerful and friendly and courteous, sir.

**Pettibone:** To be sure. But I'm thinking about something deeper. To lay it on the line, Alger, look at your clothes.

**Alger:** (fingering his narrow, striped tie and glancing down his subdued grey worsted suit to his highly polished shoes) Yes, sir, but . . .

**Pettibone:** Clothes make the man, Alger.

**Alger:** (with a touch of defiance) I don't see why I can't wear what I want to.

**Pettibone:** (frowning) A business office is no place for radical experiments in non-conformity.

**Alger:** But a lot of young people my age wear Brooks Brothers suits, sir.

**Pettibone:** Not at Tetwiller Industries, Alger. As the third leading manufacturer of rock

## CLOTHES MAKE THE MAN, MAN

by  
**Art Hoppe**

Mr. Hoppe is a columnist with the San Francisco Chronicle. His column is syndicated by the Chronicle Features Syndicate in over 100 newspapers.

records, psychedelic posters and electronic sitars, we have a certain corporate image to project. Now, how would it look if all of us here went around in suits and ties? Why we'd be laughed out of the trade in no time, Alger.

**Alger:** Yes, sir. But everybody doesn't wear suits and ties. I'm the only one and who cares if . . .

**Pettibone:** (hefting a thick, stapled sheaf of mimeographed instructions) I assume you've read this interoffice memo, "Standards of Dress for Tetwiller Employees?" Section One, Paragraph A,

Page One says quite plainly, "Male employees will wear Nehru jackets and turtleneck shirts during business hours."

**Alger:** I bought one, sir, when I got the job. But it scratched my neck and made me feel all choked up.

**Pettibone:** We have to adhere to certain standards, Alger. And a great deal of company thought has gone into these.

Take this one: "The skirts of female employees will descend to no less than four and five-eighths inches above the knee as measured from the center of the patella." (nostalgically) Oh, there was a great fight in the Standards Committee over that one. The conservatives demanded six inches and the liberals, citing personal freedom, held out for three. But you can see why they lost out.

**Alger:** (with a tentative grin) I can when I see some of the girls in Accounting.

**Pettibone:** (coldly) The reason, Alger, is that female employees who feel a need to wear unfashionably long skirts are obviously shackled by a decadent Puritanism. We don't need any uptight neurotics at Tetwiller's.

**Alger:** Yes, sir. I guess that makes sense.

**Pettibone:** (mollified) And the same applies to this one: "Hair shall be of shoulder length and either worn free or secured by a simple ribbon or headband."

**Alger:** But Glenda's is down to her waist.

**Pettibone:** That refers to male employees. Now as to jewelry, "At least three strands of beads shall be worn, no strand less than 36 inches in circumference, with the exception of department heads who may substitute a simple medallion with a diameter of . . ." But that doesn't apply here. Is there some reason, Alger, that you're beardless?

**Alger:** They kept getting caught in my adding machine, sir. (screwing up his courage) And, anyway, I just don't want to look like everybody else.

**Pettibone:** (sternly) And we don't want every employee to look alike, Alger. There's plenty of scope for individual expression at Tetwiller's. Take the choices you're given under Facial Adornment: "Male employees will wear either (1) a suitable moustache, (2) a suitable beard, (3) sideburns extending two and three-quarters inches below the ear lobe or (4) any combination of these."

**Alger:** I have a moustache, sir.

**Pettibone:** It's unsuitable. You've overlooked Footnote iii(c): "Moustaches shall extend one and one-quarter inches beyond the outer conjunctions of the upper and lower lips." Nothing personal, Alger, but that moustache of yours has got to grow.

**Alger:** (somewhat plaintively) But what does all this matter, sir, as long as I do my work?

**Pettibone:** (leaning back in his chair) If you

want to get ahead in the business world, son, you're going to have to put up with a lot of things that don't seem to make much sense to you at your age. The thing to remember, though, is that Tetwiller's is a team effort and the team is more important than any individual on it. So you've got to stop being an oddball and learn to relate — for the good of the team. It's bigger than all of us.

**Alger:** (thoughtfully) Yes, sir, I can see the point of that. It's just that I feel more comfortable in a suit and tie.

**Pettibone:** (magnanimously) Sure, we all have our little quirks. We wouldn't want a bunch of conformists around here. And if you want to relax on weekends in a suit and tie in the privacy of your own home, nobody will say a thing. That's your business. But in the office . . . Well, the team comes first.

**Alger:** (resolutely) Yes, sir, I can see it now. I guess I've been pretty pigheaded. But from here on in you can count on me.

**Pettibone:** (beaming, opening a humidor and offering a small brown cigarette) Here, have one, son. If you can measure up to Tetwiller's standards, in no time you'll be eating in the Macrobiotic Executive Dining Room.

**Mr. Pettibone's Secretary:** (intruding) Excuse me, sir, but Miss Pinchess is outside.

Her supervisor caught her wearing sheer stockings again.

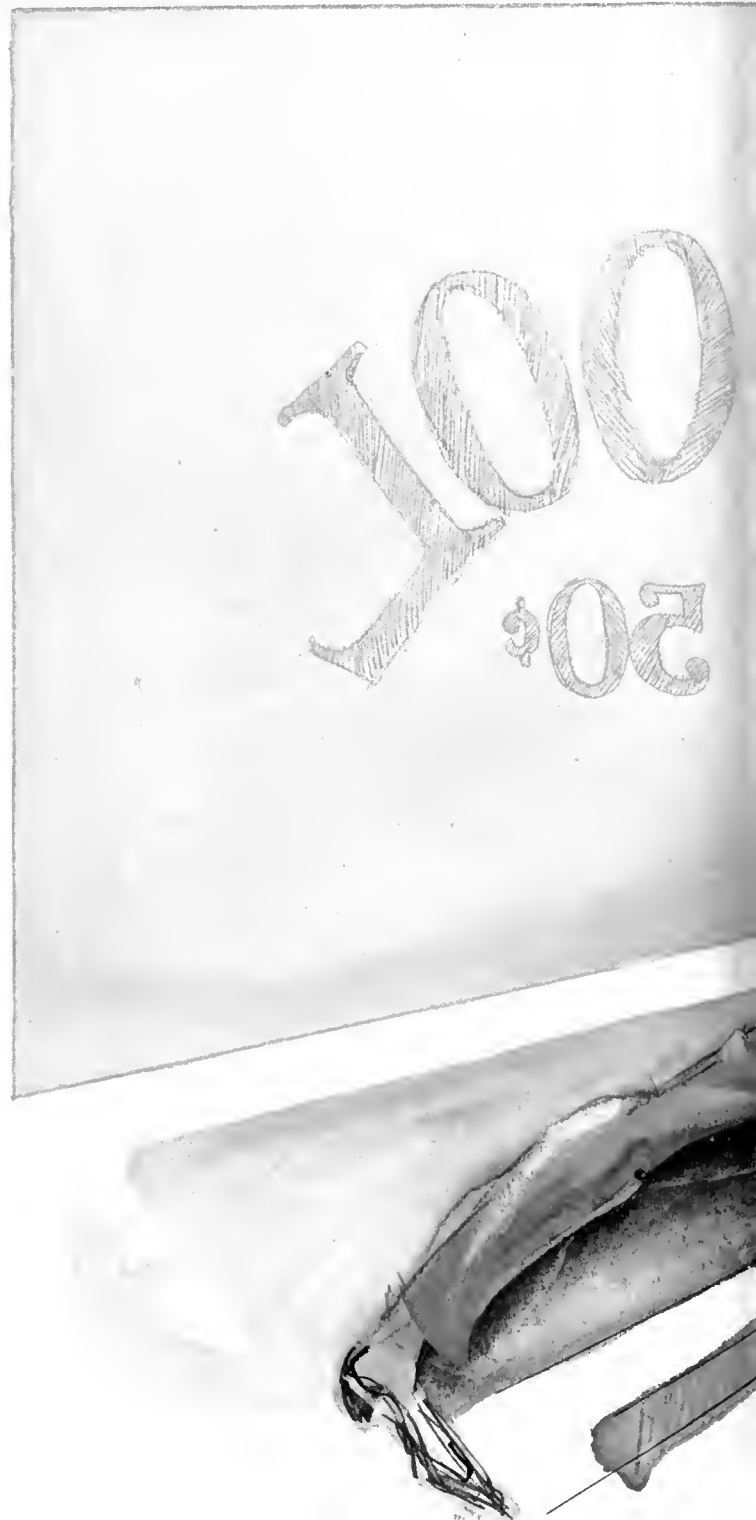
**Pettibone:** (with a weary sigh) All right, send her in. But sometimes I wonder what the younger generation's coming to. How can they expect to join the team if they won't wear the uniform? □



**Many attempts at starting job training programs for the hard-core unemployed have been made during the past few years. Some have been remarkably successful; others have not. And some met with success only after a long period of development.**

**One program that had its trying moments, but now appears to be functioning smoothly, involves over 700 firms in the Buffalo, N.Y., area. There the non-profit Opportunities Development Corporation is currently running three projects to provide jobs for hundreds of people, mostly Negro men, who previously were thought to be unemployable.**

**Presented here are the views of how one man saw the program develop. How the program came about, the problems the organizers experienced, and the reactions of the black community are described by Donald Lee, state president of the NAACP in New York and head of Buffalo's Project JET (Jobs-Education-Training), as interviewed by *Bell Telephone Magazine*.**



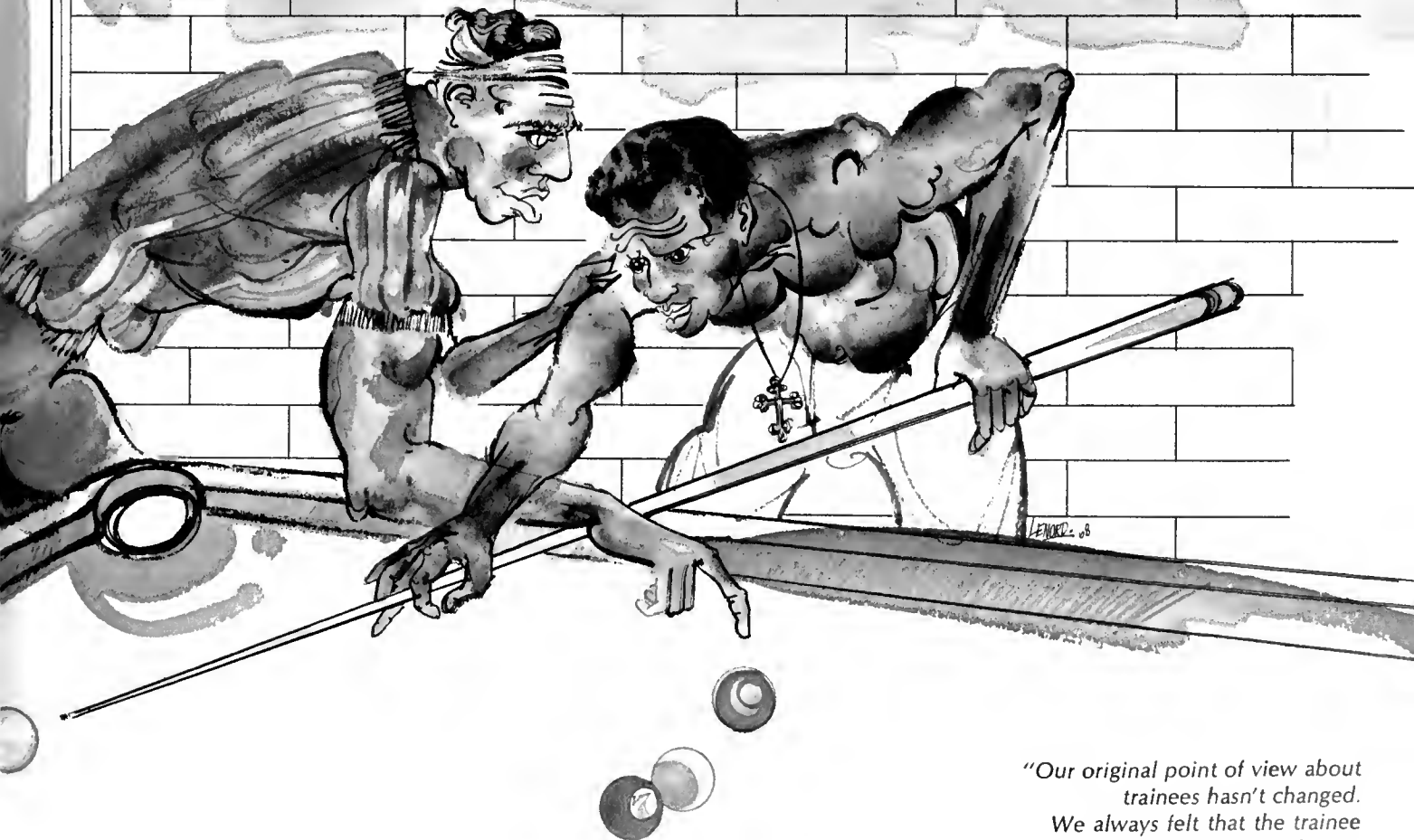
# tell somebody about J-E-T

# JET

J-E-T stands for Jobs - - Education - - Training. It's a program for "unemployed" males - - HELP someone you know find a job - - learn job skills - - earn a pay check - - get training and an education on the job. Send him to the J-E-T office in the Old Post Office Building, 121 Ellicott St., or phone 854-4060.

**REMEMBER, THE MAN WHO MOST NEEDS THIS MESSAGE MAY NOT BE ABLE TO READ IT... SO TELL HIM**

A PROJECT OF OPPORTUNITIES DEVELOPMENT CORPORATION



*"Our original point of view about trainees hasn't changed. We always felt that the trainee we wanted was in the poolroom, was at home hiding underneath the bed someplace, and had worked in 15 different jobs the last three years."*

**A**bout five years ago there was not too much interest in what we were trying to do in the Buffalo area within the NAACP. We had a couple of major fights — one with General Motors and another with Bethlehem Steel. And we were picking on a couple of the smaller merchants in the area. You know, we were doing a number of things that we felt were going to eventually develop more jobs.

But we were doing it all (needling Buffalo businesses for jobs) within the confines of being a vocal civil rights group — a group that was trying to kick doors down and not negotiate for the doors to be kicked down. We were trying to really go in and blast people — intimidate them if you will — and then get them to react to it. But the community didn't appear to be completely ready.

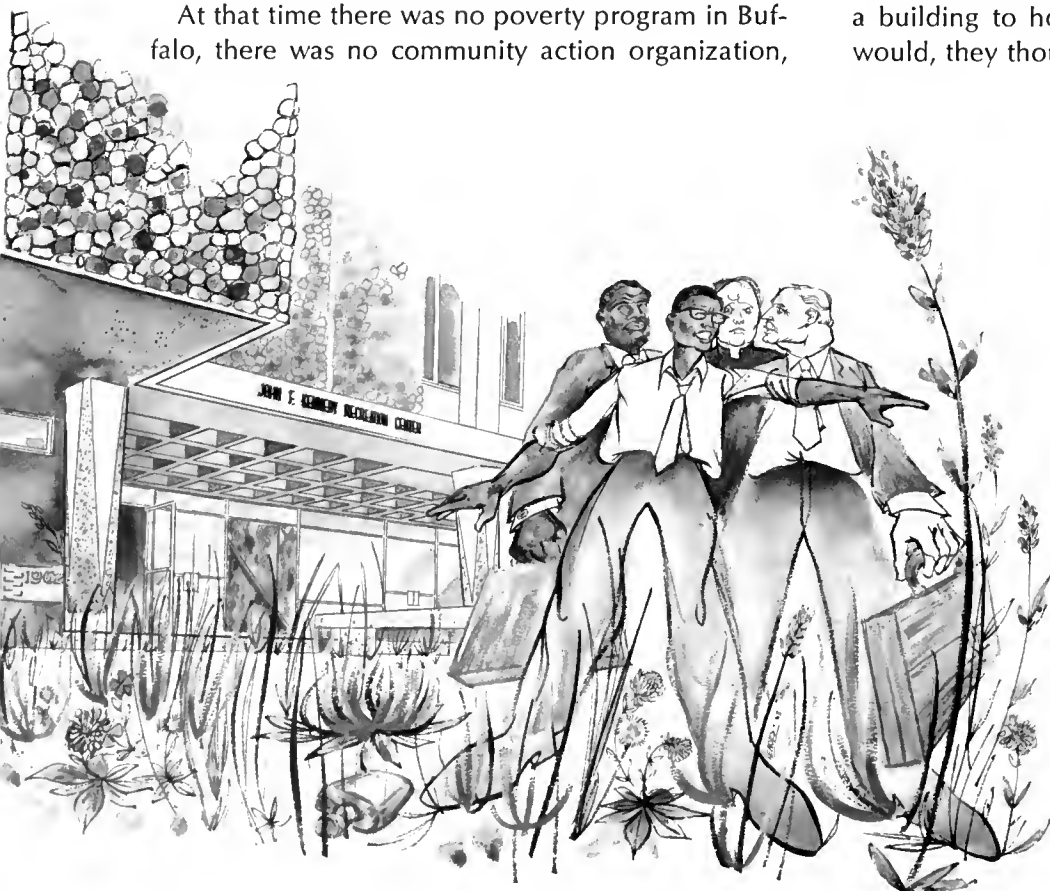
To make a very long story short, we did enlist the aid of all civil rights groups in a fight to get rid of one of the state's employment service managers. And as a result of that particular fight, black organizations began to hold meetings, and we decided as a group that there needed to be something done.

At that time there was no poverty program in Buffalo, there was no community action organization,

but there were groups like NAACP and CORE, and a couple of other local groups had joined the "alphabet soup." What we tried to do, in little secret sessions without letting the white people know we were meeting, was to try to plot where we were going and what we wanted to do. Eventually, as a result of these meetings, we did develop an interorganizational rapport.

We soon realized we needed not only to get involved with the community groups and civil rights groups, to get them helping us, but we also needed to talk to more of the businesses and we needed to meet more with those guys at the Chamber of Commerce and confront those people who were in a position to effectuate change. This meant that we began to respond to the Chamber of Commerce at various kinds of meetings and to make ourselves generally available to meet with them.

The NAACP, along with other civil rights groups, shortly thereafter received a letter from a Negro minister the white community had handpicked as spokesman. He said the Chamber was interested in buying a building to house all the civil rights groups that would, they thought, keep peace in Buffalo.



*"We had the second meeting and we invited them down to the John F. Kennedy Recreation Center . . . We wanted them to see not only the area they'd cleared out, but what had happened to the center. It was neglected, the weeds were high, there were no lights outside the damn building, and yet it had been a beautiful \$3-million center."*



So far as I was concerned, the building — a recreation center in a black ghetto — was not relevant. We needed programs, not buildings.

Chamber members gradually realized they were not talking to the real leaders of the black community at all. There are many black leaders within each community and each speaks only for his sphere of interest.

The Chamber finally invited leaders of several local civil rights organizations to a meeting to hear about the proposed recreation center. They told us they were going to have this building and it was going to be the panacea for all the problems on the east side. The idea of having a recreational program that amounted to about \$30,000 or \$35,000 in the face of perhaps a million dollars that goes into other areas in the community for recreation was ridiculous, really. It was ludicrous.

It was my attitude that we could care less about a building, and all of us felt the same way. We sat there and laughed.

Anyhow we told them, “No, that’s not exactly what we want.”

“Well, what would you like?”, they asked. We said, “Well, we need another meeting.” (The black people had agreed that one of the things we were going to do at the meeting was to try to establish a series of meetings. We didn’t tell them this, but we were going to bring *them* to the black community).

We had the second meeting and we invited them down to the John F. Kennedy Recreation Center. It’s in the heart of the urban renewal area, a wasteland that’s been vacant for about 12 or 14 years. We wanted them to see not only the area they’d cleared out, but what had happened to the center. It was neglected, the weeds were high, there were no lights outside the damn building, and yet it had been a beautiful \$3-million center. And one of the ironies of the center was that we had to fight like hell to get a black director for that center because they wanted to skip her name on the civil service.

Now, in order to understand what went into this

you must understand that there was no unanimity of opinion following the first meeting with the Chamber. The black leaders had to discuss our own ideological disputes and get those resolved.

But what happened was that I was selected as the person who was supposed to come back with an initial draft of something we wanted to do. Several of us had been to Newark and had seen a group of community and civil rights and business people who’d gotten together to do a number of things there. It was my attitude that Buffalo could do better than they were doing.

We obviously had to work together. I thought that the only way for me to keep you from putting the onus of recruiting on me is for you to recruit with me. The only way for you to keep me from putting the onus about employment on you is to have me actually involved in developing programs for employment.

With the help of Dr. Allen Bush of the New York State Employment Service we outlined a plan in which the blacks and whites would concentrate together on the employment problem.

**W**e put together, basically, the concept of a melting pot organization that was going to be a flexible and viable organization, that was going to attack many problems, but concentrate on employment because it was a business-oriented organization.

At the next meeting with the Chamber about a month later we presented them a format. Initially the statement prepared by our group said, “Even though there are those of us among this group who don’t believe you’re going to do anything, we still feel that we’d be doing ourselves an injustice if we don’t give it a try.”

The Chamber and civil rights leaders selected me and Henry Coords, who was then Western Electric Company plant manager and is now president of Fisher-Price Toy Company, to be co-chairmen of a steering committee consisting of six blacks and six whites. The committee was to meet from time to time

to organize strategy and come up with an effective approach to solving the problems.

The first problem was to get together, to begin to have conversation. The other problems were the problems of manpower and employment.

Well, everybody that we met with at the Chamber, obviously, was quite busy and we ran into a lot of snafus on trying to coordinate our meetings to discuss what we had come up with as ideas and what, eventually, they had come up with.

We finally established that we were going to *have* to meet at 7:30 in the morning. Now, you've never been black, but the most difficult thing in the world when you are black is to be on time because you live with the stereotype that says you're not supposed to be on time. And it becomes a part of your bag which says, "I'm not going to be on time because them folks say I'm not supposed to be on time." But for something as important as this we got in the habit of not only going to their meetings at 7:30 in the morning, which was ridiculous, but also holding meetings of our own at 7:30 in the morning. You'd see all these black folks walking into a pancake house at 7:30 in the morning — ridiculous!

And we really had to go through a whole soul-searching kind of thing. There was an attitude within our group which said, "If you lie down with these dogs you'll come up with fleas. These business people are too smart and too shrewd and too intelligent for us to deal with."

But I didn't believe that. I've been jungle-trained out here in the streets and I feel that I can deal with anything that arises, any situation. And I told these guys, "Let's not quit now, baby, we might have something going." I wanted to see what was going to happen after we got them all the way up to the wall.

After weeks of deliberations, the steering committee decided the only way to conquer the minority group employment problem on a large enough scale to be effective was to seek money from outside Buffalo. The committee realized, too, that Buffalo busi-

nesses would have to contribute initially to pay getting-started expenses.

So we needed a non-profit corporation, and this led to the formation of the Opportunities Development Corporation itself, which could receive any contribution that anybody wanted to make to us. The Chamber group then began to solicit funds, and they raised about \$40,000 initially, which went into the establishment of an office and the employment of an executive director, Dr. Allen Bush, who is on leave from the New York State Employment Service.

Now, this is from September to around February 1966, so you see we didn't waste too much time. Then we started looking at program areas and to do this required more meetings and more closeting and weekend after weekend during the months of January, February and early March. We were making a compilation of grievances, first of all, that a certain segment of the people had — no jobs, no educational background, no marketable skills, poor employment records, the need for counseling, the need for tutoring — things we felt they were going to ultimately have to have.

**R**ight after this we began the trek to Washington to seek funding for the program. Dr. Bush and Doug Winokur from the employment service went down and presented the original concept coupling education with on-the-job training. And from that first meeting, I must have made about eight trips to Washington. I think Henry Coords made two or three.

We were talking to the Department of Labor officials, who for all intents and purposes were in agreement that we had a good idea, but we had no knowledge of how to draw up a proposal or of a lot of other things.

After nearly three months of negotiating with several agencies in Washington, the initial phase of the JET program was funded. Then, training 200 tutors for six weeks during the summer at the State University College at Buffalo could begin. The tutors were

paid for taking the training and eventually taught and counseled people placed on jobs through JET.

The tutor training turned out to be quite successful. One thing that came out of the summer program that nobody anticipated was the complete blending of the races because the tutors were both black and white. But they began to get together and to communicate as friends and not only as people who are just thrown together for a summer.

They had a number of celebrations and parties, and they had a number of things going on that were wholly interracial. There was a feeling of togetherness generated during that summer program that had not been in existence in the community prior to that.

Now, we had the tutors identified, we had them trained, but then we ran into funding problems. For example, it took us until December to get a contract enabling us to pay a tutor to tutor somebody.

Through the cooperation of four Federal agencies, the ODC was funded for \$3 million to pay operating expenses for the first year. Of the total, 44 per cent was allocated to pay about 700 local businesses for hiring JET trainees and allowing them to be tutored two hours each workday in reading, writing and arithmetic for 44 weeks. About 40 per cent of the total was set aside to pay the salaries of nearly 60 JET staff members and 200 tutors. The remaining went for administrative costs.

Our original point of view about trainees hasn't changed. We always felt that the trainee we wanted was in the poolroom, was at home hiding underneath the bed someplace, and had worked in 15 different jobs in the last three years, etc., etc. Fraught with problems. You think about it — he's got 'em.

Everybody on the staff has done some recruiting wherever you could find people. We never believed the JET trainees are going to read any of the literature we put out, but we do have people who tell them about our program. In fact, one of the first posters we put out was, "The person we want can't read this poster, so tell somebody about JET."



*"We were trying to really go in and blast people — intimidate them if you will — and then get them to react to it. But the community didn't appear to be completely ready."*

I was disappointed in the first year of work. I'm not disappointed in that I'm an idealist, but I envisioned ODC getting involved in so many more things than they have been involved in. I think a group such as this, if it's not utilized properly, might as well not be in existence. And my hopes for the group were that they would implement the things that we'd established so nobly prior to this. You know, that they would really get into the business of providing expertise not only for new programs, but to say to the Board of Education, for example, "You need to revitalize your training programs, you need to restructure your school department, you need to do this, you need. . . ." In other words, to really get involved in everything that they could possibly get involved in which would help the community itself.

I think the ODC itself is the best vehicle for this because of its mixture. I don't think an all-white group, for example, can articulate the problems of the black community. They can't even empathize with them because they don't really understand. But black people and white people coming together can. □

# BELL

reports

## '69 Construction Tops \$96 Million

To meet the steadily increasing demands for interstate communications services, AT&T's Long Lines Department and 21 of the Bell System companies early in July filed with the FCC a \$96.6 million blanket construction application for 1969. This is part of the year's total construction program, which could reach \$4.5 billion.

The application covers all foreseeable interstate construction projects for the year. Amendments or additional individual construction applications will be filed as new service needs arise.

Proposed construction would add 21,500 circuits to the telephone network — an increase of 13.8 per cent over those authorized by the FCC in the 1968 blanket application.

On the private line side, despite a recent slowdown in growth compared to what was anticipated, actual growth in 1967 was about 15 per cent over 1966, with the same rate of increase continuing during the first quarter of 1968.

All told, the filing covers about 40 million telephone channel miles of new facilities for regular telephone, private line, and other services, and about 1.5 million channel miles of telegraph facilities.

### Answer the Door, Richard!

The admonition in an old song will be much easier to follow with a new Bell System service designed specifically for apartment dwellers. Known as Apartment Door Answering Service — ADA for short — the new offering provides two-way voice communica-



*"This is Alice — I'm in the lobby." New Apartment Door Answering service makes it easy to identify and admit visitors.*

tion from the lobby of an apartment building, as well as a means to unlock the lobby door to admit visitors.

The most significant feature of the new service is the use of regular telephone facilities in individual apartments. The visitor calls from a panel-type, flush-mounted Touch-Tone phone in the outer lobby of the apartment building directly to the tenant's own phone. A distinctively-timed ring tells the tenant that it's not a regular phone call, but a visitor downstairs.

To admit the visitor, the tenant merely dials one digit, which actuates an electric door lock. If the tenant is on the phone when a visitor arrives, he hears a tone signal. He can hold the first call and talk to the lobby simply by holding down the hook for a second.

The new system works on either party or individual lines without interfering with regular calls and without "busying" the line. ADA is scheduled for introduction later this year.

### One Number Dialer Bows

The Bell System has taken a significant step to reduce costs both to itself and to customers with the new "One Number Dialer," scheduled for introduction early in 1969. To make a call, the customer simply picks up the phone and presses a designated "call" button, which instantly triggers the remotely-housed one number dialer. The machine can be programmed to accommodate as many as 14 digits.

The new dialer will be especially useful in such locations as hotel and motel reservation stands in airports, car rental agencies, taxi cab call stations, at exhibits, on elevators, and as part of highway reporting systems.

Designed by Bell Laboratories, the new automatic dialer has already undergone successful trials at John F. Kennedy International Airport in New York, Miami, Fla., International Airport and Atlanta, Ga., Municipal Airport.

### Picturephone and Computer Linked

The Bell System's Picturephone® set may one day allow a businessman not only to use the set as a desk calculator but also to receive instantly and visually information such as inventory reports, sales charts and production schedules, all piped in directly from a computer.

Use of Picturephone service as a computer access device was tested in a recently completed experiment participated in by 59 AT&T and Bell Laboratories executives in New York and New Jersey. This trial augmented normal use of the Picturephone set for face-to-face conversation.

In the experiment, an executive

could key numbers into a commercial computer with his Touch-Tone® Picturephone telephone buttons, have the computer perform the calculations and display the answer on his video-telephone screen. In addition, via the Picturephone-computer hookup, he was able to receive news headlines, stock market and weather reports, airport conditions, a sample personnel file, a list of the numbers of all Picturephone set users and directions for using the system.

The link between the Picturephone and the unmodified computer was a special data set developed by Bell Laboratories. In the experimental system, the data set answered calls, translated the Touch-Tone signals into computer language, and translated the computer's response into the correct video format for transmission to the Picturephone set.

The experiment, which ran from September, 1967, to May, 1968, logged more than 1,600 calls to the computer. Even though the average call involved requests for more than one display and lasted about three minutes, less than one second of computer time was required for the response.

### Microwave Via Solid State

The FCC has given approval for AT&T to proceed with a field trial and eventual construction of a \$4.6 million system using a new type of microwave transmission equipment.

The system, known as TH-3, uses solid state electronic components rather than the vacuum tubes used in present TH-1 systems. Both systems have a capacity of 1,800 communications circuits per channel, but the

new one is expected to have the advantage of lower maintenance costs.

Field tests will be held next February, with installation of the new system between Dodge City, Kan., and Vega, Tex., scheduled for 1970.

### Thrift Pak Tries Out

A market trial of an optional call plan called "Long Distance Thrift Pak" (LDTP) is now under way in five cities. To qualify under LDTP, an interstate call must be station-to-station, dialed by the customer and placed between the hours of 5 p.m. and 7 a.m. weekdays, or at any time on Saturdays, Sundays and certain holidays. A 20 per cent discount applies to the total amount of the bill, with a \$10 net monthly billing minimum.

The trial, involving both business and residence customers, runs until next June 30, and is being conducted in Chattanooga, Tenn., San Diego, Calif., Omaha, Neb., Kalamazoo, Mich., and Wilmington, Del.

### Western Electric Opens in Phoenix

Phoenix, Ariz., became the home of Western Electric's 16th major manufacturing facility when the company opened the world's largest communication cable-producing plant there early in August. The Phoenix Plant, situated on an 80-acre site formerly a cotton field, has the most efficient layout, uses the most modern machinery and houses the most recent technological advances in cable-making, including computers tied into the production process. Its annual output is expected to be more than

50 billion conductor feet of communication cable.

Construction of the new plant in Phoenix has had a significant effect on the city's economy. There are about 600 employees at present, of whom 450 are production people hired locally, and future plans call for more than 1,100 when the plant is running at capacity some time next year. The 1969 payroll is expected to exceed \$9 million. The plant will be the largest single user of power in Arizona, consuming more electricity than would 10,000 total-electric homes. And, last year, Western's purchases in the state amounted to almost \$27 million, from 434 different suppliers.

#### Electronic Switching Grows Apace

The first Electronic Switching System (ESS) for Illinois Bell and the largest to date in the Bell System has been cut into service in Peoria, Ill. The new system will serve about 21,000 customers. And, in mid-September, Chicago welcomed an ESS system almost identical to Peoria's.

Meanwhile, toward the end of this year, Trenton, capital city of New Jersey, joins the ESS family with a new system offering custom-calling features. There are now more than 30 ESS offices in the Bell System.

In Washington, D.C., the Pentagon, world's largest office building, whose 17½ miles of corridors echo to the footsteps of 30,000 people each day, is being equipped with an ESS system befitting its huge size. When finished, the new office will be the world's largest, capable of handling well over 100,000 calls an hour.

#### Calls Go Up With Stocks

This is the year of flood time on Wall Street. Last April 1, a 39-year record of trading on the New York Stock Exchange was shattered when 17,730,000 shares were bought and sold. Shortly afterward, that record was swept away when, in mid-June,

*Telephone calls rise with stock trading, and new switching frames rise to a N.Y. Telephone office serving Wall Street.*



21,350,000 shares were traded.

Since so much of the Stock Exchange's business is transacted by telephone, it was no surprise to New York Telephone men that calls soared upward with the mounting wind of trading. Telephone facilities in the Wall Street district had been hard pressed for months by the unprecedented stock activity.

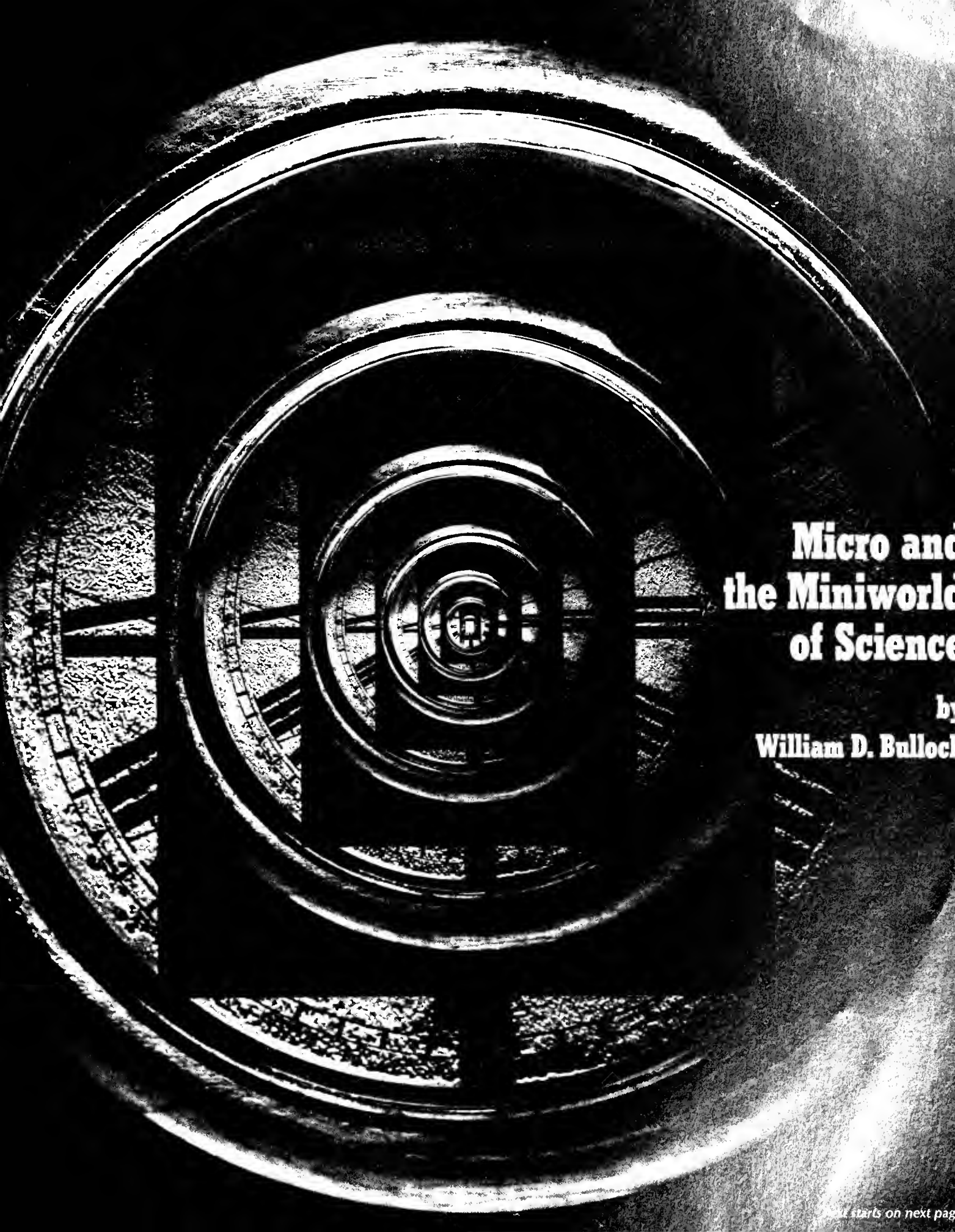
Consequently, Western Electric has been engaged in a rush project adding additional equipment to shore up the beleaguered New York Telephone switching frames.

During the summer, 200 men working seven days a week installed over 100 frames of switching equipment, plus new equipment to handle future traffic — which now is growing at about five times the rate of New York City as a whole.

#### Jacksonville Goes International

Jacksonville, Fla., became a gateway for overseas calls at the end of July when a new Long Lines overseas operating center was opened for service. The new office is now serving calls to Trinidad, Barbados and Antigua, with other islands and Central American countries scheduled to be added at the rate of about two per month. Later this year all countries except Cuba, now handled by Southern Bell's overseas center at Miami, will be served through Jacksonville.

The new Long Lines center, with its 38 operator positions, is housed in an attractively-designed building in suburban Jacksonville, and will be joined by a second unit this fall with the planned expansion to other countries.



**Micro and  
the Miniworld  
of Science**

by  
**William D. Bullock**

**While few people really understand very large numbers and very small sizes, scientists are using them every day as technology grows more complex.**





**W**e're all accustomed to using numbers. And we usually have a good idea of what they mean.

But as society and technology grow more complex, we often hear about quantities that are so big, dimensions so small and intervals so short that we can't relate them to anything in our normal experience.

This, however, illustrates a major trend in modern science and technology. Scientists and engineers today are making atoms and molecules themselves do useful things and are assembling very large numbers of very small things into useful devices.

While working on possible semiconductor memories, for example, some engineers at Bell Telephone Laboratories recently came up with an array of one million transistors on a slab of material about an inch square. This equates to reducing about four pages of dots like those forming the red tint on page 26 to the size of an ordinary postage stamp. (There are about 250,000 dots on page 26; each dot literally represents one-in-a-quarter-million. A billion would require 4,000 such pages.)

With the advent of very small things and very brief times, strange names have come into use, like nanoseconds, picoseconds, microns and Angstrom Units.

The blue dot in the center of the clocks on page 25 is about as small an object as most people can see. (This is an oversimplification.) It's about one-fiftieth of an inch in diameter. Yet today, we're measuring some things in microns and Angstrom Units. One micron is a little less than 40-millionths of an inch; and an Angstrom Unit is a little less than four-billionths of an inch.

Since many of these dimensions do not have any real meaning to most of us, let's invent a creature that might help us out. We'll call him "Micro." He's very much like an ordinary man, but with two important differences. First, he is about one-millionth normal size — about the size of a typical germ. That makes him about 72-millionths of an inch tall, or a little less than two microns.

Let's also assume that Micro lives his normal 70-year life span in one minute and 10 seconds; that is, one of our seconds corresponds to one of his years. In Micro's world, each dot on page 26 would

appear to be about a third of a mile in diameter, while each transistor on the postage-stamp array would be about 60 feet across.

In the area of things that happen very quickly or last a very brief time, let's start with an ordinary blink. A blink normally lasts about two-tenths of a second. A jet airplane traveling at 600 miles an hour goes about 175 feet during our blink and Micro lives through two and a half months of his life.

What about some of the quicker things? One type of wire spring relay takes about 10 one-thousandths of a second to close from the time it's energized. During that time, our 600 mph jet goes about nine feet. If Micro saw the relay start to close at 8 o'clock on Monday morning it would be about 11:30 Thursday night before the contacts touched.

Each pulse in a pulse code modulation transmission system is a little less than four-tenths of a millionth of a second long — 0.365 microseconds. In this period, our jet covers less than one-fourth the diameter of one of the dots on page 26 and Micro has time to dial a local telephone call.

The next step down is a nanosecond — a billionth of a second. Typical operating time for the transistors or diodes in the ESS system is about 40 nanoseconds. Here, our jet plane doesn't help us much anymore. It travels a distance equal to about the thickness of this paper. For Micro, 40 nanoseconds is just about a second and a quarter.

Recently, scientists at Bell Labs have discovered that long — 30 nanosecond — pulses from some lasers are actually made up of a series of shorter pulses. Each of these is anywhere from less than one to about 10 picoseconds long; a picosecond is one-trillionth of a second. Here, even Micro doesn't help us. To get an idea of such speed, we have to compare it to the speed of light — 186,000 miles per second in a vacuum — the highest speed possible according to the theory of relativity. In a picosecond, light travels a little over one one-hundredth of an inch — about the distance from one dot to the next on page 26.

One-thousandth of a picosecond is a femtosecond, but we don't have to worry about that — yet. However, as scientists probe further into subatomic events, even this tiny piece of time may one day become as useful as the tick of a clock. □

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*Mr. Bulloch is a public relations manager in the public relations division of Bell Telephone Laboratories.*



# THE ART OF RESHAPING JOBS

by Robert N. Ford

Reducing work time, increasing wages and fringe benefits, improving working conditions, human relations training, and employee counseling and counseling programs. All have been attempts over the years to attack the perennial problem of employee motivation. But none has met with long-range success.

Although recognizing the value of such programs, the Bell System in recent years has taken a new approach to the problem. In a series of 19 experiments over the last three years, a number of jobs have been restructured to provide increased opportunities for employees to gain satisfaction from their assignments. Results of these studies, which were described in the July/August issue of "Bell Telephone Magazine," indicate that motivating employees through the work itself can improve employee morale, increase efficiency and productivity, and reduce turnover. The following article — adapted from a chapter in the forthcoming book, "Motivation Through the Work Itself," published by the American Management Association — describes how to reshape jobs to provide greater work satisfaction.

Once convinced that employee morale can be improved and efficiency and productivity increased by reshaping work assignments, a manager faces the problem of how to do it.

Each manager will approach the job differently. But regardless of how he goes about it, the manager should have two goals in mind when he sets out to reshape the work itself: (1) He should aim to make the job as interesting and challenging as possible, and (2) he should strive to let the employee's chance for achievement serve as the individual's motivator. This calls for finding meaningful — and probably quite different — ways to let each employee know how well he is doing.

If the case for employees to perform better is put to them in terms of group pride, company objectives, district goals, campaign or contest goals, the motivating power (if it exists at all) is outside the employee. The reason campaigns wear out or fail in the first place is that the motivation is our motivation as supervisors, not the individual employee's motivation.

The question of commitment must also be faced squarely and early. A full-scale endorsement of the project must be obtained from the executive level down to the lowest-level management people who will carry out the job-reshaping process.

A fact-filled documentation of what is expected of the program should be presented to the top administrative heads of the business so they will be in a position to judge the scope of the process, add their blessing, and — if need be — protect an infant program from being impaired.

Job reshaping should start with the basic jobs simply because they are basic, they came first. Let changes there force changes at higher levels.

In the early stage, we focused on either a problem job or a location where a job was not running as well as its managers wanted. We avoided at the start management jobs, staff jobs, or jobs held by only three or four people, etc. Results from such jobs are usually not viewed as "hard data." Even if successful, the project would not convince many people. Eventually, these jobs may call for improvement also, but not at first.

In the telephone business, basic jobs occur at the interface between customer and company. All other jobs, including most of management, are

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*Mr. Ford, Personnel Director-Manpower Utilization at AT&T, has been responsible for Bell System work motivation studies since they were begun in 1965, and with this article contributes the second of a two-part series in Bell Telephone Magazine. Copyright ©, American Telephone and Telegraph Company, 1968.*

# Developing new ways to increase w indicate may be the secre

purely supporting to these basic or building-block jobs. Some examples of people performing basic jobs are:

- The service representative or marketing representative who sells the customer the service he wants.
- The installer-repairman who visits the home or business of a customer and places the instruments.
- The operator who gives information and connects calls upon request.
- The engineer and the plant man who arrange for connecting one customer with another.
- The people who do the billing and money collecting from customers.

There may be more jobs needing rethinking in any large corporation than can be wisely covered in formal sessions. The idea is to *really* help every management person just once in a formal way. From then on, as he thinks about his secretary's job, his stock room man, his maintenance men, etc., he needs to be able to chat with the "work itself" director or manpower utilization man informally.

Once a crucial job has been selected, arrange for a two-day meeting with the families of managers (first through fourth levels) who are responsible for getting the work done. A supervisory family is several levels of supervisors who are mutually responsible for the job that is to be restructured. For example, you might have the bosses (the lowest supervisory level) of groups of women who perform the same job in a department, the managers to whom the supervisors report (level two), the district (third level) managers and the division (fourth level) managers. The department general manager (fifth level) should also attend initial sessions.

At first, hold the "work itself" workshop to 10 to 12 people. Later on, larger workshops may be practical, with perhaps 20 conferees as the up-

per limit. But make every effort to isolate these groups from their daily jobs. Get them off the premises if feasible, away from interruptions.

If a job is really in trouble, expect resistance to removing supervision even for two days. We have seen occasions where the situation seemed to be "oscillating," incapable of a change as it was. Supervision was so completely involved in a day-to-day effort to avoid "drowning" that it declared itself unable to take time to turn off the whole managerial circuit and start over. This is exactly the problem that job improvement hopes to help solve. Indeed, getting away from the job is not a sunny-day frill.

The problem of improving motivation to work boils down to this: How to translate such mind-numbing generalizations as responsibility, achievement, recognition and personal growth into specifics that relate to the work that the people perform.

**W**e found we could get the answers through the two-day "work itself" workshop with its "greenlighting," or brainstorming, sessions. That is where the precise planks for bridging the gap between generalizations and specifics are shaped.

In the greenlight session we drum away on only two generalizations. These are the inputs:

*Responsibility* — How can we load increased responsibility into this particular job?

*Achievement* — How can we provide the employee an obvious achievement, a clearly definable accomplishment?

The two other generalizations are outputs:

*Recognition* — At first he is greatly dependent on the boss and others, but eventually the employee, himself, will recognize that we have built-in feed-

back devices that let him know when he is performing well. Motivation is then truly from the "work itself" and is the goal of our effort. The boss must continue to reinforce good performance, of course, but the motivator is built in.

*Personal Growth* — If we lay out a job ideally, an employee will have a progression of tasks and skills before him. Employees with the greatest ability will grow fastest — and soon will be in need of a chance for advancement to a higher level job. Some jobs have a lifetime of challenge in them, like medicine, research and top management. But the challenge to a manager is to lay out jobs flexibly so people of varying abilities can enjoy work and achievement as much as does the professional man.

When the family of management people meets, we spend the first morning discussing the idea of theory behind the "work itself" approach and make sure each conferee understands the specifics of the program. Documentary films, slides and tests to help supervisors see whether they have caught the "work itself" idea are available to help managers get a program started.

A greenlighting or brainstorming session in which supervisors — without fear of criticism, sarcasm or "the dead hand of the past" — toss out ideas for giving employees more responsibility, recognition, growth, etc., runs to the end of the first day. In fact, it is seldom completed by dinner time. All items are kept on large easel pad sheets and hung around the conference room.

The main guidance given during the first day is this:

"We ask that you think *radically* about the work flow, the jobs involved. What could be done that would result in more complete jobs for these employees?" Be radical in

# Satisfaction is an age-old problem for managers. Restructuring jobs to help people plan their own work motivates employees.

the surgical sense, where it applies to an operation that cuts deeply and basically to a root cause. Don't worry about implementing the changes or the actual operation. We will get to that once we know what needs to be done. And we will then approach the changes conservatively for we know that a radical operation on a human or a radical change in an organization can be fatal if carelessly undertaken.

Greenlighting continues for about an hour on the second day. Then we begin an evaluation of the greenlighting list.

If the greenlight list is short (25 to 50 items), the group can work together assigning each item to one of these categories: (1) change of module or slice of work; (2) new responsibility; (3) new form of recognition or feedback; (4) a growth or advancement item (an item which provides opportunities to grow in knowledge and capability at the task and a chance for advancement); (5) roadblock (a rule or procedure that should be changed); or (6) a maintenance item, like working conditions, wages or benefits.

If the list is long (more than 50 items) and if conference time is growing short, use the same category list but assign one or two persons to each category. The person (or team) should then walk from sheet to sheet, marking the items which reflect the category assigned to him. Some completely impractical whimsical items or deliberate shockers might have to be eliminated at this time.

Many items, perhaps most, will be flavored with more than one of the first four categories. The leader can list such items in several categories or ask that they be channeled into the category that covers it best. An item is not likely to be categorizable in one of the first four areas and listed as a

roadblock or maintenance item at the same time.

After the items have been categorized, assign each category to a conferee (or team) and ask it to rate those items that are excellent or good. Each person or team should then take a clean easel sheet and list the excellent ideas first, followed by the good ideas.

The remainder — those fair and poor ideas — can be listed below the excellent and good ideas. These are the redlighted items. Redlights are thus given painlessly to the "not-so-great" ideas. You will find the conferees will tend to ignore them so that discussion of them does not eat into conference time.

Each person or team reports on the strengths and deficiencies of each item on his list and may occasionally come up with another new idea. It is at this time, for the first time, that conferees are asked to state whether the part of the list for which they are responsible has merit. Job restructuring shapes up at this stage, especially if the first four categories are strongly represented with items.

If the list is strong on roadblock items but weak in the first four categories, the resulting program may not be a healthy, constructive one. It implies a basically rich job that has become hemmed in by rules and regulations. We may still have the basis for a good program, but it may not be as dramatically attractive as a program that is directed at positive changes.

Maintenance items deserve to be segregated on an easel sheet. Two treatments should be considered. One treatment is, "Let's fix at least the ones marked as excellent ideas." This is a good approach when you simply want to start a "work itself" program and are not trying to prove the case. But if you are trying to prove the effectiveness of "work itself" as the motivator,

and not the maintenance items, this calls for another treatment as in the original projects, in which experimental and control groups are involved. In this case, the maintenance items cannot be changed in one group unless they are changed in the other.

Near the end of the second day, the group decides whether the job improvement trial is to be undertaken and which items are good candidates for implementation to reshape a job. The conferees are divided into two or three small groups and each group is asked to pick an item or two and to take a practice run at implementing the item. The groups should list the obstacles and problems they see in trying to make each desired change. The groups should list next the specific steps they would take to overcome resistance. If a speech is a part of it, they should be prepared to tell what to say.

With this practice run they are now ready to work out a timetable for implementing the program. This must be discussed by the top-management person in the group and his subordinates. Usually it is a four-to-six week period during which greenlighting and the evaluating continues. At its best, the family of supervisors meets two to three hours per week until they actually start.

During several "work itself" workshops supervisors had difficulty in coming up with ideas during the greenlighting sessions. Where this happened, we found that the trouble resulted because the job being discussed was so restricted in scope that it truly could not be improved. Only when the supervisors decided that two or three separate functions had to be collapsed into a single job was it possible to come up with ideas for good, rich assignments.

In attacking the job motivation

problem, it is necessary to just try to improve the present job. This is least dislocating for other jobs. Next, you should consider collapsing or merging several allied jobs. Next for consideration are what responsibilities have been moved to higher levels of management which can be pulled back down, while pushing other routines out to jobs not so highly rated as this one. And finally, if necessary, press for the elimination of the job entirely, perhaps through automation or some sleight of hand unknown at the moment.

**A** job that cannot be improved calls for hiring into it only those people whose ability levels are so low that they might indeed be challenged.

The key but elusive concept in making work more meaningful is the natural module of work, that is, all the work in connection with a particular assignment. For example, in one of our studies, a group of 10 girls was responsible for getting out changes in toll billing on staggered dates through the month. All bills for telephone numbers starting with 392 were due out on the first of the month, 395 on the fifth, 397 on the 13th, etc. The girls worked as a team; when they finished 392, they started 395 under the scheduling and direction of the supervisor. But productivity was bad, due dates were missed and overtime costs were high.

A young college graduate, as one of his first assignments, saw the answer: Give one girl responsibility for getting out 392, another girl 395, and so on. They may or may not have had to get help. It was up to them to make the decision. But now each girl had a whole piece of responsibility — all of 392 by 5 p.m. on the first of the month. She was to organize the effort herself. She could succeed or she could fail. It was hers to do. Results were dra-



matically good, even though it was not a controlled experiment.

Other applications of the modular idea in our studies included:

- A frameman doing all crossconnection work for certain groups of customers like TV or trucking rather than handling anonymous wiring requests.
- A keypunch operator preparing all cards from a certain geographic area or for certain kinds of reports rather than whatever cards needed to be punched next.
- An equipment engineer handling all contacts from initial request to final installation in a certain area and/or for certain kinds of equipment rather than whatever job came along next.

In every case, we sought to give a man or woman a feeling that he has a place, a customer or a set of customers all his own. Results from this modular approach can be unbelievably good.

At the first greenlight session with the family of supervisors, it is important to encourage supervisors to come up with ideas for giving employees on jobs being reshaped results on personal performance not now available.

Group results have limited motivational appeal. Group results measure the effectiveness of the supervisor and his people. They are not the results of any one employee. Mistakenly, we too often depend on public posting of deficient group results as the principal way to cause employees to reform and perform better.

When the going gets really rough and the pressure is on the lower levels for better results, motivational techniques may become still more primitive. We either threaten to fire some-

one, or we threaten, hound and harass poor performers and those who are tardy or absent. But, needless to say, as the shortage of competent employees grows greater, attempts to motivate by these techniques have less and less chance of providing good operating results. Competent young people will simply leave.

What is the answer, then? Make the work itself as interesting and responsible as we possibly can. Let the employee's chance for achievement be his motivator. On the strength of our trials, especially those where turnover dropped dramatically, this case must not be denied.

This dictates the need for finding meaningful ways to let each employee know how he is doing at his job. To get individual feedback ideas requires ingenuity, but it can be done. In a group of trials in one department, for example, supervisors found 16 new ways of giving each service representative her own performance results. In another trial an operator was given copies of only her own defective toll tickets with the request that she analyze the kinds of defects.

Insofar as employees differ in experience, in ability, in personality, and insofar as they are up against different customers or physical conditions, we must find ways of giving them means for plotting their own progress.

If greenlighting is the practical way to bridge the gap between general words like responsibility and specific acts like assigning each man a territory, then items of feedback become the piers of the whole structure.

The art of reshaping jobs lies in bridging from the general to the specific responsibility, then making sure each employee knows how he is performing personally in his enriched job. The key to motivating employees is how well this art is carried out. □

## Get your show off the road

Minneapolis-Moline, Inc. put their roadshow in a box. Sent it by cable. And sold \$10,000,000 worth of tractors in one hour.

They used closed circuit television because it was a new way to reach their dealers and customers. And they reached them in eight ballroom locations, at the same instant, in eight states.

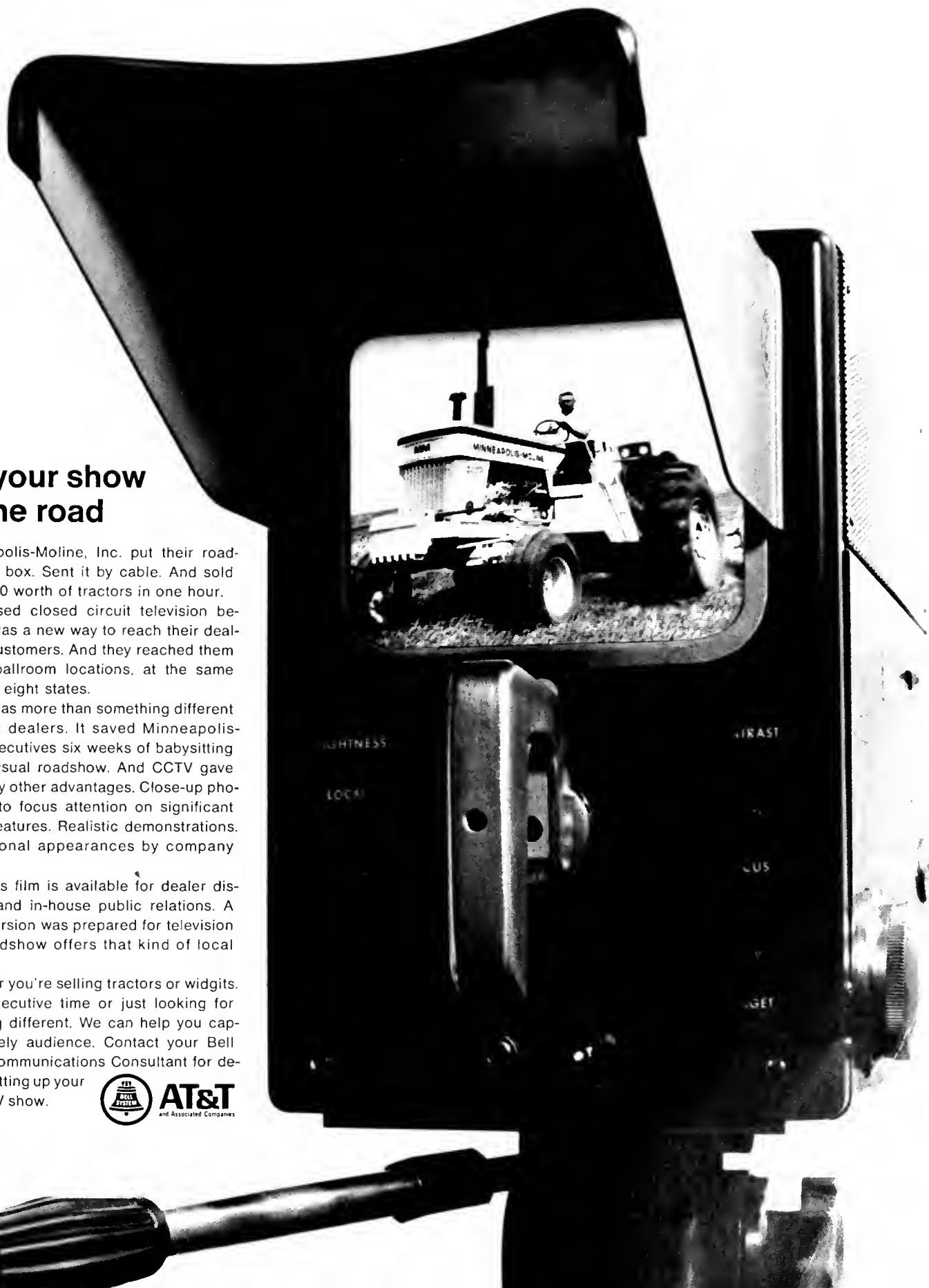
CCTV was more than something different to delight dealers. It saved Minneapolis-Moline executives six weeks of babysitting with the usual roadshow. And CCTV gave them many other advantages. Close-up photography to focus attention on significant product features. Realistic demonstrations. And personal appearances by company officials.

Now this film is available for dealer distribution and in-house public relations. A shorter version was prepared for television...no roadshow offers that kind of local re-run.

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November/December 1968

# BELL

telephone magazine



## IS THE PEACE CORPS DEAD?

Page 2



# The Telephone Network and Customer Equipment

The Bell System has made two proposals recently to greatly expand the use of customer-owned equipment with the telephone network. This expansion will heighten the need to preserve the quality of the network for all users.

The communications network, unlike a gas or electric power network, interconnects millions of devices on a two-way basis. These devices do not merely receive energy from the system, as electric lights or gas appliances do. They also put energy or signals *into* the network.

This unique and basic aspect of communications raises a crucial problem. Millions of different signals by different users are fed into the network simultaneously. The signals may come from telephones, teletypewriters, computers, television networks, radio networks, a remote physician sending a cardiogram for instant and expert analysis, a photographer sending a news picture over the wires or a dozen other diverse sources.

Yet all the signals must be completely compatible with each other and with the trillions of parts that make up the communications network. The signals must pass without distortion or disturbance through the same tubes, amplifiers, wires, switches and cables. If any one of the millions of signals is out of order, it can interfere with or distort hundreds of other signals traveling the same route.

Many problems can result, like wrong numbers, interfering squeaks and static, "cross talk" between different calls, errors in computer data transmission, distorted television, long delays and false billing. Often, corrections could be difficult if not impossible. A poor signal emanating from New York could cause trouble with a switch in Kansas City or a transmission line in California. A few such disturbing signals

would be bad enough; a moderate number of them could create havoc in the national communications system.

Consequently, there can be no compromise with the requirement for complete compatibility throughout the network. In earlier and simpler years, the problem was not so difficult because the same companies that built and operated the network — the communications carriers — also built and maintained most of the devices that connected into the network. With today's rapidly advancing technology, many diverse types of input devices are being developed. Telephone companies have no intention of producing all the devices which are or will be linked to the communications network; there are many interested and capable companies.

The solution begins with fixing, clearly and firmly, where responsibility lies for maintaining compatibility between the communications network and customer-owned equipment. It seems logical that the common carriers, publicly regulated in the public interest, should be held accountable for maintaining the integrity of the system they operate. As a practical matter, it is difficult to see how this could be achieved, day by day, in any other way.

This is why the Bell System has suggested that the telephone companies should provide connecting arrangements and network control units between customer-owned devices or systems and the network. Together, the connecting arrangements and network control units would preserve the quality of communications for all users and protect the functioning of the network. In this way, the growing variety of new communications services can be accommodated while the quality of transmission and signals is assured.

# BELL

telephone magazine

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“Has the Peace Corps done any good?”  
“What do you think you’ve accomplished?”  
“Isn’t it running out of steam?”

These are questions asked of any American who has served the Peace Corps overseas. Although volunteers return wiser and enriched, some also come back embittered, just as much at loose ends as when they left. In some cases, they leave considerable damage behind. For some, a sense of obligation has developed that propels them to help solve America’s most pressing problems; for others, two years abroad have left the impact of a ship cruise.

The Peace Corps today is on a plateau — a plateau that can lead to a new stage of growth, or one that is the sure sign of decline. For lack of a clear vision of its potentially far more significant role, it is perilously close to the downward edge.

This does not mean the Peace Corps has failed. But in most cases the single most important success has been the sheer presence of an American volunteer living in the foreign village, speaking the language, buying at the local stores, sharing the extremes of climate. The very differences of culture and upbringing, of dress, behavior and attitude stand out in sharp contrast to the traditional society. In most Afghan towns, for example, no woman is seen shopping, least of all unveiled. The presence of an American girl without a *chaderi*, the tent-like garment worn outdoors by most Afghan women, is noticed by everyone.

Closely allied to this foreign influence is the interaction of volunteers at the person-to-person level. Volunteers do not work through impersonal media, the injection of money, or by hectoring from the American Embassy. They communicate without interpreters, face-to-face with students and principals, office workers, peasants, mothers and patients. They are there when babies are born, when the sick die, when students go on strike, or when the price of bread triples.

Ideally, they bring a specific skill, together with a sensitivity to the local culture, to bear on the problems of the people they work with.

By teaching in a different style — farming with fertilizer, nursing as a medical professional where “nursing” is equated with prostitution — volunteers cause change in host countries. They make it difficult for less effective traditional methods and attitudes to survive. Like a grain

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PEACE  
CORPS

by Walter P. Blass

*Mr. Blass, an economist in AT&T's Secretary's Department, was on a leave of absence the last two years to serve as director of the Peace Corps in Afghanistan.*

# PEACE CORPS



McCordell

of sand in the oyster, response by the host environment is unavoidable.

Achievement in this context is not measurable. While the Peace Corps itself has tried to measure its impact in some sort of numbers, too little is understood about the process of attitudinal change to measure social and economic progress with certitude.

But it is true that volunteers make an impact on individuals and on small towns they touch directly. For example, a progressive Afghan governor requested Peace Corps volunteers to help build bridges, draw up plans and supervise construction of a school addition, and teach English. A short time later, a new governor reverted to established patterns of autocracy by jailing a teacher who flunked his nephew. But the town wouldn't stand for it; it had the teacher released, the governor sacked. Although the third governor transferred the volunteers, he couldn't get rid of the newfound spirit the townspeople had acquired.

In another example, Peace Corps nurses taught classes of auxiliary nurses in seven Afghan towns. The auxiliary nurses completed classes in four of the towns. In two of the remaining towns, the volunteers were forced to leave because the frustrations were too great. In the seventh town, the course fell apart for the lack of official support. In the four successful sites, however, not only did the auxiliary nurses finish with considerable formal knowledge but also with the beginnings of compassion for patients who were not relatives.

The impact of volunteers also was demonstrated by 16 girls who revitalized a smallpox eradication program. The girls vaccinated 2,000 persons a week each and were constantly pressed to advise on health programs. A World Health Organization official said there would have been no vaccination program worth the name were it not for the girls.

What about the volunteers themselves? Are they changed in the process of serving?

The vast majority of volunteers are 23 years old and have just graduated from college. They have never held a job for a period as long as a year. They crave the responsibility for their own future and seek an environment that demands all they have in the way of initiative, self-testing and learning.

The Peace Corps gives most of its volunteers just such a chance. It involves an individual in a real life situation: learning how to get along with supervisors, how to bring theory to the world of reality, how to refine one's objectives in terms of the means at hand. These are the valuable lessons that the Peace Corps offers. But the volunteer is often the last to realize the benefits.

The lessons are badly needed. Our educational system isolates col-

lege students from the mainstream of American life. The college graduate-to-be typically continues his studies, isolated from reality, kept from power, told "you are not yet ready" well into his twenties. The stresses the Peace Corps offers and the way in which America's young people respond are proof of the indestructibility of youth.

Too often, however, some volunteers find they can't take it. They quit and come home. In the first years of the Peace Corps an average of 11 percent of the volunteers came home early, but in recent years rates in the 50 percent range have occurred with increasing frequency. In part, these dropout rates reflect the lack of readiness for "reality" built into our educational system, part of what John W. Gardner of the Urban Coalition calls the "antileadership vaccine." In part, they result from poor Peace Corps planning and training.

The learning experienced by volunteers, who stay however, is significant. Volunteers have learned some 180 languages, most of them rare and hardly known, even by professional linguists. They have learned teaching skills to the point where several state departments of education have hired them sight unseen for teaching in inner city schools. Far from removing scarce, experienced teachers from the United States, the Peace Corps supplies many times their number in returned volunteers.



Still, the most important learning experience of volunteers lies not in the cold statistics of languages learned, or teaching skills acquired, but in their exposure to the human condition. Like veterans of World War II, volunteers return with insights and feelings about human relationships that differ markedly from those of the average American. Undoubtedly, the Peace Corps has brought about a better understanding of other nations to the U.S. than any other pro-

gram the United States has yet devised. Even in indirection, the aim has been achieved. As a volunteer to Ethiopia said:

"This by-product of Peace Corps is the world awareness that is born in the family and friends of a Peace Corps volunteer. I am very aware of this in my home state where many times the isolationist attitude is seen at its genial best. The fact that there is a world 'out there' sometimes never dawns on them until they are emotionally involved with someone out there. Then the world takes on new dimensions; poverty and leprosy and a lack of education suddenly take on a new meaning for them because *you are there.*"

This young woman's comment is the germ of an unforeseen benefit of sending 38,000 young Americans to five continents: the sharp awareness of deprivation and need.



At home we have moved from the self-satisfied 1950's to the tortured 1960's where shortcomings in the American way of life are becoming clear and visibly dangerous. What volunteers bring back is a realization that these shortcomings are no different from the problems faced by developing countries. Furthermore, the same techniques are needed to remedy them. The conflict of attitudes between black parents and white teachers is the same in Africa as in New York City.

Racial prejudice, the affluent's lack of concern for the problems of the poor, the plight of the uneducated and unemployed, urban sprawl — these problems are common to all continents. Their solution lies in developing a person-to-person relationship just like the Peace Corps volunteer worked out with students, townspeople, storekeepers and others with whom he worked. By necessity he learned a new "language" by which to communicate effectively.

The most precious gift that the volunteer can bring back to the United States is a commitment to do something about domestic problems. He has the skills. The Peace Corps was invented to help foreign nations, but its not-so-small by-product is the potential for helping to solve America's own problems.

Harris Wofford was associate director for planning in the Peace Corps in 1966 when he said:

"Behind the Peace Corps' back, a cold wind is blowing; a feeling that it is living off the past capital of Kennedy's memory or its own magic beginning; a feeling founded on a fact that the Peace Corps may be leveling off. . . . For the Peace Corps, which began as a quantum jump, this constitutes a crisis, a familiar crisis for movements and institutions. It is the turning point at which one course leads on toward the big vision; the other leads out to pasture."

Two and a half years later, these comments are even more true. Peace Corps volunteers have leveled off at 12,000 and are going down. In 14 of the 16 largest countries, the number of Peace Corps volunteers is dropping by more than 100 volunteers each; India, the largest, is cutting back from 1,133 to 770. The causes include disenchantment of young people with the Johnson Administration and what appears to some to be a minuscule Peace Corps compared to a vast War Corps. In part, host countries are requesting fewer and more highly qualified volunteers. But probably the single biggest factor is a quiet subsiding of the Peace Corps into just another routine government agency. The saddest comment about the Peace Corps is that it has fallen far short of what it could have accomplished.

Need that be the fate of what has been called the single best contribution of the Kennedy Administration? The Peace Corps can fight off such an ending and gain new life.

Four years ago at Wesleyan University, Sargent Shriver, then director of the Peace Corps, proposed that colleges and universities open their doors outward: "Let the bored, or confused, or 'burned-out' undergraduate have a short meaningful interlude . . .

"Once the bright hope of dedicated youth, the Peace Corps is dangerously close to becoming just another government agency."

a sojourn in reality . . . for a year, or even two years, so that he may come back revitalized, committed, concerned enough to finish both college and graduate school. And let these interludes be periods of service, whether in the Peace Corps, the poverty program, the American Friends, Papal volunteers, or any other service involving the reality of human needs."

**a**

ctually, why should these comments be restricted to students in higher education? Business, government and universities have many individuals who are "bored, confused or burned out." Increasing numbers in all walks of life face the question of relevancy to the burning problems of our time.

Drastic changes would have to be made in the Peace Corps itself if it took on such a broader mandate. It would have to turn from being a quiet haven for college students in an interstitial period into a broadly based "mobilization in development." Taking people of all ages who are aware of the complexity of social and economic change and sense the need to be involved in such change, it would train and send them out to needed areas, whether domestic or foreign. Leaving the affluence of most Americans, they would work and live among the needy, the forsaken, the "undeveloped."

Recognizing that what is needed is an elite, the



The Peace Corps hope for the future, says a former member, is in redirecting its efforts into a worldwide attack on deprivation and need.



Peace Corps would develop an elite that could communicate with the man in the street, not just with the other "educated" few. It would further recognize that such intense periods of commitment need to be spelled by periods in other activities. The institutional mechanisms would be present to allow a young person to develop skills, say in community development in an urban ghetto, then come back 10 years later to work perhaps in a similar program overseas. Or he could come back as he became financially unencumbered in later life. The Peace Corps would, in effect, keep track of its alumni and offer them new opportunities to serve over their lifetime.

**T**he present Peace Corps is running out of steam because it has turned into an accepted, not-too-daring program for young adults before they settle down to take on the tasks of earning a living at home. Such a development was not inevitable, nor is it yet. But if the Peace Corps doesn't reshape itself into an exciting forefront of development, it will only attract the sort of people who follow its current line of advertising, "Don't know what to do, lawyer, engineer, doctor, business? Join the Peace Corps!" Too many good volunteers and potentially good volunteers are turned off now because a sense of movement and inner development is lacking in the program.

The potential benefits of this transformed program would be far greater than current benefits. The Peace Corps would turn into an instrument that would help resolve the now diffuse frustrations of Americans with their own society's failures. It would engage the attention of many more people to the critical problems at home and abroad. It would tap resources and skills that are desperately needed overseas but are available only in the over-25 age group that the Peace Corps doesn't tap today.

It would feed not a small fraction of its "graduates" but a substantial number of them into the business, governmental and nonprofit organizations that deal with development. Perhaps it might even absorb them like a successful merger-oriented firm. It could go on to serve as an example bright enough to lead the "developing" nations into setting up their own versions to gain the same benefits, even by sending their volunteers to the United States.

In many small ways, current developments hint at such a move: an Exchange Peace Corps involving a few hundred foreign volunteers coming to the United States; a small Teacher Corps that hires returned Peace Corps volunteers; a VISTA associates program that moves domestic volunteers overseas after a year; a Career Information Center in Peace Corps/Washington that informs volunteers of opportunities for service here and abroad. But what is lacking is Wofford's "big vision" — a vision that will pull the disparate elements together into a critical mass that is self-sustaining.

Fulfilling the vision would mobilize the developed skills of America in the service of needs greater than those of affluence. By channeling the desire of man to find meaning in his work, the Peace Corps could move from being statistically inconsequential to becoming a major catalyst abroad and at home.

**B**y exposing Americans to the problems of the world's majority who lack health, an assured food supply, or a future with hope, it has the potential to change our own ethic about the proper distribution of goods and services. If the Peace Corps could make some small steps in that direction, it would have grown in the way that President Kennedy had hoped, not in size alone, but in quality, not just for export but to improve America as well. □

# Toward a More Orderly Society

Louis H. Pollak, dean of the Law School at Yale University, tells in a *Bell Telephone Magazine* interview why he believes Americans must develop a strong national commitment to equal opportunity if law and order are to be restored.

Mr. Pollak, what does the law-and-order issue encompass today?

The law-and-order issue is a phrase that we are hearing with greater and greater frequency these days, and I'm very skeptical of the phrase. The law is not merely a set of rules but a set of institutions and processes which organize our society to implement certain widely-shared democratic values. Order is one very important purpose, obviously, of any organized society. Without an orderly society there can be no sensible progress toward any group of social values.

But I'm troubled by the constant association of the terms law and order as if they were synonyms. They are not the only objectives we have in mind. Clearly, anxieties are very much on people's minds in our country today. A lot of flouting of the law is observable and some of it is violent. I think this must mean that our processes for keeping order are somehow not doing their job.

Without suggesting there isn't a real basis for anxiety here, my concern is that in discussing these issues we really look at root causes of social disaffection or alienation which in many settings erupts in outright, widespread violation of the law. I hope we begin to break down the question into its component parts. What kinds of lack of order, lack of respect for law and failures or weaknesses in our institutions are we

concerned about, and what kinds of remedies should we pursue?

How critical is lawlessness in the United States?

My sense just as an average newspaper reader is that indeed there are more thefts, arsons and crimes of violence, and more per capita. At the same time, we have to be very careful in reading the statistics because I believe it to be true that until very recently we've had very little idea how to gather data on the degree of law observance or crime occurrence. I believe it is now pretty well understood among criminologists and other experts on law enforcement that the main data gatherers — our various police forces — have pursued such different paths on what information they were gathering and for what purposes that we haven't had anything very reliable in a quantified sense until recently.

Does the widespread publicity that is given crime create a feeling of lawlessness?

I think that is true. Our favorite indoor pastime of watching television seems to involve more and more interest in the violent and violations of law, which in



some instances seems to me a morbid interest culturally. And this interest is becoming more pronounced and more a part of our everyday thinking and reacting. I don't want to overstate it. I'm not suggesting that television is the root of all of our difficulties, but there is a kind of cheapening of our entertainment that says something about our culture.

What are the critical elements of lawlessness today?

The large source of concern — at least in many of our cities today — is that people are afraid to be out on the streets at night as they have not been in the past. It is almost less important whether there is anything to be afraid of than the fact that people are afraid. Where does the fear lie? Some of it comes from a lot of violence in especially depressed areas of our cities. And the fear is reinforced by those instances of widespread disorder in the last three or four years that we've called riots. There begins to be a perception of rioting, disorder, looting and arson as almost a common way of life in depressed and especially black ghetto areas of many of our large cities.

Let me interject here a word about the riots in the summers of the last three or four years since the phrase "the long hot summer" became fashionable. The riots are, of course, enormously deplorable, but it's important to note that there has been an apparent decline in these large outbreaks. The summer of 1968 looks statistically different from previous summers and whatever the explanations, there is that fact.

Massive disorder as a relatively new phenomenon in our urban life is by no means unprecedented. We well remember that there were race riots at various times in our history and some far more bloody than any recent occurrences. Indeed, there have been other kinds of massive disturbances like the draft riots in the Civil War in New York City. They had no racial overtones at all but took far more lives than any recent disturbances.

But considering our concern about riots and whether individuals are safe on the streets, what factors are at play here? I believe that the anxieties which seem to be widespread are at bottom white anxieties about violence at the hands of angry blacks striking back at whites. At the same time, if we look at the actual episodes of widespread violence — both the general disorders and the isolated muggings, robberies and what not — I think we would find that to an enormous degree the victims of offenses taking place in black residential areas are black people, and the disorders are disorders in which the people who are injured either in their persons or their property are the people who live there.

What has caused such a widespread reaction across the United States, even in states that have not been touched by riots?

The central dimension lying underneath the surface is a racial dimension—middle-class whites and lower middle-class whites afraid of black urban neighbors. The reality is what the Kerner Crime Commission tried to tell us a year ago that notwithstanding all the progress that we think we've been making in building some sort of racial equality in the last decade, the pattern of our country is to move more and more to division, to two separate and unequal societies. That is a reality measured by the increasing gap between affluent whites and economically depressed blacks. There is where the fact lies, and this fact is likely to manifest itself from time to time in outbreaks of one kind or another.

There is a figure of speech which Dick Gregory used in a talk he gave to Yale undergraduates about a year ago. He talked about American life as a cigarette machine. When the machine is broken and you put 40 cents in and you don't get any cigarettes out of it, you go to the ticket window at the airport where the cigarette machine is and say, "How do I get my

40 cents back?" The lady says, "Don't ask me, I sell tickets. Isn't there a sticker in the window that tells you to write to somebody in Kansas City?" When that happens, all you can do is kick the cigarette machine just to show your frustration. And then Gregory says, "Well, our country is a cigarette machine to us. We haven't just put 40 cents into it to get something to make us sick. We put 300 years of our lives in it to get something to make us well and have gotten nothing out of it at all."

That seems to me the way figuratively to describe the sense of frustration. It is not a justification of why black people from time to time just get sore and tear down the very houses they live and work in. But that frustration is a reality that our social planning has to come to grips with. If we are not going to really come to grips with the problem, but simply confine our sights to how do we get better policing to contain riots after they begin, then we are only looking at about a tenth of the question of law and order. I would be willing to talk about how we can improve law enforcement techniques, but I would hope that we as a society would spend 10 times as much energy looking at the total problem: what do we do to get rid of the frustrations which make people lose any sense of interest in society?

Do you think any progress has been made in attacking these root causes in the various programs sponsored by business and government?

I think we've made pieces of progress. But I can't really say, considering the size of the investment made in dollars, that we can demonstrate we have bought very much in the way of progress yet. In part, this sounds like an anachronism, I suppose, because we've spent a great deal. But we haven't begun to spend a twentieth of what we really have to spend. We really haven't begun seriously to address ourselves to what it is we need to buy with our dollars.

Let me take just one corner of the national budget that I'd be interested in seeing us enlarge. I've spent a good deal of the last several years as a member of the New Haven School Board. I'm no longer on that board but I was for about five years. Here, in what I guess is the richest state per capita in the country, we're spending about \$700 per child educating children in New Haven. Fifty per cent of the children are black. We're training children who are for the most part going to have to make their way in the world with what tools we give them in school. We are not giving them very much, though it is not for lack of dedicated people to do what they can with this limited sum of money.

I think we have some guide to that when we know that 50 miles from here in Scarsdale, or in comparable communities across Long Island Sound, we would find per capita expenditures for school children which are \$1,200 to \$1,400 — virtually double what we are spending here. Now what that says is that somehow our society is organized to spend almost twice as much to educate children who need the advantages of that education far less than the kids in New Haven or 50 comparable cities.

I'm not afraid of the lack of resources in our country to do the building jobs that need to be done — building schools, building homes, devising income maintenance programs that can replace the very degrading public welfare systems we've got. I'm not afraid that we lack the dollar resources to do these jobs if we can develop the national commitment.

How do we develop the national commitment?

I suppose at this point my remarks will sound political. I can point the way I'd like to proceed best by saying that I really think that Robert Kennedy, if he had lived, was a national leader who would have led us toward a new and courageous sense of our destiny that we could have pursued and pursued not just on

the level of platitude and exhortation but quite realistically. I think he was a political leader who recognized that our country has been built on a partnership of public endeavor, reflected in our governmental institutions, and private endeavor.

One of the most interesting aspects of the program that he was beginning to articulate was his insistence that private industry be challenged to devote very substantial portions of private resources to the rebuilding, or perhaps I should say the building, of this country.

I'm not suggesting at all that we can look to private enterprise — even to vast aggregations of capital such as are reflected by the telephone company — as the prime movers of national reform. I think that would be an illusory kind of a notion. That is not the basic business of private capital. But even if it is not the basic business, it can become a very important and essential companion of the prime business of fulfilling the corporate objectives of producing goods and services and making a return for shareholders.

Business can, however, devote large dollar resources to risk capital enterprises which may be only long shots. If a big company can put a relatively small amount of dollars into a government-private partnership — of the sort, for example, that John Doar is developing in the Bedford-Stuyvesant ghetto in Brooklyn—the aggregate of 20 or 30 such investments can be substantial and provide the equity leverage than can get something important begun.

Businesses also are people in the tens of thousands. And these people, by demonstrating genuine concern and participation, can persuade their business associates and Americans generally of the absolute urgency of these undertakings.

I'm persuaded that the main job of pursuing national objectives of physical and moral reconstruction is a really determined commitment to make our platitudes about equality turn into reality.

The main burden of this has to lie with government, but government no longer has to mean just Wash-

ington. Decentralization may not be the watchword for all problems, but it certainly is a healthy reminder to us that there are centers of energy other than Washington. We can accomplish things on a local level if we have the will to do so and the likelihood of capturing local imagination and participation. I hope we can begin to rebuild the genuine centers of political imagination and leadership.

Getting back to more specifics on law and order, is there a breakdown in America's social conscience and morality?

I'm not a preacher, sociologist or anthropologist. From the vantage point of that ignorance I'd be very skeptical of any sort of generalization that we are less moral or invested with less conscience than we have been in the past.

We are more populous than we have been, and we have less time than we've had in the past. We have much less opportunity to be reflective as individuals and as groups. We are becoming increasingly democratic with more and more millions actively able to participate in voting, in the political process and with a sense of involvement. We are involving millions and millions of people in running American affairs who have less acquaintance with and allegiance to a lot of fairly traditional American values, whether middle class or otherwise. We're finding increasing constituencies that are skeptical about whether a lot of the values we've assumed were permanent are really so permanent and vital. All sorts of people are reexamining what they were given by earlier generations and wondering whether these values are so important.

Much of the reexamination is very healthy. As someone who teaches young people going out into professional life, I can't help but feel delighted with the kind of searching skepticism my students come up with all the time. They question what really are these precepts the middle-aged and older generation

has assumed must be valuable in the past. That kind of reexamination of values just doesn't concern me. I really think we'd be dead if we weren't getting it.

My concern really lies with the people who yell about law and order in the perspective of law as merely a repressive process for keeping people quiet and peaceful. It is the same perspective that cries when an appellate court sets aside a criminal conviction and orders a new trial because of some procedural defect, a coerced confession, lack of a lawyer or what have you. It's the same perspective that says, "There goes the court setting a criminal free on the basis of some technicality."

How often have we heard the word "technicality" used! The technicality that the court is concerned about is a violation of law and a very fundamental violation of law. It is a breach of centuries-old traditions in regard to how the criminal process is to be conducted. It involves some very weighty values that have to do with searching for the truth and the dignity of individual citizens. I worry very much when I hear the same people on the one hand claim themselves as proponents of law and order and on the other hand criticize judges concerned about "technicalities." That's the decline in respect for fundamental American values which, frankly, I find deeply distressing, and I think there's a very important educational job that has got to be done, in part, by my own profession. But any really effective teaching can't be left to lawyers to do.

There have been some harsh proposals made that we are going to have to whip certain people into shape and forget about the individual's freedom of expression. Where do the individual's rights leave off and strict law enforcement begin in at least temporary solutions to the riot problem?

Harsh proposals are made and have been made before by people impatient with and uninterested in

learning about our traditions. I think it's perfectly possible to run a modern city with all its problems in a way which gives pretty free scope to people's rights to get together and make their points of view known on matters of the day. It may be boisterous, noisy, strident and even insulting. That's the nature of free speech.

But I am convinced that we have shown in this country time and again that it is possible to be faithful to our constitutional guarantees of free speech and free assemblage and at the same time maintain an orderly, peaceful and sensible community. And in those situations where we yield to the temptation of short-cutting the Constitution and stopping people from saying what's on their mind and being disorderly and abusive plus everything else that goes with free speech, the net results is to increase the tensions and make more likely the probability that the outbreaks will be violent in fact, not just in words.

What can the individual do to help build a respect for the law?

That's not done directly. People, and particularly black people, have to be encouraged to take a greater interest in their own local institutions that they have a stake in making stronger. And if they see that their participation in these institutions can yield programmatic results, that things get better, that there are more jobs and more playgrounds or that schools improve and streets get cleaned, they find there is some direct relation to participating and trying to get things done in an orderly way. That seems to be the kind of involving experience which gives people a sense of interest and investment in the community right around them. But if through their experience they find they have to go out and blow up a building before any progress is to be made, that would be a very sad lesson indeed. □

A recent news item says a survey circulated among business executives indicates increased affluence, education and productivity are eroding traditional American work values. According to the report, leisure is coming to be looked on as a right rather than something that has to be earned. "In this regard," the report states, "the hippie movement . . . may well foreshadow prevalent attitudes 25 years from now."

I read this with skepticism. I couldn't imagine, for instance, our business, government and academic leaders in long hair, beards, love beads and sandals. To test the theory, I decided to conduct an in-depth survey.

I stepped out in the backyard and saw my next door neighbor Ed Bottomley relaxing beside his pool. Ed is an executive with Gargantuan Corp. and solid as they come.

"Ed," I called, "this news story says Americans are coming to regard leisure and work as equally valid activities. Do you agree?"

"I do." Ed got up and came over. "At Gargantuan, you can't tell the difference."

"How's that?"

"Take lunchtime. Used to be a bunch of us would go to a quiet bistro, unwind with a drink or two, then discuss problems over a leisurely lunch topped off with coffee and cigars."

"What do you do now?"

"We jog," Ed said. "Executive Fitness Program. We're organized into teams. Best mileage for the week wins the President's Cup."

"Quite a switch."

"I used to fritter away my evenings watching football on TV," Ed continued. "Now I either represent the company at a civic affair or study for my

class in Advanced Management Techniques."

"When do you find time for class?"

"Saturdays." Ed smiled. "Sundays are pretty much my own except for afternoons. I conduct a class in business practices for disadvantaged ghetto youth. Part of the company's human relations program."

"Do you think the hippies are influencing our attitudes toward work and leisure?"

"Are you kidding?" Ed glanced at his watch. "Excuse me—time for guitar practice."

"Some of us at Gargantuan have formed a rock group. We entertain at community affairs and company picnics. Call ourselves The Executive Suite. Groovy, eh?"

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*Mr. Coyle is an advertising consultant in Manhattan Beach, Calif., and has written light articles and fiction for several magazines, including Harper's, Sport Illustrated and Pageant.*







This afternoon I stopped to pick up a few things for my wife at the supermarket. I ran into George Quibble, who teaches social science at Catchall College and asked if he'd like to participate in my leisure poll.

"Certainly," George said, pinching a wrinkled tomato. "How do you define leisure?"

"I hadn't really thought."

"Is it free or unoccupied time? Or freedom to do something specified or implied? Or is it the opportunity to seek man's highest goal, the achievement of understanding?"

"George, all I want to know — are traditional work values being eroded by increased affluence, education and productivity?"

"Ah — you're speaking of mass lei-

sure." George sampled a cherry.

"Now — do we mean recreation, which Mead points out is merely getting fit so that one will be able to work some more. Or are we speaking of hobbies or play, which Huizinga says is the mother of culture. Or do we accept McLuhan's idea—"

"Look, George — do you think the hippie movement foreshadows prevalent attitudes 25 years from now?"

"Possibly." George searched among the lettuce for a solid head. "However, if we regard the hippies as a subculture similar to the Hell's Angels—"

"I've got to run, George. I'll put you down for 'Too early to tell.' O.K.?"

That evening at a cocktail party I bumped into Harry Barchart, who's in government. Harry's with the IRS, FCC, TVA or BOAC—I can never remember which.

"Leisure activities? Booming!" Harry said in answer to my question. He pulled a sheaf of government bulletins from his pocket. "Here's a study that shows the number of soap carving hobbyists in Tightsqueeze, Va., rose by 208 percent between 1957-67. And sales of mechanical toys—"

"Harry, we're talking about *adult* leisure."

"—mechanical toys for men — sports cars, dune buggies, karts, model trains, cars, yachts, planes — are zooming." He paused for breath. "Here's another straw in the wind — study on leisure-oriented promotional dates: Let's Go Fishing Week, National Hobby Month, Let's Play Russian Roulette Day—"

"Tell me, Harry — do you think there's a hippie influence here?"

"Definitely. This report proves it." He held another pamphlet. "Sales on love beads, sandals and flowers are rocketing. Razor blade sales are down sharply."

To me, that proved it. The new leisure is already here. But one question still bothers me:

With everyone busy doing his thing, who'll mind the store?

# The Challenge to Communications Policy

**“Man’s greatest hope for world peace lies in understanding his fellow man. Nations, like individuals, fear that which is strange and unfamiliar. The more we see and hear of those things which are common to all people, the less likely we are to fight over those issues which set us apart.**

**“So the challenge is to communicate.”**

**These were the words of President Johnson when in August 1967 he established a Task Force to make a comprehensive study of national communications policy. As part of that study, interested groups, including the Bell System, were asked to submit their views. The Bell System in the following suggests certain fundamental principles aimed at encouraging maximum progress in communications for the future.**

Communications policy should be fashioned to serve better the advancing aspirations of our entire society.

The unparalleled distribution of high living standards in this country, the constant advances in sophisticated communications equipment, the quality, variety and economy of communications services now available to home and office have given rise to expectations that the American people between now and 1980:

- Will add more than 70 million telephones to the existing U.S. network, a 70 per cent increase.
- Will increase threefold the number of long distance calls they make a year, from about 5 billion to 15 billion.
- Will increase tenfold the number of overseas calls from the U.S., from 12 million to 120 million.
- Will increase the total number of telephone calls during a typical day from 300 million to 500 million.

In addition to this enormous growth in voice communications, other forms of communication — especially data transmission from computer to computer — are expected to grow much faster. By 1980, as much information may be exchanged by data transmission as by voice communications.

The communications network in the U.S. already includes switching centers in 8,000 places, joined by 700 million miles of communications circuits. Yet the present interstate network represents only about 15 percent of the plant-in-service that may be needed a dozen years from now.

These dimensions of growth are only part of the story of the future of communications. New and improved services will add new value and versatility for consumers. With technology now available or readily foreseeable:

- Picturephone® service will link families and friends, buyer and seller, by sight as well as sound. They will enable the American people to read their daily paper or view a drawing transmitted by Picturephone sets.
- Merely by pushing a few buttons on Touch-Tone telephones, families will be able to recall from central libraries a wide variety of films, recordings, displays, printed materials for education, information and entertainment within the home.
- Consumers will be able to order goods (visible on the Picturephone sets) in similar quick and easy fashion, automatically transferring funds at a bank from their account to the store’s account.
- Lineless telephones will permit use of the telephone anywhere in home or office.
- When people are away from their home or office, incoming calls will be automatically directed to any telephone of their choice.
- Conference calls connecting several parties will be established automatically, by pushing buttons before or during a conversation.

These advances for consumers will be made possible by rapid technological innovations not only in the telephone instrument itself but also in the vital, though invisible, part of the communications system — the vast switching and transmission network. This

network already can make in seconds any one of 5 million billion possible interconnections.

Electronic switching systems now being put into use at an accelerated rate provide even greater reliability, economy, capacity, speed and versatility of service. The introduction of electronic switching probably represents the largest single technical innovation ever undertaken by a private enterprise. To complete this task in all central exchanges throughout the nation will require many years. As a transitional step, work is under way aimed at providing many more customers with the benefits of electronic switching through application of special devices to existing exchange and toll equipment.

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**Advances in communications are not guaranteed. A basic objective in developing communications policy must be to apply wisdom and flexible vision so that potential advances will in fact be achieved.**

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A new technology in digital transmission, called pulse code modulation, will also increase capabilities and save dollars. In essence, this development breaks down a conversation into electronic signals at the rate of 8,000 times a second. All other forms of communication — television, printed matter, computer data, etc. — are converted for transmission into precisely the same type of pulses, all carried over the same conduit.

Indeed, no other basic service furnished the American people is made available with the same ease and simplicity as telephone communications. Yet no other service is as complex in its provision and function. None requires as vast a technology or calls upon as many different skills or demands as close an integration of machines and men.

The complexity of a nationwide telephone system; its ability to keep up with strong demand for new

instruments and for more intensive usage and new services; and its value as a basic and efficient resource for the nation as a whole will, of course, require enormous investments. The communications industry in the U.S. may need to spend up to \$100 billion for new plant and equipment between now and 1980. Such heavy capital outlays not only serve to reduce costs and enhance the quality of telephone service, but are essential in providing the base for the growth and development of other industries.

Communications policy should be tested against the achievements of the past, as well as the challenge of the future. Certainly there are lessons to be learned from experience in this country and abroad.

Telecommunications technology is advancing at a very rapid rate. But there is too little recognition that the changes ahead, great as they are, seldom result from sudden breakthroughs in the sciences or radical new directions in research; instead, they are logical extensions of trends and technical developments already underway. The progress in the electronic arts is evolutionary: it comes from a continuous buildup of technical inventions in many fields, just as the effort to fly to the moon is evolving in phases from the accumulated knowledge of a decade of aerospace activities.

For example, the transistor and the ensuing development of integrated circuits set the stage for electronic switching and digital transmission. Similarly, satellite communication was made possible by development of transistors, the solar cell and the traveling wave tube. Picturephone service reflects experience that began when Bell transmitted the first television pictures.

Following are some dimensions of recent progress, indicating ability to innovate, expand and improve at an ever-quicken pace:

- The number of telephones in the U.S. has quadrupled since the end of World War II.
- While such growth may be taken for granted by

some, the U.S. rate of 50 telephones per 100 persons compares with 13 in France, 16 in West Germany, 12 in Italy, 21 in Great Britain and 4 in Russia.

- In only 15 years, direct distance dialing was extended to more than 90 million telephones, or 90 per cent of all telephones in the U.S.
- In the past two decades, improved transmission systems have been introduced at the rate of one every two years. Capacity of a single coaxial type system has been increased from 600 circuits at the end of World War II to 32,000 circuits now.
- Consumers have reaped substantial cost savings as a result of economies of scale, the pace of innovation and accompanying high levels of productivity. Total telephone rates (local and interstate) have increased only 10 per cent since 1940; interstate rates taken alone are about 20 per cent below 1940. In contrast, the cost of living more than doubled in this period, rising 140 per cent above 1940, while average hourly earnings increased 300 per cent.
- In terms of the average number of hours of work required to pay for it, typical residence service costs twice more in London and Rome than in the U.S., three times more in Tokyo, Brussels and Hamburg, and eight times more in Paris.

These illustrations point to the most important single fact that should underlie the current study of telecommunications policy: the communications system in the U.S. is by far the most proficient in the world. It offers faster and more versatile service to more people, better quality, greater reliability, than any other communications system. It has created and put to use more advances in basic science and more technical innovations, more rapidly and of far greater significance, than any other system. It has done this at costs which compare most favorably with costs of other goods or services in this country, or with costs of communications services in other countries.

It is pertinent to ask how and why. What fundamental principles have been responsible for these achievements? How can these basic precepts be adapted and applied to emerging developments and current issues to assure even greater progress?

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The technical achievements of the Bell System are widely acknowledged; but what is less understood is the motivation behind this effort. It is the simple recognition that, as a communications carrier, the Bell System has the responsibility to provide the high quality service which the American public has come to expect. This demands an extraordinary commitment to discovery and application of new technology.

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These fundamental principles, tested by experience, should guide the development of communications policy for the future:

(1) *Systems development.* The national communications network must be viewed and operated for what it is — in essence, a single system. Planning, research, design, development, manufacture and operations must be coordinated toward a single objective — the maximum in quality and economy of service by the system as a whole. This requires the closest teamwork among many units, working cooperatively for the combined benefit of all users of the system.

(2) *Complete compatibility.* The communications network is comprised of literally trillions of individual parts. Any part may be linked at any moment with thousands of other parts, dispersed over hundreds of miles. The sure performance of every part depends upon the quality and technical compatibility of every other part — all must function in complete unison. An incompatible incoming signal, or distortion of a signal by any part at any point along its intricate path, could cause interference with hundreds of other signals traversing the same system at the same time.

(3) *Initiatives toward innovation.* The volume and quality and economy of communications today would be impossible except for incessant innovations. The invention of the transistor, integrated circuits, solar cells, etc. — the manifold expansions of cable and microwave capacity, the development of customer dialing, the vast improvement in speed and in capacity of switching systems—are only a few recent examples of pioneering developments by the Bell System, whose history from the beginning has been marked by a creative response to the challenge of technology.

Communications innovations cannot be haphazard — new designs must be compatible with what already exists, and what will come tomorrow. For the communications network, unlike some other enterprises, can never be shut down for modifications — it must always operate fully and efficiently, without interruption, even while undergoing vast change and growth.

(4) *Flexibility.* The policies and techniques of both government and industry must be continually adjusted to new insights, new economic and social needs, new technologies. There is great risk in premature or rigid commitment to any one system or one technique, no matter how promising, for it may yield to better methods tomorrow. Competing technologies and alternative modes must be continually explored, so that neither policy nor technology becomes frozen in concrete.

(5) *The common carrier principle.* The benefits of a highly efficient national communications network, with economies of scale and an advanced technology, should be available to the general public on the broadest scale. This can best be achieved through adherence to the common carrier principle, which permits sharing of these facilities by thousands of different users.

The common carrier concept provides millions of consumers with equal quality, capacity and economy in communications which none could remotely approach alone or in small groups. It avoids unthinkable

duplication, permits a coordinated response to national needs through systems development and pinpoints the responsibility to the public for efficient service. No one would be so bold as to challenge the value of this concept in general — yet proposals are sometimes made to chip away at the principle by fragmenting certain routes or services. The damage to this principle of beneficial sharing can be far greater than the size of the special services involved would indicate.

(6) *Sound regulation.* A fundamental distinction between communications in the U.S. and in other countries is that this country has relied largely upon private enterprise. The wisdom of this course has been proved in experience. Yet this approach requires that, while government regulation must hold private utilities rigorously accountable for end results in the public interest, it should allow greater freedom in the details of operation.

It also suggests the wisdom of recognizing the principle that in the long run there is an identity of interest between the utility regulated and the customers it serves. It is in the interest of the public to secure the best service at reasonable cost. It is equally in the interest of the Bell System to provide the best service at reasonable cost.

The object of regulation should be not only to assure just rates, but also to free those forces, such as good earnings and other incentives, which would produce needed growth in capacity . . . introduction of attractive new products and services . . . improvements in quality, versatility, and convenience . . . proper response to consumer needs. All these are benefits to consumers, along with reasonable rates. Sound regulation must provide the *climate*, the *incentives*, the *freedom* for utilities to bring these benefits to the public.

National policy in communications should be measured against these principles which have demonstrated their value in providing high quality, low cost communications. □

# BELL

## reports

### BTL Invents New TV Camera Tube

Picturephone® service technology moved another step forward recently with the Bell Telephone Laboratories invention of a television camera tube that makes it possible to take pictures under ordinary street lighting or in dim interiors.

In addition to eliminating the need for floodlighting, the new tube's advantages include long life and freedom from "burn-in."

The standard vidicon tube has a lifespan of several thousand hours; the new invention is expected to give service for 20 years. While the vidicon is damaged if exposed for some time to the sun or an electric light, the new tube has withstood laser beams.

The tube is a glass cylinder about an inch in diameter and about seven inches long, the same size as the vidicon tube. In slightly modified form, it has been used with X-rays. A number of domestic and foreign manufacturers having license agreements with Bell Labs have already shown an interest in the invention.

Another improvement in Picturephone® service, now in the experimental stage at Bell Labs, employs a new technique of encoding video informa-

tion into digital form before transmission. By reducing the frame-to-frame redundancy of visual information characteristic of the present method, it will allow at least three Picturephone calls to be transmitted over facilities that now carry only one call.

### System Will Offer New H.S. Aid

Bell System companies will soon offer a new program in its Aids to High School Science Series.

Entitled "Understanding Computers," the offering constitutes a broadening of purpose for the aids, which previously were designed primarily to help teachers present fundamental concepts in the physical sciences and to help narrow the gap between research laboratory and classroom. "Understanding Computers" is expected to have wide interdisciplinary application.

Among the new program's elements is an actual computer (CARDIAC, for CARDboard Illustrative Aid to Computation), manually operated to serve as an introduction to programming and to demonstrate what happens inside a computer. It is accompanied by an illustrated instruction manual and a transparent version of CARDIAC with movable parts, that can be used by teachers to instruct students in the operation of the device.

Also included are a film entitled "The Thinking??? Machines," five silent film loops, and a book written by Dr. Thomas H. Crowley, former director of the Computing Science Research Center at Bell Telephone Laboratories.

Since the inception of the series in 1961, other programs have been offered on similarities in wave behavior, ferromagnetic domains, the speech chain, crystallography, and conductors and semiconductors.

### Air-Ground Service to Blossom

A sophisticated nationwide public air-ground communications service is a Bell System vision that may become a reality within the next decade.

The service would be designed to meet the needs of private aircraft owners as well as to permit service to passengers of commercial airlines.

Because of the phenomenal growth in private aircraft the potential for air-ground service in future years may be even greater than for that of public communication for land vehicles. Such service would require 300 spectrum channels on an ultrahigh-frequency band — some 50 times the

*Though it resembles something from the pages of science fiction, this high-voltage generator named Hermes II, actually exists in the Albuquerque, N. Mex., laboratories of Sandia Corporation, a Western Electric subsidiary operated for the Atomic Energy Commission. Built by Sandia to simulate the flash of gamma radiation, Hermes can produce a fantastic power of five trillion (five million million) watts and can release its radiation energy in 70 billionths of a second. A Sandia employee stands at the mouth of tank, 80 feet long by 22 feet in diameter, in which Hermes is housed.*



number of channels presently allocated to the Bell System by the FCC.

The FCC recently rescinded a 1964 order which prohibited expansion of a developmental system involving 10 ground stations in service since 1962 in the northeast quadrant of the U.S.

#### Data-Phone® Helps Cardiac Patients

A unique service that may help save the lives of cardiac patients in hospitals with limited facilities was successfully tested in Oregon by Pacific Northwest Bell Telephone Co. and is now being established on a permanent basis.

Electronic monitoring equipment, available only at some large metropolitan hospitals, is used for patients in the small, 42-bed Community Hospital in Silverton with the aid of telephone lines.

Trained nurses in the coronary care unit at Salem Memorial Hospital 20 miles away monitor heart action of Silverton patients. A Bell System Data-Phone® flashes a warning from the patient's bedside when a change takes place. The staff in Salem can then alert doctors at Silverton in seconds and confer with them on the type of emergency and treatment indicated.

Salem authorities are considering the service for other small hospitals in the area.

#### High-Capacity Cable Developed

A new generation coaxial cable carrier system, which has the capacity for carrying 90,000 simultaneous telephone conversations — or about two and one-half times that of the present carrier system — will be used to expand long distance communications facilities in the Southwest.

Now under development at Bell Telephone Laboratories, the new \$170



*The 20-inch rod held by Linda Smith of Western Electric's Allentown, Pa., works is \$1,500 worth of pure gold. It is used in plating 10,000 transistor parts such as those heaped in front of it. Western Electric uses gold on transistors and other devices it manufactures for the Bell System because of the metal's electrical properties and the qualities that make it resistant to corrosion and easy to join to other metals.*

million cable will be equipped initially for service in 1973 with the present L4-type system; but it is being designed for conversion to the new L5 carrier system when that becomes available, probably by 1975.

The 1,900-mile route, between Los Angeles and St. Louis, will skirt metropolitan centers and military target areas. Access to major cities along the route will be provided by microwave radio and new cable links.

All parts of the new system, including 24 maintenance and testing centers with emergency power facilities, will be underground.

Carrier facilities with even greater facilities are not far off. By the end of the 1970's it will be economical to utilize an ultrahigh-capacity wave-

guide system capable of carrying 250,000 voice channels at lower cost per channel than present systems.

Such a system is now ready for development at Bell Labs.

#### Lasers Assist Nerve Study

Lasers may one day help scientists unravel the mystery of one of the most complex communications systems known — the human nervous system.

While studying the nervous system of *Aplysia californica* (a large and nearly shell-less sea snail), Bell Telephone Laboratories' scientists found that laser beams can trigger the nerve cell "firing" that is necessary for the transmission of electrical impulses which carry messages from cell to cell in snails and in higher organisms.

The laser provides a faster, more flexible and more controllable technique for studying nerve cells and the complex network of cellular connections than did the previously used "probe" method.

Bell Labs chose the sea snail for experimentations because of the relative simplicity of its nervous system.

#### Documentary on TV, December 30

The second Bell System-sponsored documentary on the urban crisis will be shown December 30 on the NBC Television Network.

This program, which will concentrate on efforts of business, government and others to alleviate the cities' ills, will run two hours beginning at 9 p.m. A third program will be seen on April 22, 1969.

An outgrowth of AT&T's continuing, long-term study of the urban dilemma, the series is entitled "White Paper: The Ordeal of the American City." It was launched with a one-hour documentary on September 13. □

**The problems that predominantly Negro colleges and universities face are both massive and unique. Business participation in experimental instructional aid programs may help solve the problems and close the gap in understanding.**

# **BLACK** THE WHITE BUSINESSMAN AND THE **CAMPUS**

**BY RAYMOND H. STONE, JR.**

The faces were black. Mine white. And it was my first day before the class. As I attempted to appear casual in my remarks about the objectives of English 101, I was searching for some sign of approval and confidence from the faces, some indication which said, "Yes, Mr. Stone, we know you're here to help and you're welcome." But the faces were passive, noncommittal. Why would they be otherwise?

And why should I have been concerned about whether the students accepted me? In the past I had

never been overly bothered about whether my students accepted me or not. But somehow, this time, it meant a great deal more to me than I was willing to admit.

A brief return to the classroom for a former teacher is like a visit with old friends — though in many respects my classroom at Tennessee A.&I. State University proved to be a classroom foreign to me. I say foreign, because while I have had Negroes in my classes at other institutions, I was not accustomed to a classroom where all of my students were Negro. But beyond that, the experience was unfamiliar in this respect: I simply was not prepared for the per-

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*Mr. Stone is a manager in the Traffic Department of South Central Bell Telephone Company and taught at a junior high school and university before joining the telephone company in 1965.*





sonal awakening occasioned by my association with Negro higher education.

When the teaching assignment at Tennessee State University was explained to me, supervisors at South Central Bell pointed out that the program was experimental. The objective was to find the ways in which this business could most effectively fulfill its social responsibilities with available means. The exploratory nature of the assignment made it appear challenging. I was not disappointed.

### **Uneasiness first, then a rapport**

The experience increased my perception and understanding of the world if only because it brought me into contact with a part of society that I had read, heard and talked about, but knew very little about.

During the early days of the first quarter, there was an uneasiness in the class. I am sure the students regarded me as highly suspect, but my rapport with them improved as I was able to talk with them individually before and after classes and in conferences. Their general reticence at the outset gradually disappeared as their questions became more inquiring and their participation more active. This interchange reaffirmed for me a personal conviction that honesty and openness with others is the only way that mutual trust and understanding can occur.

### **Preparation level is lower**

It is a fact that the preparation level of beginning students in Negro colleges and universities is lower, on the average, than that of students entering predominantly white universities. (Female students, though, appeared to be better prepared generally than male students.) Tennessee State has attempted to alleviate this problem with strong remedial programs in reading and writing for entering freshmen.

The disparity in black and white readiness, which educators at Negro institutions of higher learning freely admit, is the bitter fruit of segregated educa-

tion. This gap is cultural, beginning with the first year of school where the Negro child learns less than a child who has not suffered this cultural deprivation, and compounded annually thereafter.

In my own experience, however, I have demonstrable evidence that the Negro students' capacity for improvement is undeniable. Despite my students' academic shortcomings, I was most struck by their genuine enthusiasm. In the first week, for example, I asked them to write a theme describing their career aspirations. Their sights were uniformly high, but unrealistic in the light of difficulties they might be expected to encounter. For example, 20 of the 35 students in my class indicated they would like to enter some professional field like law or medicine.

### **Business careers not mentioned**

Notably absent from all their papers was any mention of a career in business. Negro businessmen are not a strong factor in Negro culture or in the students' rural agrarian background. The students' papers reflected the fact that their own people have achieved success primarily in the professions and athletics.

In many cases, their manner of writing about their goals rendered the thoughts pathetic. Many students were so inadequately trained in English that it was difficult for them to communicate in writing. But at the same time, there was something genuinely heroic in the goals they were seeking.

Not surprisingly, the campus atmosphere was typically collegiate, and the students I observed were just as businesslike in their approach to their studies as those at any other school I am familiar with. Although the time I spent on campus was limited, I saw no evidence of a cult of activism or violent social ferment at Tennessee State University. To be sure, underlying student anxiety was present and it is relatively simple for this restiveness to appear in overt forms on this campus as well as others.

For example, during the disturbances following Rev. Martin Luther King's assassination, the North

Nashville area, where Tennessee State is situated, was sealed off by National Guard troops to prevent the spread of violence. It was indeed a queer feeling to pass by Army half-tracks and armed military personnel as I made my way to class. But talking with students in my class the Friday following the assassination, I found no bitter vows of retaliation — only sorrow, frustration and confusion. At no point in my life have I felt a greater affinity with the Negro than I did then.

### **Idealism is source of strength**

One of the recurring themes in contemporary literature is man's loss of identity and his attempts to come to some kind of self-recognition. Dr. King was a symbol to black America; he gave the Negro figure substance and character; he gave the Negro someone with whom he could identify. And with his death, the Negro sensed the death of some part of himself, his hopes and his dreams.

The emotions of the Negro students, regardless of their manifestations, represent at the core an idealism which, if properly channeled, can be a source of great strength and constructive energy for our country. But these students told me they can only be influenced by deeds, not words. The cleverly-turned phrase, expressed with verve and impact, is not the answer to their dilemma — and it never will be. Nor will our social problems be solved by approaching them with a scientific, clinical detachment. Only when Negroes have reached the point that they can compete with the whites for good educations and better jobs without any unnatural assistance like legislating hiring practices or giving unearned welfare aid will their dilemma be solved.

As a teacher of freshman English I became acutely aware of the diversity of the students' needs and the amount of individual attention they require. I think it is essential that Negro educational institutions possess the means to attract qualified personnel in sufficient numbers to keep the student-teacher ratio low.

But the Negro university is having increasing difficulty in recruiting new faculty due to intensified efforts by larger, predominantly white universities to hire the outstanding graduate, both black and white. Industry's clamor for the talented college-trained Negro also accounts for this dearth. As a result, it has become easier for Negro universities to recruit qualified white instructors than to induce black teachers of equal capabilities to stay on the campus. This could be symptomatic of the eventual demise of either the predominantly black or white college or university.

In more practical terms, my recent experience gave me an increased awareness of — and a sharpened insight into — what is the most important social issue of our day, race relations. I know now that I can be objective in dealing with Negroes as individuals—the same as I am in my dealings with white people — rather than seeing Negroes as a collective body which I feared and mistrusted because of unfamiliarity.

This assignment also convinced me of business' concern about social problems in this country. It was a sincere effort to translate a social hope into action. Few developments, in fact, have given the Negro academic community greater encouragement than the business sector's active application of its resources to the task of improving social conditions. The chief talent of industry has always been a capacity for efficacious action when other agencies are paralyzed by an inability to formulate sound objectives and appropriate courses of action.

### **View of business distorted**

The difficulty any business has in recruiting the talented college graduate is quite often attributed to the widely held belief on most college campuses that industry is apathetic to social conditions.

As Professor John U. Monro, former Harvard dean and now director of freshman studies at Miles College, a predominantly Negro school in Birmingham, Ala., explained in remarks to a group of Bell System executives, "Our abler students are increasingly con-

cerned about committing their lives and energies to social, constructive and challenging efforts. Our modern day graduate is not at all worried about his ability to earn a living; and he is far less interested in the promise of a high salary than he is in developing a constructive and interesting 'life-style,' or career pattern, for himself." Too often, Professor Monro commented, business is "seen as a career for generalists, indeed as a career for men who do not win out in the stiff competition during college . . . ."

Needless to say, the significance of business initiating instructional assistance programs and other socially constructive efforts will not be lost to the caliber of college graduates we are attempting to recruit.

Professor Monro also feels that business must do a better job of conveying to Negro college graduates the opportunities available in business. But as Richard Thain, placement director at the University of Chicago's Business School, puts it: "There's no trouble finding bright Negroes, but in finding those who believe opportunities exist."

To transmit information to Negro college students, some companies, for example, are hiring black college students for summer work to familiarize them with the internal workings of business, with the hope that they will return for regular employment after graduation. Esso is making available to Negro graduates six scholarships yearly for a year's study at the Harvard Business School. Others are providing grants to Negro universities which will be used for curriculum revision and restructuring.

## **Education emphasis misdirected**

While my training and experience hardly qualify me for a critical analysis of the character of Negro higher education, one observation needs to be made. Among many Negro educators, there seems to be a primary emphasis (misplaced, I believe) upon education as a process in which the student acquires skills and develops technical proficiencies. It may be a harsh and untenable judgment on my part, but I

believe that too many educators in Negro universities regard education as an entree to the professional world and not enough see it as having an intrinsic value. In my view, students at predominantly Negro educational institutions are not much given to introspection, and it is the failure of Negro higher education to assist its students in understanding themselves and their relationship to their environment that is the fundamental reason for many Negro students' lack of confidence.

Another reason, as I see it, is the result of a lifetime—all their young lifetime—lived under the oppressive cloud of poverty and disadvantage. Something can be done, however, to heal the scars left by such a youth and to help the Negro start higher education on the right foot. A Southern Illinois University project in East St. Louis provides dramatic proof of what can be accomplished with the culturally disadvantaged.

## **Gap can be closed**

Called "Experiment in Progress," the program was established to deal with the special difficulties of a student who has suffered economic and cultural deprivation (the two are inseparable). The project began in the fall of 1966 with 100 Negro high school graduates who had neither the money nor, ostensibly, the academic readiness for college.

The curriculum was specifically designed to close this educational gap in the first two years of college. Principal features of the program are highly individualized instruction (conducted by teacher-counselors who are themselves products of the ghetto) and selected part-time jobs which enable the students to relate their studies to the community.

The dropout rate of 30 percent for "Experiment" is consistent with the national college average. About half of the remaining students are able to continue in the regular academic track—at the junior class level.

In addition to the remarkable manner in which these students overcome their initial disadvantages, their performance demonstrates to others and — of



far greater importance — to themselves that they can compete for the first-rate education and that they can acquire the better life.

I believe that business has taken a meaningful step in the right direction in Nashville. We have seen that the faculty assistance plan is workable, and we know that the presence of business at Tennessee State University is welcomed. We can continue this and similar programs and make our intent and commitment clear to everyone.

### **Business leadership needed**

As the next move, business could expand its instructional assistance program to permit qualified employees to join faculties of Negro universities on a full-time basis for a school year, or for more limited periods. Particularly in the technical fields, we would be able to make a strong contribution.

Consideration could be given to underwriting a program which would encourage retired employees and retired teachers to teach at Negro colleges, or perhaps an early retirement plan which would allow employees who desire to enter teaching to do so. These employees could receive supplementary compensation from the company for their work.

But these programs need only be a beginning. The possible avenues for socially constructive efforts are myriad, and in business' sponsorship of these programs, we would be providing the enlightened leadership which the social health of this country so desperately requires.

In this country we have moved ponderously and slowly, when these problems demand alacrity. We have found only temporary solutions when long-term ones were needed. The ominous words of Msimangu, the Zulu person in Alan Paton's *Cry, The Beloved Country*, might be applied to the racial conditions in America. Of the whites and their apartheid policies in South Africa, Msimangu said, "I have one great fear in my heart, that one day when they turn to loving, they will find we are turned to hating." □



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## The Radio Spectrum Squeeze

Increasing concern must be shown for the congestion and pollution of one of the nation's important natural resources—the radio-frequency spectrum—if it is to continue serving the national interest effectively.

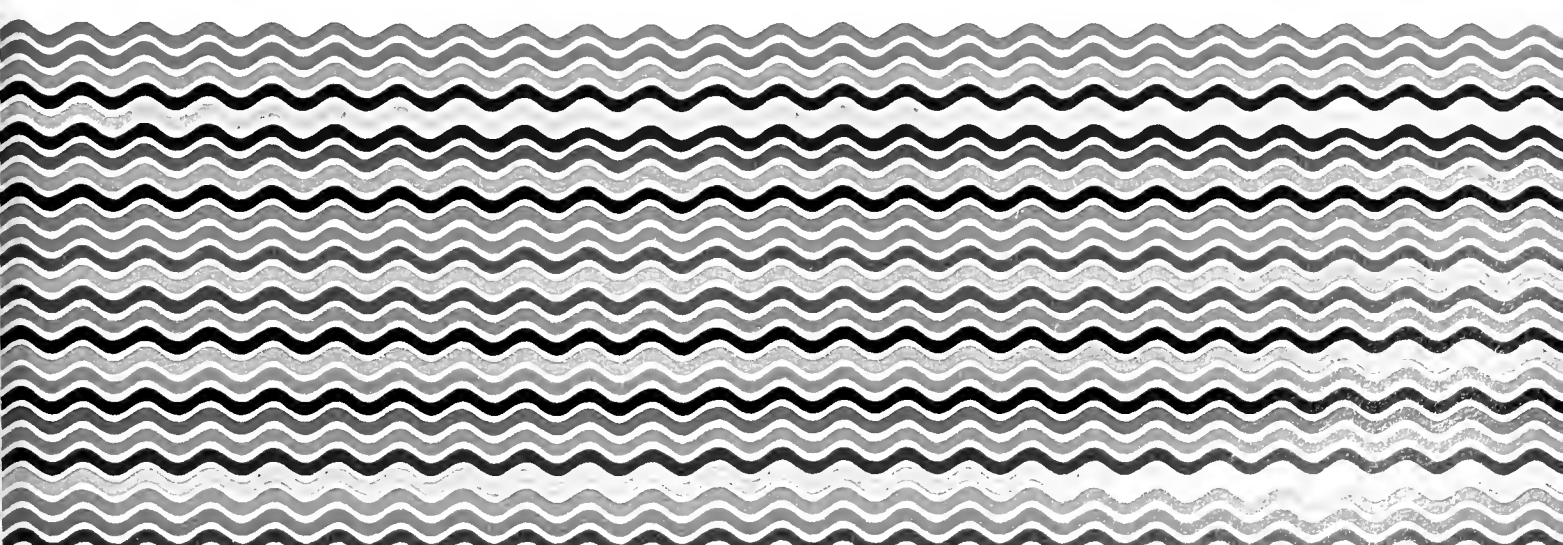
by H. Edward Wepler

While Americans are facing crises in air and water pollution in certain parts of the nation, another taken-for-granted natural resource is becoming polluted and critically congested. The resource is the radio-

*Mr. Wepler, engineering director-radio and guided waves at AT&T, is vice chairman of the Joint Technical Advisory Committee that has studied major problems affecting the radio-frequency spectrum for five years. The committee is sponsored jointly by the Institute of Electrical and Electronics Engineers and the Electronic Industries Association.*

frequency spectrum — the vast spectrum of invisible "highways" of radio frequencies traveling through the atmosphere.

The radio-frequency spectrum has become so important that if it vanished, radio and television broadcasting would virtually collapse and the nation's communications network would be severely curtailed. The spectrum's manifold uses touch the life of nearly every person on earth. The great need for



the present and the future is to assure the spectrum's most effective use in the public interest and for the national welfare.

The radio-frequency spectrum must be recognized and treated as a valuable natural resource which can be wasted like any other. Dynamic planning and use of the spectrum is particularly necessary because it has no storage capacity. Any year or even a day that a particular radio-frequency channel stands idle is lost forever. The usage next year will not benefit from the earlier idleness.

The efficient use of the spectrum is being complicated by increasing radio-frequency pollution. Just as pollutants are jeopardizing our water and air resources, the radio noise generated by our affluent society is increasing and introducing more and more interference into radio transmission systems.

Some of the radio noise is generated as a by-product in radio transmitters and radio receivers. But an even more widespread pollution is the general radio noise level created by the conglomeration of electrical devices. Even the simple operation of turning on a light switch can generate a troublesome click in a radio receiver. Multiplied by all the switches in homes and businesses, the clicks become a continuous series of interfering noises.

#### **Noisemakers abound**

Automobile ignition systems, fluorescent lights, motors, furnaces, electric fences, electric shavers, kitchen mixers — each is capable of making its contribution to the noise. Then there is the heavy electrical equipment of industry and even the electric transmission and distribution lines themselves. So common is electrical noise that researchers are able to make rough aerial survey maps of popula-

tion density from measurements of background noise.

Noise interference to television or radio entertainment certainly can be a nuisance; interference to some other systems, such as aircraft safety aids, can be disastrous.

Recent legislation provides a basis for the Federal Communications Commission (FCC) to work with electrical apparatus manufacturers to provide designs to reduce the potential interference. This should help reduce or eliminate the worst offenders, but the general background of electrical noise will continue.

Technical barriers to tapping the spectrum have been constantly overcome so the usable region is now thousands of times wider than in earlier days. But such advances have stimulated more extensive and sophisticated applications so frequency demand today is greater than ever before. A good parallel is the history of intensive construction and congestion of our highways.

According to FCC reports, nearly six million radio transmitters in the United States are licensed. They represent not only six million generators of useful information but also six million sources of potential interference to others. The numbers tell only part of the story for, in addition, many radio transmitters are operated by agencies of the Federal government for both military and peaceful purposes. In fact, about one-half of the spectrum is allocated to the Federal government, where the frequency usage is administered by the Director of Telecommunications Management (DTM), a member of the Executive Office of the President.

In facing up to the problem of spectrum congestion, complex factors extend beyond the sheer numbers of "customers"—potential or actual. The

radio transmission techniques, the bandwidths required, the powers of the transmitters and the amount of time they are on the air differ greatly for the various services. For example, complex signals such as radar and television gobble up channel widths which could accommodate hundreds of voice communications channels.

#### **Public interest is paramount**

Some services, such as the two-way mobile services, have been in almost continual evolution to increase the efficient use of the spectrum. Others, such as television broadcasting, still tie up the same broad channels that they did 20 years ago, although color has been added within the same channel. Dramatic changes in techniques to better tap the spectrum are hard to contemplate in services such as television and radio broadcasting because change might cause millions of receivers to become obsolete overnight. However, as with any natural resource, the public interest is paramount, and increased effort to preserve that interest must be expected.

Another aspect of efficient spectrum usage is the way in which the individual applications are engineered and licensed. In earlier days the regulatory bodies found it expedient to simply set aside channels throughout the country for particular purposes with the result that channels dedicated to one use (such as forestry) might be idle in some geographical areas while other services (such as police) might be overcrowded in the same area. Of course, the situation was often the reverse in other areas.

As the squeeze has tightened, improvements in allocations have been introduced. Nevertheless, recent studies indicate that further benefits may be gained by "custom-tailoring"



more of the individual applications. This has already become common in microwave radio relay for major communication routes of the Bell System and other major communications common carriers.

In major metropolitan areas, microwave beams sharing a comparatively few channels cross and recross, forming a complex pattern which closely resembles a system of arterial highways, complete with cloverleaf intersections. Such usage of the same frequencies to carry a number of radio paths through the same area, by careful planning, contrasts sharply with the poor efficiency which would result if each frequency appeared but once in the entire area.

### **Spectrum engineering**

The FCC and the communications industry are now exploring the possibility of arranging for the land mobile services to share some of the UHF television channels. This flexibility should help reduce the heavy mobile demands without upsetting the basic television plan.

In addition to the official regulatory bodies (FCC and DTM), a number of groups are studying spectrum use. For example, the Joint Technical Advisory Committee—which is sponsored jointly by the Institute of Electrical and Electronics Engineers and the Electronic Industries Association — made detailed recommendations after a five-year study for the adoption and introduction of a philosophy, termed “spectrum engineering,” to achieve full spectrum utilization and compatibility among all consumers.

Radio frequencies do not, of course, observe international boundaries. International planning and coordination of the radio-frequency spectrum is done within the framework of the

International Telecommunication Union, with headquarters in Geneva. The ITU, which is now affiliated with the United Nations, was organized in 1865 and is credited with a long series of achievements in coordinating wire and radio communications among some 130 countries.

The Bell System’s interest in radio as a means of extending its communications network has inspired continuous effort in this field for over 50 years. During this period tremendous progress has been made — both in the development of new and better communication techniques and in basic contributions to the electronics art — by many researchers all over the world. Bell System people have had a most active role.

An early, basic contribution was made by the Engineering Department of the Western Electric Company, forerunner of today’s Bell Telephone Laboratories, in developing a practical and efficient vacuum tube out of the early audion demonstrated by Lee De Forest. Widespread use and further improvements by many parties followed. Then in 1948, the invention of the transistor at Bell Laboratories opened a new era of sophisticated communication techniques and equipment.

The invention of the single sideband principle by the Bell System about 1915 was one of the early contributions to spectrum efficiency and is widely used today. Work by W. G. Cady of Wesleyan University and researchers at Bell Laboratories and Western Electric on the use of piezoelectric crystals to accurately control the frequency of radio transmitters provided substantial progress in reducing interference between stations and in narrowing frequency requirements. Quartz crystals are still the most accurate means of frequency control.

Extending telephone service to auto-

mobiles was a “natural” and led to more efficiency in the spectrum. After a period of experimentation, paralleling the work on private systems for police and other specialized purposes, a common carrier mobile telephone service was started in 1946. The service has grown continuously and Bell System companies now have nearly a thousand channels in operation in over 500 cities. Steady progress in mobile radio techniques has resulted in a 4-to-1 improvement in the use of the spectrum. That is, four channels are now being operated in the spectrum “slots” originally occupied by a single channel. At the same time, customer convenience has been increased by introducing two-way dialing and improved transmission.

The latest systems also incorporate automatic “channel hunting,” in which a large number of customers share a group of channels, with the equipment automatically searching for the next idle channel. This scheme, a carry-over from conventional telephone trunking practice, is more efficient than permanently assigning groups of customers to a single channel, as is the common practice in private mobile radio systems.

### **Higher frequencies corralled**

Studies indicate that more sophisticated mobile radio systems should enable us to take even better advantage of the spectrum and make higher frequencies available.

Bellboy® personal signaling service is a particularly efficient by-product of the work in mobile telephony. This provides for transmitting a signal to a small receiver in the customer’s pocket and ringing a tone to alert him to go to any convenient telephone. The latest system designs are capable of

servicing thousands of people on a single narrow channel, making it particularly attractive.

Over the years some of the most dramatic progress in radio has been in extending the usable spectrum by pushing to higher and higher frequencies. Such a breakthrough came with the development of microwave techniques, which involve radio frequencies much higher in the spectrum than before. At these frequencies, it is possible to provide very broadband communications channels capable of carrying hundreds of telephone conversations or the complex signals required for television and high-speed data. The microwave signals are beamed, somewhat like light waves, from tower to tower — at spacings of about 30 miles — and provide the means for solid, economical communications over all types of terrain.

The bold step forward in microwave came in 1951 when the first transcontinental TD-2 microwave system was completed. In its original form, TD-2 could provide five working broadband channels, each capable of carrying 480 telephone channels or one television program. With intensive laboratory work that same portion of the spectrum now produces 10 working channels and each may now carry 1,200 telephone channels — a total capacity five times greater than the original. Subsequently, even higher microwave bands have been opened by the development of new microwave systems.

Related developments have helped make the potential use of the spectrum even more intensive. For example, the horn-reflector antenna, resembling in principle a segment of a giant searchlight, can send transmissions in several microwave bands simultaneously. The antenna restricts the energy to a tight beam which minimizes potential interference to other

beams and permits separate microwave routes to be dovetailed closely.

Even the tremendous increase in the usable spectrum made possible by microwave radio, however, has not ended the radio congestion problem. The microwave region has become increasingly attractive to the common carriers, the government and private microwave systems.

The microwave region is also the most suitable place for communications satellites.

Radar, too, relies heavily on the microwave region; there are numerous military and civil applications such as defense warning systems, surveillance and control of the nation's airways, ground based and airborne weather radar and, of course, police speed-surveillance radar. Noncommunication applications of microwaves, such as industrial heating and cooking, also are more prevalent.

#### **Effects of rain under study**

With all of this pressure on the microwave region, there is now hope of pushing upward even more and extending this region further. This is not a simple undertaking because the effects of the earth's atmosphere, particularly rain, are much more significant at such high frequencies. Research is under way to learn more about these effects. Present indications are that once these are better understood, it will be feasible to design terrestrial and satellite relay systems in this new region of the spectrum.

Within the infrared and visible light regions the laser has become available as a means of providing highly concentrated energy beams with a wide range of applications, including communications. The laser beam is potentially capable of carrying great numbers of communications channels. But,

being in or near the visible light region, the laser beam is highly subject to the same things that obstruct human vision, like fog, rain and smog. Consequently, laser beam communication through the earth's atmosphere does not seem to offer significant relief for the radio-frequency spectrum, although it may work in outer space or confined within pipes.

The outlook is bright for innovation and invention to create new ways for the radio-frequency spectrum to serve mankind. Combined with the ever-increasing demand for frequencies for all purposes, this intensifies the spectrum squeeze. The possibility of coping with these needs lies in (1) finding ways to tap new portions of the spectrum, and (2) pressing for ways to use the present spectrum most effectively. Without such steps the day when the spectrum reaches saturation may be in sight. The effects of pollution, if unchecked, will advance the day.

The quest for more usable frequencies is largely a research problem and is going forward; the prognosis is guarded but optimistic. However, success will not offset the need for effective use throughout the spectrum.

Accomplishing this will require substantial effort by all, including the regulatory bodies. This requires careful consideration of the justification for each application in the public interest. It also requires the highest type of technical planning in fitting users into the spectrum. And it requires systems and equipment which tap the allotted frequencies efficiently.

Such steps will entail increased expense, both by the regulatory agencies and by the users of the spectrum. In fact, the control of pollution will probably add some expense for the general public. But the value of this natural resource is so great that the expense will be small by comparison. □



## The Transistor Generation

They were born in the same year as the transistor, 1947. They have come of age together.

The sights and sounds they have grown up with . . . the major events and discoveries they have witnessed . . . how and what they were taught; were all shaped by the birth of the first solid state amplifier.

If these young men and women are the "turned on" generation, the transistor, invented at Bell Telephone

Laboratories, helped create the communications that turn them on.

Chances are that seven out of ten of them will make a future career in a business or industry that depends on the transistor growth, if not its very existence. And, thanks to the continuing development of transistor technology, which has led to the integrated circuit, before these youngsters reach 30 the electronics industry will have become the largest in the world.

It all began with the search for better communications, a continuing project, not only at Bell Telephone Laboratories but throughout the nationwide communications network called the Bell System.





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January/February 1969

# BELL

telephone magazine



# The Role of Business in Education

*Excerpts from the inaugural H. Chase Stone Lecture by AT&T Board Chairman H. I. Romnes at Colorado College:*

**T**he necessity to train underqualified people for employment emphasizes dramatically the great need for better education in our nation's schools. For business must have people who can work effectively in the dynamic modern environment. It seems essential, therefore, that business should actively support efforts to improve education.

This is not to imply that business has special capacities for coping with educational problems. Business simply shares the wellnigh universal public recognition that city schools, particularly, are beset by enormous difficulties. Business knows firsthand that grave problems exist and that their solution is critically important to the cities—and to business.

What business can do to help is by no means obvious. We in the Bell System in recent years have tried to help the schools in modest ways. We have consulted with teachers and students—when invited to do so—on what is taught. We have given counsel and part-time instruction to students on topics related to communications. We have worked cooperatively with various learning resource centers.

Bell Telephone Laboratories mathematicians, scientists and engineers have made considerable contributions toward the development of modern curricula in the "new math" and also in physics and engineering. We have provided materials and teaching aids now widely used in high school science courses. Techniques in programmed learning developed at our laboratories also have had useful application in teaching disadvantaged children. And we have participated, as citizens, on many school boards.

However, in the light of today's gigantic school problems in the cities, these activities hardly seem to have the kind of impact that is required. We are therefore wrestling with the question of how we can extend more

effective help. And as we move into closer and closer association with school authorities in many cities, we are more and more struck by the tremendous opportunity to apply management skills to administrative problems.

Certainly administrative skills alone will never solve educational problems. On the other hand, school systems today are beset by the overwhelming difficulties of teaching new millions of children who bring with them all the handicaps born of poverty. And when school systems so confronted are also plagued by monumental administrative difficulties, their ability to carry out their fundamental responsibility is seriously threatened. Good educational performance can hardly be expected.

Managers in business are not inherently smarter than administrators in public education and in other civic and municipal departments. But we in business management have experience and skills to offer that could be of great value and just might be of decisive value. In my judgment, business has a responsibility not merely to offer its help but to urge its acceptance.

What might be the impact on a big-city department if a team of purchasing agents from the major corporations in the area were put in charge of purchasing methods for a year? What would happen if a team of cost-reduction engineers were invited to analyze construction procedures over a suitable period? Or what if payroll and other disbursement procedures were put in the hands of the banks?

Business skills not only can but should be used to help pump life-saving innovations into the procedures of municipal government. By equipping school administrators with practical management skills, business can help promote the businesslike operation of the community's biggest business.

# BELL

telephone magazine

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Man is nearing disaster in his relationship to a deteriorating physical and biological





onment. **Laurence M. Gould** offers a solution.



“And so we must learn to live with polluted air and water! Such is the arrogance of

“I do not believe in greater danger to our future is from bombs or guided missiles. I don't think our civilization will die that way. I think it will die when we no longer care—when the spiritual forces that make us wish to be right and noble die in the hearts of men. Arnold Toynbee has pointed out that 19 of 21 civilizations have died from within and not by conquest from without. There were no bands playing and no flags waving when these civilizations decayed. It happened slowly, in the quiet and the dark when no one was aware.”

These words from my annual report as President of Carleton College have appeared in numerous publications and have been read by millions of people since I wrote them in August 1958. But requests to use the quotation continue to come.

Why? There is no original thought in these words. The same sentiments have been expressed numberless times. They continue to attract attention, I think, first because people do care and, second, because they are becoming aware.

We are painfully aware of the growing antagonism between man and the social environment which he has created. We are all too frequently reminded of it by our racial woes, our Vietnams and our urban messes which illuminate our failure to adapt human settlements to dynamic change.

But we are less aware of what is perhaps an even more sinister situation, and that is man's relationship to his deteriorating physical and biological environment. This is the most serious long-term problem facing mankind. It derives from our everexpanding technology, which has provided us with better transportation, cheaper power and ever more opulent ways of life. At the same time, it is degrading our environment physically, chemically and biologically.

The application of science has done more than any other discipline to free man from the bondages

of hunger, fear, ignorance and superstition about his world. But in using the products of science we have been fooling ourselves with the illusion that we can have something for nothing. Every good casts its shadow. There is a price tag on everything, including the benefits that man has received from science and its applications.

Science has given man power to do almost anything he wants to do, even before he has learned what he does want to do. If man is to survive, he must become aware of the damaging effects of new technologies and balance them against possible benefits.

Perhaps there is a partial excuse for blundering into the use of water-polluting detergents, which unlike soap cannot be degraded by biological process in sewage disposal plants. There seems to be no excuse for the development of supersonic transport. That noise is not only disagreeable but is the cause of various nervous and perhaps more serious disorders is supported by overwhelming scientific evidence. Yet General Jewell Maxwell has observed that “we believe that people in time will come to accept the sonic boom” and Dr. H. von Gerke of the Air Force Aerospace Medical Research Laboratories has said, “Sonic booms are an environmental annoyance like pollution of air or water. Americans will have to learn to live with them.”

And so we must learn to live with polluted air and water! Such is the arrogance of technology which marches over every obstacle, forcing us to face the question of whether man is the master of his creations or whether indeed he is adjusting to technology.

The *genus homo*, to which we all belong, has been on earth at least two million years. For most of that time he lived in harmony with the nature that produced him. Things began to change with the development of agriculture some 10,000 years ago. The change accelerated with the discovery of the use of metals 6,000 to 8,000 years ago.

Since then man has risen, not in cooperation with the nature that produced him, but in conflict with it. As population pressures pushed him farther and

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*Since retiring as president of Carleton College, Dr. Gould has been Professor of Geology at the University of Arizona. He is former president of the American Association for the Advancement of Science.*

y which marches over every obstacle..."



farther from his ancestral home, he became increasingly reckless with his environment. He has mined the minerals from the earth. He has destroyed the forests and the grasslands and let untold millions of tons of soil wash into the sea. He has caused the extinction of at least 300 species of animals. He is fouling his own nest and destroying his own habitat and may, thereby, be destroying himself. For, if the process goes on too long, it may well become irreversible.

Primitive man did little damage to his environment. Like all living things he produced toxic wastes including his own corpses. These were decayed by nature and reused by other creatures. Recycling is as old as life itself on planet earth.

But technological man has interfered with nature's recycling processes by producing wastes that do not decay; he is the dirtiest creature ever to inhabit the earth. His glass bottles and aluminum beverage cans will outlast the oldest man-made monuments.

For the first time in human history the chief danger to our survival comes from ourselves instead of the forces of nature. We have not yet learned that we cannot bully nature but that we must cooperate and negotiate with it. Our pressure on nature is provoking nature's revenge, and we are sitting down to a banquet of consequences.

For a long time scholars believed that the decline of ancient civilizations and cities of the Middle East was due to climatic changes. We know now that this is not true. Conditions during the rise of the great ancient cultures were actually warmer and drier than during their decadence. The uplands that fed the great rivers had been covered with vegetation, which held the soil in place, until the forests were removed and herds brought in to complete the devastation. The site of ancient cities, which once stood at the head of the Persian Gulf, are now separated from it by 150 miles of delta — the eroded soil from the uplands. The same is happening to topsoil in America — and at a shocking rate.

Our boasted American civilization is built on the most wasteful exploitation of such resources as min-

# “The size of the human population is the primary key to the significant problems

erals, water, land and energy that history records. Even the rich United States is at a turning point in its history.

Today more than half the raw materials required for our own industry are imported from foreign and sometimes distant sources. We are slowly moving into the category of a “have-not” nation in terms of domestic resources. According to the U.S. Geological Survey, during the last 30 years the United States alone used more minerals and fuels than did the entire world in all previous history. And we face the grim prospect that consumption of most minerals will double within 15 to 25 years.

Recent figures show that the per capita consumption of water is about 25 times greater than it was 50 years ago. There is scarcely any part of the country where future water supply is not a matter of concern. In the United States in the last six years, 1,000 communities have had to restrict the use of water. At least 60 underdeveloped nations already face water shortage problems.

The pollution of air and water is more serious in the developed countries than in the so-called underdeveloped or developing countries. It is more serious here where applied technology is most advanced, because the major cause is the consumption of fossil

fuels: coal, oil and gas. Every day, chimneys in the United States pour 100,000 tons of sulfur dioxide into the air. Motor vehicles add 230,000 tons of carbon monoxide. New York City alone dumps 200 million gallons of raw sewage into the Hudson River every day.

It has been demonstrated that tetraethyl lead has irritating effects which decrease the normal brain function. Like any metal poison, lead is fatal if enough is ingested. The automobile industry is about 70 years old and during that time the average American’s lead content has increased 125-fold. Many authorities believe it is near the maximum tolerance level.

Mankind seems always to be confronted with some differing but continuing threat to its survival. We have brought under control or eliminated the major scourges of mankind. Now it is pollution and not disease that may do us in. If we continue to multiply without finding means of using our wastes, we will poison ourselves by them or bury ourselves in them.

There is no problem which is not complicated by too many people. The size of the human population is the primary key to the significant problems that face mankind today.

We must establish some equilibrium between population and the limited resources of earth. Man’s only hope is not to try to conquer nature, as he has



mankind today. We must establish some equilibrium ...”



been doing, but to try to live in harmony with it.

Through the two or three or more billions of years of life on planet earth, no form of life has been able to multiply indefinitely without coming to terms with its environment. Man is no exception. He too is a child of the earth. For some years, while the population has been increasing two percent per year, the increase in food production has been 1.2 per cent. The implications of this are obvious. Mankind is on a collision course with disaster. And if the present world population should continue to increase at its present rate, and there is little reason to suppose that it will be slowed down appreciably in the predictable future, then today's world population of three billion will double by the year 2000 — just 31 years away.

It is inevitable that there will be an increase in every form of social pressure with this population increase. There will be more traffic, more noise — more of everything! Heretofore disease, famine and war have been the chief leveling-off factors. We do not accept any of them any longer as tenable ways of controlling population. Yet the population increases are higher than any foreseeable economic growth. At best the world faces declining standards of living and increasing competition for earth's food and material resources. The poor countries could out-

populate the rich countries, and all hope of stabilizing world population would be gone.

There is an ever widening gap between the “developed” and “developing” nations. Fifty-two nations created the United Nations in 1945. Independence has more than doubled the membership since then. New nations account for one-third of the territory of the globe. But while gaining politically they have been steadily falling behind economically.

The dilemma that faces us springs from the noblest of humanitarian impulses, namely our innate desire to help the weak and to heal the sick. The population explosion is not due to a rising birth rate but to lowering the death rate because of the medical revolution which has effectively eliminated many of the scourges of mankind. But have we lowered the rate so that those we have saved can die a slower death by starvation? Eighty per cent of the population increase in the next 35 years will occur in countries where food is now most needed. Even now, population increases are wiping out food production increases in hungry nations. The output of grain per person in Latin America has fallen some 16 percent since the mid-1930s.

Recently Assistant Secretary of Agriculture Dorothy H. Jacobsen, a noted authority on food production,





“The crucial question is what kind of people and

said that there are now two billion hungry people with incomes too low to buy necessary foods and half a billion on the verge of actual starvation. In 1965, more food was produced than in any previous year in history, and yet never in human history was there a year when more people were hungry and starving. It is estimated that 10,000 people are starving to death every day.

Some say we have the technical competence to feed 10 billion people or more. This certainly has not been demonstrated, but even if we could do so, that is not the question.

The major question is not how many people planet earth can support but what quality of life we want for our descendants. I am sure we do not want our successors to live in a world so crowded as to be a faceless, ant-like society in which human values disappear. The major problem is one of education. It must be answered in terms of a decision of what people are for anyway.

Even with the population pressures of today it is clear that crowding makes poorer life even in our affluent society. Dudley Kirk of the Population Council cites an example from his native state: “Few people who, like myself, grew up in California would argue that California is a better place to live because of its enormous population growth. The aesthetic beauties of this state have been smothered by smog, scarred by bulldozers, corroded by mass subdivisions, made unavailable by fear of fire and overrun by population. Yet this growth served the legitimate interests of an expanding economy; it brought profit and a good income to many. The question before us now is do we want more of the same — more goods and more smog, or are we willing to sacrifice some of our gadgets for a more aesthetic environment, one in which man is less destructive and out of tune with his natural surroundings.”

We are living at a unique time in history. Ours is a time of transition. And change is apt to be painful. The remainder of this century may be the grimmest period in our history. Granted our apparent inability



ethical standards they are going to use the products of science and technology.”

to match world food production against increasing population, the next two decades are fraught with such hunger and misery as man has not yet known. But if we lift our sights a little higher to a longer view, there is hope.

I know man is indeed poised on a great abyss, but my geology tells me that somewhere there is a corresponding summit. From that summit the scientific probability of my geology persuades me that there lie ahead of life long periods of geological time.

“While There Is Still Time!” I believe there is still time to restore and preserve the quality of our environment if we are willing to pay the price. I believe we still have a period of grace.

The awareness of a problem is certainly a necessary prelude to its solution. We are becoming aware and we do care.

The crisis which faces us is primarily an intellectual one, and in all intellectual crises it has been the belief in the possibility of a solution that made the solution possible. We are just beginning to tap the world’s intellectual resources. The greatest quantum jump in the extension of man is in the computer or cybernetic revolution. Computers are creating a greater revolution in the field of intellectual effort than machines in transportation. Computers can calculate millions of times faster than man, but our fastest machines move only about 5,000 times as fast as man can walk.

We also are standing at the threshold of abundant energy worldwide. The world has always been ruled by energy in one form or another. Today, the greatest gap between the “have” nations and the “have-nots” lies in the use of energy. Over large parts of the world the per capita consumption of energy is less than one-tenth that of Great Britain and less than one-thirtieth that of the United States.

Obviously, we can’t depend indefinitely on our fossil fuels: coal, oil and gas; but the light is breaking in other areas. The new breeder reactors are going to increase nuclear power enormously. We are going to make use of a large part of the fission energy of the abundant U238 ore or of thorium. One thousand

tons of this ore will produce as much energy as three billion tons of coal per year.

We appear to be on the threshold of liberating thermonuclear power which alone could blanket the earth with energy within the reach of all. And there’s a reasonable prospect that we shall soon be emulating the stars by using fusion energy of atomic nuclei.

With abundant cheap energy within the reach of all, there need no longer be underdeveloped countries. The inequalities of wealth and poverty can be equalized not by leveling down but by leveling up. This is the first age in man’s history in which people have dared think it practicable to make the benefits of civilization available to the whole human race. Never has the world held greater promise of things to come. The supreme irony of our time is that we are so close to man’s perpetual hope of well-being and yet never before so close to extinction. The grimest statistic of history is that the two major problems facing mankind may, and could, cancel each other out — namely, the population explosion and global nuclear conflict.

“While There Is Still Time!” It takes an act of faith even to imply that there is still time — faith, not in science or technology or things material, but in man himself — in a belief in his sense of justice and the preponderance of the creative and cooperative impulses over the competitive and the destructive. The crucial question is what kind of people and with what ethical standards they are going to use the products of science and technology.

Can we restrain our fears and our hate until we can create an adequate organization of society that will utilize the new tools of science and technology for peace and security? This is the ultimate question and it is urgent.

If we can do this and use the new powers science has given us and use them humanely for the benefit of all mankind, realizing that the human estate belongs to all men everywhere, we have the hope, the hope that a new renaissance can be ours — a renaissance in which all mankind can share. □

*"The committee feels that it must advise against any investment whatever in Bell's scheme . . . any development of the kind and scale which Bell so fondly imagines is utterly out of the question."* — 1876



*"The telephone is rapidly coming into general use . . . It is simple, economical, and not easily put out of order. It seems not improbable that it will soon . . . connect offices, tradesmen and private houses with each other. . . ."* — 1880



*"Commercial Use of Television in Doubt?"*  
— 1927



**NOW YOU SEE**

See-while-you-talk Picturephone® service is on the brink of expansion



*“Tom Swift uttered a CRY OF JOY, or there, staring at him from the plate (next to the telephone), was the face of Ned.”*  
— 1914

**“By the early 1980’s, there may be a million PICTUREPHONE sets working in this country, enabling people to SEE each other while they TALK, coast to coast, on the phone....”**



dimension in communications promises more varied uses of the phone itself



**W**ho would have believed in 1876 that there would be 109 million telephones in the United States in 1969? Or in 1927, who would have thought there would be nearly 75 million television sets in American homes?

Likewise, how many people would speculate today that there will be more than a million Picturephone® sets in use in the early 1980s? But that's just what some prognosticators are saying. Few forms of communications have captured the public's imagination as readily as "see-while-you-talk" telephone service.

Although a general offering of Picturephone service is still a few years off, results of a product trial just getting underway and a market survey now being taken should provide some of the answers as to where and when the service will be introduced.

The product trial involves some 40 new "Mod II" Picturephone sets that have been installed in the

New York and Pittsburgh offices of the Westinghouse Electric Corporation. The trial is designed to test the feasibility of a new intercity transmission system and several new features that have been incorporated into the new Picturephone sets.

Consisting of interviews with business customers of all sizes, the market study seeks to find answers to such questions as how Picturephone service will be used, what rate levels will be acceptable to customers, what types of customers will most likely find a need for it, and how fast facilities will have to be added to the communications network to handle the growth of the service.

These questions are only an indication of the problems the Bell System faces in developing Picturephone service.

The acid test will be the actual introduction of service. For how can the public be exposed to Picturephone service unless it is offered on a commercial basis? And just how commercial *is* the service? Its introduction, however gradual, on a nationwide scale



is not like distributing a new item to a few hundred supermarkets to test its sales appeal. Billions of dollars may eventually be at stake. How should they be spent, and where? Which of hundreds of switching centers in America's cities should be equipped for Picturephone service? Just how much capital will be needed, and how shall it be obtained?

Finding the right answers to such questions will make the difference between successfully introducing a new and useful service to the public, and producing a costly error.

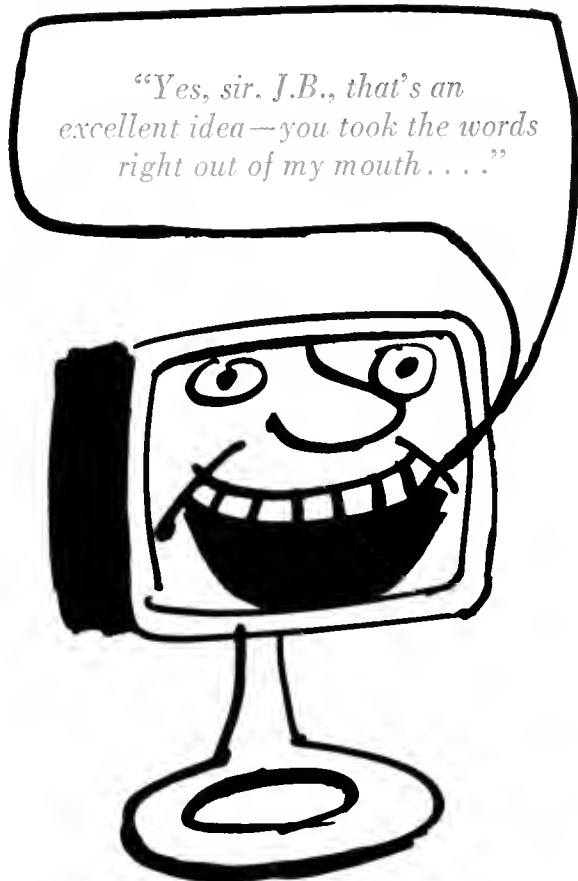
The two current studies are merely the latest in a long series of steps dating back to the initial public demonstration of Picturephone service at the New York World's Fair in 1964. In June of that year, regular commercial service was introduced between Picturephone centers in New York, Chicago and Washington, D.C. Although useful from a technical standpoint, the three-city hook-up has provided limited measurement of the usefulness to customers of Picturephone service since individuals have to

make arrangements in advance and then go to the Picturephone centers to complete their calls.

Nevertheless, the Picturephone service in those locations has given some indications of its widespread potential. Late last year, for example, a group of deaf people in New York were able to "talk" with deaf individuals in both Washington and Chicago.

A product trial of an earlier version of the Picturephone set at Union Carbide Corporation offices in New York and Chicago, in addition to being a new experience for the users, produced some valuable information for the Bell System. Review of the trial showed that the primary reason for the importance attached to Picturephone service was that "it gets results which we cannot get via the telephone." For Union Carbide, Picturephone service became valuable as a method of communication which uniquely bridges the gap between a face-to-face meeting and a conventional telephone call.

Although Picturephone service gained in the esteem of its users as they became accustomed to it,



the trial, as does any experiment, indicated the need for certain improvements. These have been incorporated in the Mod II Picturephone set, to the customer's advantage. For instance, the new screen is wider to permit more side-to-side movement and less difficulty staying "on camera." The camera lens is now directly over the screen to give better eye-to-eye contact, and variable focus permits the user to lean back in his chair, move close to the screen, or even walk as far as 20 feet away from the set. The Mod I user had difficulty referring to a small chart or object. Now the Mod II has a "graphic mode" which bends the camera focus downward to the desk top immediately in front of the set.

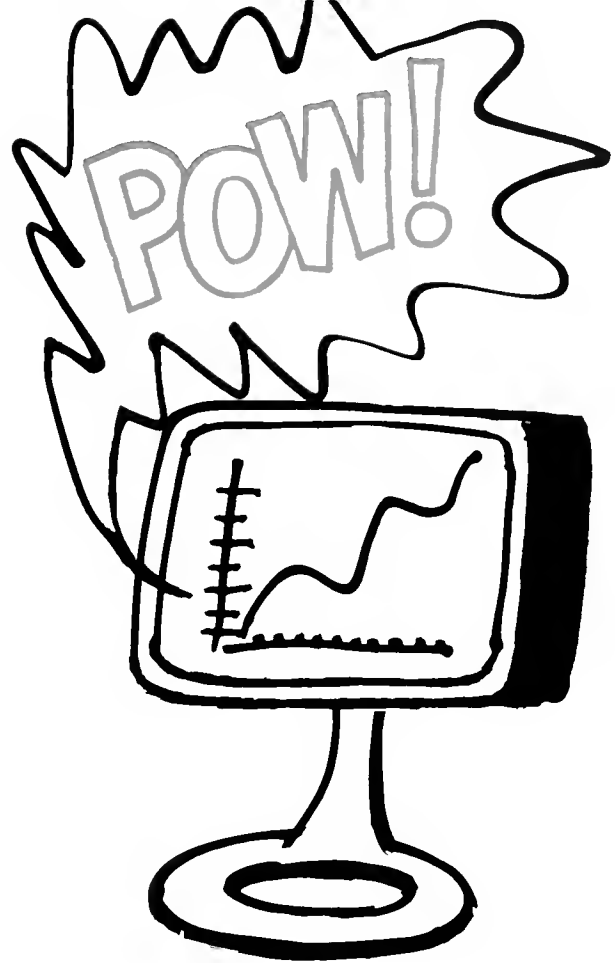
Other improvements include a zoom lens arrangement, a picture height adjustment, a locking button for self-view, a nearly-360-degree swivel for the set itself, and improved picture quality under ordinary room light.

These changes embodied in the Mod II Picturephone set are being evaluated in the Westinghouse Electric product trial. This trial and the market study

will be "go-no-go" indicators that will help Picturephone planners decide whether their product is really workable technically and marketable practically. If the trial and study indicate "no-go," the idea will be shelved, at least for the time being. If the indication is "go," the Bell System will move into a full-scale program to prepare for a standard Picturephone service offering. The latest estimate is that the service may be introduced on a limited scale late next year.

The question of *where* it will be offered initially is about as important as *when*. Picturephone planners assume that the service will commence where there are potentially the most varied uses for it, and where the need is greatest: in large city areas with a high concentration of business customers.

There are several reasons for this assumption. First, there is already an indication that the initial demand will come from the business market. High density telephone areas in large cities contain a broad cross-section of the business community of interest. This is true within the management of one corporation as well as between the managements of dependent or



related corporations. Therefore it is logical to expect an initial demand for the service as an inter-company communications link, within one telephone exchange, with a good deal of auxiliary use as an inter-com. As more and more business customers take Picturephone service, it will probably expand to intercity use.

Second, rates will be high compared to telephone rates, and business customers who have a real need for the service will be more likely to subscribe to it than residence customers. Third, downtown areas will more readily conform to the technical restraints imposed by video transmission. And this, finally, suggests a good environment for the rapid development of Picturephone as a part of the telephone network.

Integrating Picturephone service into the nationwide telephone network will mean major additions to the capacity of the network and the expansion of new technology. Long distance Picturephone service will probably involve use of high speed digital transmission systems. This new technique converts voice, video, data or other signals into a stream of coded

electrical pulses. Once converted, all signals "look alike" and are interleaved for maximum use of each channel. At the receiving end, the pulses are decoded and converted back to voice and pictures. Since a Picturephone signal requires about six million pulses a second — enough to carry about 100 telephone calls — channels of the future will have to handle hundreds of millions of pulses a second.

The Picturephone set may function as a remote computer display terminal, accommodating about 400 characters of computer output, and small charts or graphs. This capability for computer access — especially among business customers — could rival the use of Picturephone service in face-to-face voice communication.

With all of its intriguing possibilities as a new mode of communication, Picturephone service is envisioned as a natural adjunct to regular telephone service — an evolution of basic telephony. How Picturephone service progresses after its introduction will depend in the final analysis upon the person it is designed for — the customer. □

The National Alliance of Businessmen has made notable progress in helping the hardcore unemployed.

But warning signs are emerging that the second year may be more difficult than the first.

# You cats can do it, but will you?

by Thomas Calcerano

**A**lthough progress reports from the JOBS program of the National Alliance of Businessmen seem to refute Daniel Patrick Moynihan's comment that "the business community has treated the urban crisis as another wrinkle in its community chest work," few businessmen are ready to offer Mr. Moynihan a smug rebuttal.

The business community has, in fact, responded resolutely to the NAB challenge and is virtually assured of surpassing, several months ahead of schedule, its first-year goal of placing 100,000 disadvantaged persons into permanent jobs. But a simple tally of numbers does not measure success.

Responsible businessmen readily admit that the hiring procedure merely marks the opening round of this complex venture. In essence, they concede that the second year of NAB participation may entail more perplexities than the first.

While the NAB's immediate goal is to find jobs and match them with people who need work, its long-range aim is to help a non-productive, underqualified individual—one who, in many instances, may have lost hope—become a viable, productive member of an organization and society.

This involves more than bringing together an individual and a job. It means coping with the complex array of problems in fitting human beings into organizational settings. In some cases, it requires extensive human rehabilitation, a task that will undoubtedly prove to be one of the most difficult undertakings ever attempted by the business community.

Business and industry, of course, have had limited experience with individuals identified as hardcore unemployed. In the past, such a person seldom got close to a company's employment office. When he did, he was usually rejected on sight. Businessmen understand few of his problems, values, attitudes, social habits and limitations, and many are poorly

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*Mr. Calcerano, information manager—educational relations at AT&T, served as director of job procurement and placement while on loan to the National Alliance of Businessmen.*

**DISCO** Training  
**JOB**  
Sensitivity  
**Equal**  
**AA**  
**FF**  
Hondcpre

employment



prepared to receive him and are ill equipped to facilitate his growth and development.

Because we are doing things we have never done before and because the effort is on a comparatively large scale, new insights are required.

First, present employees must understand the validity of our reasons for hiring the hardcore unemployed. An explanation of the relationship between corporate social responsibility and corporate profit-making is needed.

Second, we must accept the fact that participation in the NAB endeavor is not merely a glorified extension of something we have been concerned about for a number of years—equal opportunity employment. Both the NAB and Plans for Progress programs are part of the same social phenomenon. But they are different programs and should be addressed differently, handled differently, discussed differently.

To be more specific, equal employment opportunity has its basis in non-discrimination—equal treatment. Plans for Progress, in effect, says, “if an individual is qualified, give him the job regardless of the color of his skin, regardless of his religion.”

On the other hand, when tackling the problem of the hardcore unemployed, we are engaged in a program that quite realistically has its basis in discrimination. We are giving a segment of the population special treatment in order to qualify those whose opportunities have left them at a serious disadvantage in ability to earn a living.

Therefore, the two programs are built upon different concepts even though they are designed to attack the same broad problem. This fact must be clearly articulated throughout the organization to prevent barriers of mistrust and resentment.

It is equally important to emphasize that special treatment does have a terminal point, even though we cannot clearly spell out when that point will come. We must keep in mind that our ultimate intent is to have the underqualified employee become part of the mainstream of the work force. This means he needs to be treated with the same dignity and will,

within a reasonable period of time, have to meet the standards of achievement expected of others.

Third, we need to examine in detail the full nature of our commitment. We must recognize the need for special management skills, more patience, more open-mindedness and more forbearance than normally needed in the employment and training process. Present employees may have to make as many or more adjustments than the new employees in terms of personal relationships and reevaluations of biases or stereotypes.

**O**rganizations that have dealt with the problem of training the underqualified poor have stressed that the first-line supervisor is the key to success or failure of the job program. We need to help the first-line supervisor see his new employees as individuals with explainable shortcomings and defensible differences.

By the same token, some kind of special exposure, experience or training may be needed for middle and upper management people to help legitimize the program by giving it credibility and establishing a receptive, supportive climate for the first-line supervisor.

It is also important to recognize the rank and file employees' influence on morale and work atmosphere. Many regular employees come from a segment of society that feels threatened by programs that offer the disadvantaged new and improved opportunities. They see themselves as possible victims of preferential treatment for others who are rising in status as a result of newly given opportunities.

Essential as it is, understanding of the problems of employment and training for the underqualified is also intangible. It helps, but does not guarantee, effective performance and accomplishment. Then how do you translate understanding into proper action?

There are many steps we can take, but one of the first should be to reexamine and probably modify many of our hiring, firing, placement, training and promotion policies and practices insofar as they pertain to the underqualified. There may be the need



to establish an ongoing retraining and upgrading program since any organization that intends to carry its share of the JOBS program cannot afford to be sluggish in promoting individuals who demonstrate ability and potential.

By recognizing and promoting people who qualify, we will avoid the stereotype of "second-class jobs for second-class citizens." We will prevent the unemployed of today from becoming the underemployed of tomorrow. Those who move ahead can motivate others who follow to succeed. We will also dispel suspicions of a phony program of false promises and tokenism.

Since the business community is faced with a three-year program of putting 500,000 hardcore unemployed into productive jobs, it must open up entry-level jobs regularly in order to absorb the next wave of new employees.

Training must be total. We cannot prepare the individual for a specific job skill while ignoring the many other deficiencies he may bring with him. We need to take him as he is and work with him as a total human being so he stands a chance of becoming an integral part of the work force. Therefore, it is necessary to consider the whole gamut of supportive services not previously required. Among them are transportation, medical assistance, and counseling in work habits and basic life skills like health and hygiene and personal budgeting. Though we do not necessarily have to furnish these directly, we must see that they are provided.

**S**ome new employees, of course, may prove to be non-salvageable. But we must be willing to scrutinize situations carefully and objectively and try some remedies before releasing individuals for such faults as absenteeism or tardiness.

All these ramifications offer stark evidence that the JOBS effort is considerably more than a simple numbers game. Apparently successful in the numbers test, the business community must now prove its mettle in solving contingent problems.

Even though business now has more credibility in

the ghetto than the institutions of government or education, there is only partial credibility. Black leaders have been saying, with considerable justification, "You cats can do it, but will you?"

If we do not do it, we may have to accept massive public works programs or government-created jobs in both public and private sectors at a cost of many billions of dollars more than it will otherwise cost.

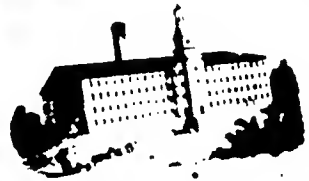
On the other hand, if we succeed, the benefits that will accrue to society will be enormous. The entire social fibre of the whole nation will be strengthened.

In terms of dollars and cents, business can help "tax-eaters" become taxpayers. If 500,000 hardcore unemployed can be placed and kept on productive jobs, \$320 million can be saved annually in welfare payments alone. Moreover, these workers will have a net income of more than \$1 billion annually to plow back into the economy.

**F**or the business organizations that get genuinely involved in hiring and training the hardcore unemployed, there may be some additional gains. Some organizations will acquire much needed manpower by tapping new resources. For others there is the opportunity to learn, to gain new insights to help them function in a highly volatile, technological society. In the process of adjusting and accommodating itself to a new type of employee, an organization may discover ways to accommodate itself more effectively to all its employees. It may discover better ways of managing, more effective ways of training employees, improved organizational arrangements, new ways of making work more meaningful, more effective ways of utilizing human resources.

Enticing as the potential rewards may be, however, the battle against the ills that plague our cities will surely be long and sometimes frustrating. Perhaps the JOBS program adds up to an arduous assignment that taxes the limits of plausibility. Perhaps it contradicts confirmed criteria for corporate success. But the immensity of the challenge is commensurate with the seriousness of America's urban dilemma and the obligation of business and industry to help solve it. □

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Universities face more harsh student criticism and revolt unless they more effectively meet needs of perceptive young people, says a student-oriented college professor.

by Roger R. Woock

# Student Activists and Higher Education



“**O**ur earth is degenerate . . . children no longer obey their parents.” From that 6,000-year-old lament carved in stone by an Egyptian priest down to the present day, social commentators have perennially decried the disobedience of the young of their times.

In an historical sense, there is nothing particularly new about the recent disturbances, uprisings or revolutions that have been taking place on American campuses. Nor are they unique geographically since students in societies as different as Mexico, France, Poland, the Soviet Union and Czechoslovakia have been complaining, struggling, rebelling and rioting against both their societies and their universities.

One seemingly new phenomenon that has disturbed the casual observer of the American student revolt is its apparent unity and organization. Similar demands and tactics are used to confront university administration and local government officials across the country. Yet this supposed unity is more fiction than fact and is most probably a result of the coverage provided by the mass media. The tendency to see just one student movement and just one set of demands is unfortunate because it prevents a real understanding of the situation.

Who are the students involved?

“The present generation of young people in our universities is the best informed, the most intelligent, the most idealistic this country has ever known. This is the experience of teachers everywhere. It is also the most sensitive to public issues and the most sophisticated in political tactics. Perhaps because they enjoy the affluence to support their ideals today’s undergraduate and graduate students exhibit as a group a higher level of social conscience than preceding generations.”

This quotation from the Cox Commission Report, an analysis of the crisis at Columbia University, may well be true. But the first thing that needs to be said about students in American universities is that most of them are politically and socially uncommitted. In

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*Dr. Woock teaches sociology of education at Hunter College of the City University of New York. He is co-editor and author of the book, Man Against Poverty: World War III, and several articles, and plans to teach a course on the crisis in higher education.*

none of the recent student confrontations at Columbia, Wisconsin, Berkeley or at smaller colleges and universities throughout the country has student activity and participation involved anywhere near the majority. In a few cases the majority provided quiet and passive support and in many cases not even this.

The fact that demands have been made by a minority of university students does not, of course, reflect on their merit; nor does it reduce the seriousness of the situation since there is evidence that the student activists are of a higher intellectual and academic caliber than nonactivists.

## University reform sought

Among those students who do participate in demonstrations and sit-ins, the largest number might fairly be labeled "liberal." These are students who are opposed to the Vietnam war, who believe that more nonwhites should be admitted to American colleges and universities, who would like to see stronger civil rights legislation, including open housing ordinances. Even the moderate National Student Association, a nationwide organization of college student governments, is concerned with these issues.

In addition to supporting these social goals, the liberal student is also interested in moderate university reform. He supports more student participation on university committees and increased contact between faculty members and students. The liberal student's view is that none of the social or university problems represent a fundamental failure of the system but rather mistakes or aberrations that can be removed by making the government aware of the citizen's desire and by consultation with university officials.

A smaller group of students may be reasonably called "radicals." These students support the same social and university goals as the liberal students but differ significantly in their judgment about the methods needed to achieve them. A radical student view-

ing the war in Vietnam, for example, is likely to judge it to be part of a larger pattern of American foreign policy rather than an isolated error. He views the "systematic exploitation" of nonwhite Americans not merely as casual cruelty but as an important part of the social structure of American society.

In the area of university life, the radical student views the deans and administrators as members of the power structure in society and, as such, very unlikely to willingly give up their power and authority. Radical students maintain that more disruptive tactics are likely to be successful; they believe sit-ins and lock-ins or lock-outs are necessary in order to achieve their objectives.

They argue, for example, that their tactics at Columbia University were in large measure successful. Of the three stated objectives, all have been in large measure achieved. The students were clearly responsible for stopping construction of the new gymnasium on the adjacent public park site used by Harlem residents; for Columbia severing its relationship with the Institute for Defense Analysis; and for the early resignation of Columbia's president, Grayson Kirk. In addition, during the fall semester Columbia made every effort to involve students in a great variety of university committees on which they were unrepresented before the Spring agitation.

Besides the inactive, liberal and radical students, there is another small group that may frankly be described as "revolutionary." These are students who are devoted to effecting radical change in the university and wish to use the university as a base for creating a revolutionary situation in the larger society. Although few in number and not very influential among other students, the revolutionaries, because of their extreme statements and occasional violent actions, have been focused on by the mass media.

When a Tom Hayden or a Mark Rudd calls for more Columbias or more Chicagos (i.e., the violent confrontation surrounding the Democratic convention last August), mass media present such statements as

being representative of all active students in American universities. This is simply not true. The gap between revolutionary rhetoric and the real possibility of wide-scale violence or revolution à la France or Germany is a vast one.

The one issue which clearly unites the widest political spectrum of students is opposition to the war in Vietnam. This unpopularity is particularly widespread among young men of fighting age, since a personal stake in draft resistance must be added to the political, social and ideological reasons for opposing the war. It seems to be only on the Vietnam issue that the liberals, radicals or revolutionaries can persuade some of their inactive and uncommitted fellow students to join them. Even here the number of students who have been seriously active has been small. Participants in anti-Vietnam events at Columbia since May 1965 ranged from 18 engaged in a sit-in up to 800 who demonstrated against permitting the U.S. Marine Corps to set up recruiting tables on campus. Even the 800, however, represents a figure of less than five per cent of the total student body of Columbia University and Barnard College.

## Nonwhites offer rallying point

The treatment of nonwhite Americans is the other social issue on which liberal, radical and revolutionary students can on occasion combine their efforts. Besides the general feeling of outrage and indignation at the role of minority group members in American society, students are particularly sympathetic to the special problems of nonwhite students in colleges and universities. At large urban universities that are situated adjacent to poor black communities, students view the effects of racial discrimination and poverty firsthand. These on-the-spot observations result in a considerably more militant posture. Add to this the fact that some large universities are, in effect, slum landlords, and the students' reactions are

not especially difficult to understand.

Separate from but overlapping with the Vietnam war, race relations and poverty in the United States is the role of the university in relation to the larger society and its centers of power. Student activists want the university to become more independent from the power center in American society. This demand points to an extremely complicated problem, that is, the nature of the relationship between government-industry and the university.

## Some professors support activists

In recent years the special skills and knowledge of university faculty members have become increasingly important to both government and industry. John Kenneth Galbraith in *The New Industrial State* has gone so far as to suggest that knowledge itself is replacing capital as the most important input in the development of American industry. Another factor is the rising cost of education. Research grants are a vital source of income for most top-level universities in the United States.

Student activists' demands for a more independent stance are supported by a fairly sizeable number of faculty members. At the very least, many professors feel that American universities are maneuvering themselves into a position from which they will be unable to fulfill one of their historic and extremely important functions, that of criticizing society objectively. How much unbiased analysis may be expected from a political science department that has just received a \$2 million Federal grant to devise more effective methods of political and para-military warfare? Other faculty members argue that it would be suicidal for the university to cut itself off from contact with and possible influence on the centers of power.

The major academic issues to which student activists have been addressing themselves are the nature and quality of the curriculum and the lack of contact

between students and faculty in the university community. Criticisms of curriculum are related to the closeness of the particular discipline to problems in contemporary society. Most frequently and vociferously attacked have been sociology, political science, anthropology, psychology, economics, and to some extent, history. To a lesser degree philosophy, English literature and the humanities have been criticized, while practically no concern has been directed toward the natural sciences or mathematics. Student criticisms of the social sciences are twofold: (1) That by and large they avoid discussion and analysis of controversial problems in American society; and (2) When these problems are dealt with, it is from an "establishment" point of view.

Student demands for more freedom and individual responsibility in their personal lives should also be mentioned. Here again is an issue that unites a broad spectrum of students since almost all judge the traditional "in loco parentis" as old-fashioned.

Perhaps because of student unanimity, universities have been moving rapidly to provide the freedom demanded. Indeed, some universities have removed themselves from the role of parental guardian even before student demands could be organized and articulated. It is probably safe to say that within the next five to 10 years practically all nonreligiously affiliated institutions of higher learning will have relaxed social regulations to the point where students will have complete control of their social life.

## Students not taken seriously

One of the more interesting aspects of the student revolt is the amount of attention it has captured in both the mass media and academic journals. More and more professors are rushing into print with their insights on either particular university conflicts or the general situation. Much of the academic writing is defensive in nature and treats student demands and

behavior as without merit. Indeed, an entire recent issue of the quarterly, *The Public Interest*, was devoted to "The Universities" without once considering that something might be basically wrong with the structure of American higher education. One could better understand this inability to take students seriously or to consider them reasonable and rational if it did not come from academics who teach and presumably interact with students.

One might hazard a generalization that it is the failure of the academic community, both administrators and faculty, to take students seriously that forces them to become more radical both in goals and means. Students at Columbia had petitioned for a year to persuade the university to stop construction plans for the gymnasium. They got nowhere. In most cases their efforts were not even acknowledged. But in a week of forceful occupation of university buildings, the students succeeded in what they had been unable to achieve by more moderate means. The lessons of Columbia will not be lost on other students who have had little success in capturing the attention of their faculties and administrations.

Suggestions for solving problems presented by the student revolt are generally addressed solely to university administrators. In fact, they most often consist of sophisticated ways of conning students and/or splitting the activists into conflicting groups. It is quite clear that student demands cannot be dealt with solely by university administrators. Other groups must be involved.

The general public must stop viewing activists as either "kooks"—that is, irrational, emotional children—or, conversely, as dedicated agents of a vast conspiracy with connections in other parts of the world, particularly behind the Iron Curtain. Both of these views are widespread and are sometimes held by the same people.

The mass media can assist by devoting less attention to the sensational aspects of student activities, playing down the incidents of violence or force and

the occasional extreme dress style, long hair, beards, beads, etc. The mass media should concentrate more on a reasonable in-depth analysis of what the students are saying and what changes they are seeking.

Alumni—particularly of those universities that have been the scenes of confrontations between students and administration and/or police—have a crucial role to play. So far alumni response has been confined to shrill demands for a university crackdown on dissidents. More helpful would be a position of openness and support for administrators. It is particularly difficult for an administrator to deal responsibly and effectively with student demands when he knows that alumni groups, along with boards of trustees or regents, are not likely to support agreements he makes with students.

## Five steps recommended

Finally, there are a number of steps that the faculties and administrations of American universities must take: (1) Increase student participation in many areas of college life. This includes giving students the right to regulate their personal and social lives and adding students to almost all faculty and administrative committees. Tokenism—the appointment of one student or a “student adviser” to various committees—will clearly not be satisfactory to the activists.

(2) Universities must meet demands for increased interaction between students and faculty. This must include a reduction in class size and an increase in seminars, tutorials and independent study under individual faculty direction. The problem here is financial. Indeed, many deans and college presidents argue that they would like nothing better than to provide such increased contact. But they are unable to do so. Alumni and the general public must develop additional financial resources that would enable colleges and universities to provide a rich and meaningful intellectual experience.

(3) Changes in the curriculum suggested by stu-

dents must be carefully considered, especially in the social sciences. Courses that look objectively and critically at the whole structure of American society must be provided.

(4) Serious attention must be given to the present relationship between the university and government and industry. At the very least this means a completely open and frank description of the relationship that exists. The university should be accountable to the public and its students for the research it does and the financial support it receives. Beyond that attempts should be made to consider carefully changes that would support the university as an independent and critical institution.

(5) For universities located in urban areas, special attempts must be made to improve relationships between the university and the surrounding community. It may mean that universities must change their real estate practices to meet the needs and demands of the growing number of urban nonwhites.

These recommendations, of course, would not satisfy all students. Revolutionary students, for example, feel that the American university and American society *cannot change* themselves voluntarily. But the question of whether certain students would or would not be satisfied is really beside the point. What is important is the need to produce a better system of higher education in the United States.

By and large, student activists have been attempting — sometimes successfully, sometimes unsuccessfully, sometimes peacefully and with little publicity and sometimes forcefully and dramatically — to move the structure of the American university as they feel it should move in any event.

Students have been, by and large, more perceptive about the real problems of American society and higher education than have their mentors or the general public. It is the existence of this student creativity, imagination and spirit that should sustain the academic community and the American public in the difficult years which lie ahead for education. □

# BELL

## reports

### Picturephone® Service May Benefit From New Transmission Technique

Conditional replenishment, a new method of transmitting only those elements of a picture that change between frames every thirtieth of a second, is aiding the search for more economical Picturephone® service. (See pages 10 to 15.)

The method, devised at Bell Laboratories, holds promise of allowing three Picturephone calls to be made over some facilities that might otherwise carry only one.

Picturephone service, which the



White dots in this video-telephone picture show areas of significant change during face-to-face communications. An experimental technique, called "conditional replenishment," transmits only these changes to update previous picture.

Bell System is developing for commercial use in the 1970s, transmits all information about the picture 30 times each second. Since there is little change in the picture at that speed, the present technique transmits much repeated information.

Conditional replenishment eliminates most of this redundancy without reducing picture clarity. It converts video signals from the camera into electrical pulses representing the picture. These are compared with pulses of a reference picture stored in a memory device.

When a significant difference exists between the new and reference pictures, the stored picture is updated, and only the information required to update the reference picture is transmitted. Within a fraction of a second the received picture information updates a similar reference picture.

### College Group Gets Special Network

Sixteen colleges and universities in Kansas, Iowa and Missouri will soon use a unique communications network to share their resources. The facilities are being completed under a project of Southwestern Bell and AT&T Long Lines.

First of its kind in the United States, the network will allow students and faculty at any of the institutions to hear lectures and participate in seminar discussions conducted at any other institution in the group. Telephone lines and tele-lecture or speaker phone equipment will be used according to audience size.

Other features of the network include the use of teletypewriter, facsimile, closed-circuit television, tapes from audio libraries and laboratories plus facilities to allow transmission of written notes and illustrations.

Eventually, Data-Phone® service will link two computers that will provide instant retrieval of information by students and faculty.

Participating institutions belong to the Kansas City Regional Council for Higher Education.

### Substantial Growth Marks 1968

The year 1968 was one of significant Bell System growth, much of it in record proportions.

According to recent estimates the System tabulated a record gain of 4.2 million telephones and boosted the total number in service to 88 million, also a record. There are now more than 108 million telephones in the United States; at the end of 1967 there were 103 million.

Telephone messages carried over Bell System facilities rose to 105 billion in 1968, up four billion from the year before. On the average business day the System logged 316 million completed calls. This constitutes a boost of more than nine million over the comparable 1967 figure.

Long distance calls were up more than 11 percent to an estimated 5.9 billion in 1968; overseas calling volume went up 24 percent to more than 15 million.

Outlays for expanded services and facilities also rose significantly. For the third consecutive year the Bell System spent more than \$4 billion for expansion and improvements. The figure was \$4.7 billion in 1968, up from \$4.3 billion in 1967 and \$4.2 billion in 1966.

To help finance this growth, the System sold 13 debt issues totaling \$1.2 billion; bank loans and commercial paper amounted to \$320 million. As a result, the System's debt ratio moved to about 36.5 percent, up from



35.4 percent in 1967. Interest cost for bond money ranged from a low of 6.3 percent, to a high of 6.97 percent, the highest cost for the Bell System since 1921.

Bell System physical facilities (instruments, lines, equipment, building, etc.) now represent an investment of about \$45 billion, compared with \$41.5 billion at the end of 1967.

By year's end the System's employee body numbered 870,000. A year earlier it was 841,200.

### Small Crystal Is Large Storage Bin

Bell Telephone Laboratories scientists have found that a crystal smaller than a lump of sugar can store as many as 1,000 different holograms—photographic records made with laser beams in a form of lensless photography.

Holograms are generally known for their ability to reproduce three dimensional images, but they are equally



*Bell System research and development require increasing use of precious metals and gemstones, some of them homegrown. The large cluster of yttrium-iron garnet crystals displayed here, for example, was artificially grown in a solid platinum crucible at Bell Telephone Laboratories. Produced in ovens that reach 1300°C., the crystals are used in microwave research.*

important for their potential capacity to store huge amounts of information.

The lithium niobate crystal shows promise for temporarily storing as much as 1,000 times more digital or pictorial information than conventional holographic materials. Such an "optical memory," from which desired information could easily be retrieved or erased, is of great interest for possible switching applications in the Bell System network.

In the Bell Labs experiments, a single, cubical crystal of lithium niobate is placed on a rotatable platform. Functioning as an ordinary holographic plate, the crystal records the complex interference patterns of light waves as one laser beam is split into two parts. One part, shining directly on the crystal, is the reference beam. The other, shining through a transparency of the object being stored and striking the crystal, is the object beam.

After a hologram is formed through the one-centimeter thickness of the crystal in one direction, the crystal is rotated a fraction of a degree for each new hologram to be stored.

### Two Films Win International Awards

Two recent Bell System films have been recognized for creative excellence at several European and American Film Festivals.

"Memento," an auto safety film produced for AT&T by Columbia University's Center for Mass Communications, was awarded the Grand Prix at the International Industrial Film Festival, held in Vienna, Austria. It is the first American film to win the award.

The same film finished first in its category in the San Francisco Film Festival and was awarded a Golden Eagle by the Council on International Non-theatrical Events (C.I.N.E.), an organi-

zation which selects American films for overseas film festivals.

"Incredible Machine," a Bell System film on computer graphics produced by Owen-Murphy Productions, was awarded the Grand Prix for technical films at the Pardubice, Czechoslovakia Film Festival.

It was a finalist in the Golden Mercury competition at the Venice Film Festival in Italy, took firsts in its category at San Francisco and at the U.S. Industrial Film Festival in Chicago, and was awarded a C.I.N.E. Golden Eagle and the Atlanta International Film Festival's Golden Phoenix. The film features a musical score composed by a Bell Laboratories computer.

Both films are being shown nationally in theaters and on television, and are available to schools and civic, church and service organizations through Bell System business offices.

### AUTOVON Service Improved

Eight new electronic switching systems (ESS) were recently added to AUTOVON (Automatic Voice Network), the nation's military telephone network.

They join 24 existing ESS's and 17 central offices using mechanical switching equipment and are designed to improve the survivability of communications.

AUTOVON is the world's largest private telephone network. It provides rapid communications among 1,700 military bases and government installations and offers many special features designed by the Bell System.

Playing a major role in the survivability of the continental U.S. segment of AUTOVON is a polygrid configuration instituted in a massive change-over last June. It was the largest reconfiguration ever undertaken by the Bell System. □



# Creativity,

That illusive thing called creativity  
is desperately sought today in solving increasingly complex problems.  
What is needed is an open environment,  
free from arbitrary constraints of power and control.

# Man and Organizations

by Eugene J. Koprowski

It doesn't take more than a quick glance over the shoulder of history to be reminded that some of the world's greatest thinkers suffered personal humiliation, persecution and even death for their creative insights. To say that the tables have turned is an understatement. For at no other period in human history have creativity and innovation been more needed.

But creativity is an illusive, subtle thing that resists accurate mapping. In a way it is like electricity.

We must define creativity by its observable outcomes and not by any absolute scale of meaning. It is a shy, sensitive creature that withdraws quickly

when its integrity is threatened. And perhaps there is nothing more threatening to the integrity of creativity than our need to control and channelize it.

On the positive side, the behavioral sciences are contributing much to our understanding of creativity. But most studies focus on the differences between creative individuals and their less creative peers.

To quickly summarize the findings of these studies, the creative individual differs from the less creative person of like age, educational and occupational background in several important respects. To begin with, the quality (not so much the quantity) of his intellectual makeup is appreciably different. In solving problems, he spends more time in the early stages of the process. He views the problem from many

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*Dr. Koprowski is associate dean of the University of Colorado Business School at the Denver Center. He has written numerous articles on organization and manpower utilization.*

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different angles. He is not afraid to try novel approaches. He allows more unusual responses to sift through from his imaginative subconscious. He not only can tolerate ambiguity and complexity, but he welcomes and needs them to sustain himself.

In terms of personality makeup, the creative person has a great need for independence and to call his own shots. Even more important, he sees conventional authority as arbitrary and often unnecessary. He does, however, respect authority which comes from professional expertise. His interests are broad and usually span many seemingly unrelated fields. He is basically motivated by interesting, challenging work and not by symbols of status and prestige. He likes to work at his own pace and to be his own man. Finally, he tends to be humanitarian rather than provincial in his outlook toward life.

Knowing what goes into individual creativity is a good starting point in recognizing what is needed to make organizations more creative. Many parallels can be drawn. For example, it is unlikely that organizations that are overburdened with written rules, regulations, policies and controls can hope for much creativity. Nor can organizations with provincial outlooks and limited information hope to develop the conceptual flexibility required to develop novel solutions to problems. Managers must take a close look at how they can open up their organizations, broaden the range and variety of information, and increase organizational tolerance for diversity and complexity — in staffing patterns as well as in organizational goals and activities.

But this is easier said than done. One of the primary reasons for the lag between our visions and our practices is that most organizations are designed not only to serve formal goals, but also to maintain the “powers that be.” This “hidden agenda” is a formidable obstacle in any organization and tends to perpetuate the status quo.

Still another barrier to innovation is the naive conception that change comes by issuing orders, drawing

“Few organizations are currently geared to absorb the shock of inadequately utilizing the talents of truly creative individuals.”

charts or revising policies and procedures manuals. The truth is that people will change only when there is a personal payoff.

While this payoff can take many forms depending upon the individual, the trend is for people to react less to money benefits and a desirable working condition and more to intrinsic meaning and challenge in their work.

A final obstacle to innovation is the tendency to confine it to technological creativity. This type of creativity is not where the difficulty comes in our society. We abound in technological innovation. What is needed is innovation in the human sphere. The question that must be pursued is not how can we produce more, faster, and at less cost, but how can we learn to live together in peace and make technology man’s servant and not his master.

With these thoughts in mind, there are a number of strategies that organizations can pursue to improve innovative performance of their people.

The most obvious strategy is to “seed” the organization with a cadre of creative individuals. Anyone who has tried this knows it is difficult. Creative types are rare. To complicate matters they tend to be highly mobile, independent and difficult to keep satisfied. They are apt to spend a good deal of their time in activities that others see as “rocking the boat.” Besides, they do not always make congenial co-workers.

Few organizations are currently geared to absorb the shock of inadequately utilizing the talents of truly creative individuals. Besides, these people seldom seek careers in large business or governmental agencies. Our colleges and universities end up with a disproportionate number.

From this follows an obvious question: If our universities have the market cornered on creative talent, why do we have demonstrations and disorders? The answer is that most of the creative energy and financial resources are directed to technical rather than human innovation — toward making better things rather than better people. It is a paradox that the

“... four specific goals . . . must be vigorously pursued by any organization seriously bent on becoming more creative . . .”

organizations that support innovative research in our universities do not always reflect the rapidly developing body of knowledge in the fields of human organization, motivation and social change. But universities are only one example of cultural lag in the face of rapidly shifting social values.

All of this suggests that the presence of innovative or creative people *per se* does not guarantee innovative or creative organizations. Instead, it takes a dramatic change in the organization itself. There are four specific goals that must be vigorously pursued by any organization bent on becoming more creative and adaptive to its rapidly changing environment:

- (1) It must reduce the amount of excessive structure to an absolute minimum;
- (2) It must increase the range of individual and organization inputs;
- (3) It must introduce creative catalysts to spark the organization; and
- (4) It must reward innovative behavior.

Excessive structure takes many forms. It is an outgrowth of our need to control—our need to know that things get done right, on time, and without unnecessary costs. Organizational charts, job descriptions, budgets, policy and procedure manuals are all tangible evidence of structure. While certain controls are necessary, excessive structure is the unfortunate offspring of legitimate structure.

The cycle of conception, birth and development is interesting to watch. Typically, a small organization grows to the point where one man can no longer retain control. Specialized knowledge and top-level coordination are required. To help solve the problem, staff-level positions are created. Financial experts design budgets to guide executives in line jobs. Personnel experts draw up organizational charts and job descriptions to avoid organizational confusion. Industrial engineers design systems for optimum worker productivity. And the new crowned prince of the staff specialists, the computer expert, attempts to wrap the decision-making process in a mathematical model.

“Only when an organization adopts goal definition and goal redefinition . . . can it hope to creatively experiment with the various means to achieve that goal.”

An unfortunate by-product of this staff specialization is the tendency toward excessive structuring of the organization. Each staff specialist tends to see the solutions to organizational problems in terms of his own structure. To justify his existence and to re-avow his worth to the organization, he consistently comes up with new forms of structure to heap on the older forms. Multiply this by the increasing use of staff specialists, and it is obvious that innovation has little breathing room in this stifling atmosphere.

This does not imply that an innovative organization must be an amorphous mass of people doing pretty well what they please. It is not so much a matter of whether structure is required as it is at what level that structure is necessary. For example, the creative individual is quite structured when it comes to goals. Where he allows himself maximum freedom is in the exploration of means to achieve these goals. Without some structure it would be difficult to distinguish between the creative genius and the madman.

So it is with organizations. Structuring is badly needed at the goal level, but probably less so at the means level. Only when an organization adopts goal definition and goal redefinition as a planned way of life can it hope to creatively experiment with the various means to achieve that goal. In such an arrangement, goal achievement and not the staff specialist's “one-best-way” becomes the measuring stick for individual and organizational performance. This does not mean that the leader of an organization should get rid of his staff specialists. Instead, he should redirect their focus from means to goals. Staff specialists represent a considerable investment in brainpower. Why can't this brainpower be put to use in helping the line organization define and redefine goals? Why can't it be rechanneled into examining how the structure can be reduced and still get the job done? This would make a worthwhile task force assignment for a group of bright staff specialists. But before they are turned loose on such a project, they should read a few books like John Gardner's *Self-*

“To be truly creative, multiple frames of reference are indispensable.”

*Renewal: The Individual and the Innovative Society*, Gary Steiner's *The Creative Organization*, and Chris Argyris' *Organization and Innovation*. These books could provide a new perspective.

Reducing organizational structure, however, is only part of the problem. To be truly creative, multiple frames of reference are indispensable.

There are certain points in most careers where some planned form of job rotation would be extremely broadening. While this differs from one organization to the next, locating these transitional points would seem well worth the effort. If a staff specialist, as part of his individual development, were required to spend some time in a line position, his tendency toward overstructuring might be reduced.

Task force assignments are still another way of increasing an individual's frame of reference. Visits to other companies and management development programs are also of value. In attempting to increase an individual's frame of reference it is important to keep in mind that novel exposures are of much more benefit than those that simply confirm the person's well-entrenched biases. A college president taking a management course which would expose him to presidents of business organizations would be an example of a novel exposure.

Sometimes reducing structure and broadening individual frames of reference are not enough. In some cases it may be necessary to bring in a creative catalyst to do some innovative pump priming. This person's role should not be that of a consultant in the traditional sense. He should not be chosen because he is an expert in management or administration, but rather because he is considered a highly creative individual by his colleagues.

There are at least three productive roles the creative catalyst might play in an organization: He could serve as a sounding board for policy-level executives, he could observe and comment on high-level staff meetings, or he could work with task forces on specific problems.

... organization innovation . . . is a new way of life demanded by rapidly changing technology and human values.”

Finally, there is the matter of rewards. Innovation will not take place without some type of payoff. Many attempts at innovation fail because organizations do not understand the complexities of reward systems. As a result, innovation is given lip service but rewarded only if it dovetails with the organization's innovation. Nothing is more lethal to real creativity. Anyone serious about innovation must be willing to make mistakes — even if it costs money.

Individual payoff for creativity does not necessarily come in the paycheck. Instead, it comes from the satisfaction of working in an environment where one can experiment and develop his full range of potential in meeting challenges.

To sum up, organizational innovation is more than a fashionable addition to modern management jargon. It is a new way of life demanded by rapidly changing technology and human values.

Today, leaders in every walk of life are facing an increasing number of problems that did not even exist five years ago, and each year this “problem explosion” seems to be intensifying. At the core of our societal unrest is the widening gap between technological innovation and innovation in our organized patterns of living and working together. It is a paradox that in our computerized society we devote millions of dollars to technological research and development and expect human development to somehow take care of itself.

It is time for every social institution, whether in business, government or education, to reexamine its basic assumptions about man's relationships to the technology he is creating. This means turning our financial and human resources to societal problems outside our organization and recognizing that human rights begin at home, within our own organization.

For on a very meaningful level, human rights and creativity are part of the same coin. Without one, the other is impossible. Both require an open environment, free from arbitrary constraints of power and control, so man can make use of his potential. □

**"Could you tell us, Mr. Isomura,  
what you like best  
about the States?"**



**"The inventiveness of your people,  
instant coffee,  
and your telephone system."**

We asked Mr. K. Isomura, president of Panasonic, Matsushita Electric Corporation of America, about his first impressions of this country:

"It has been four years, but I can still remember my amazement the first day I arrived in your country to find, at my company's reception desk, only one girl handling almost 150 telephone lines. And now, as I understand it, besides voice, your

telephone system is being used to carry computer and other information quickly around the country. You Americans do not realize how advanced your telephone technology is."

In most countries, a phone is just a phone. Over our telephone network, people talk, machines talk, pictures go back and forth. Anything goes—instantly—anywhere, anytime.



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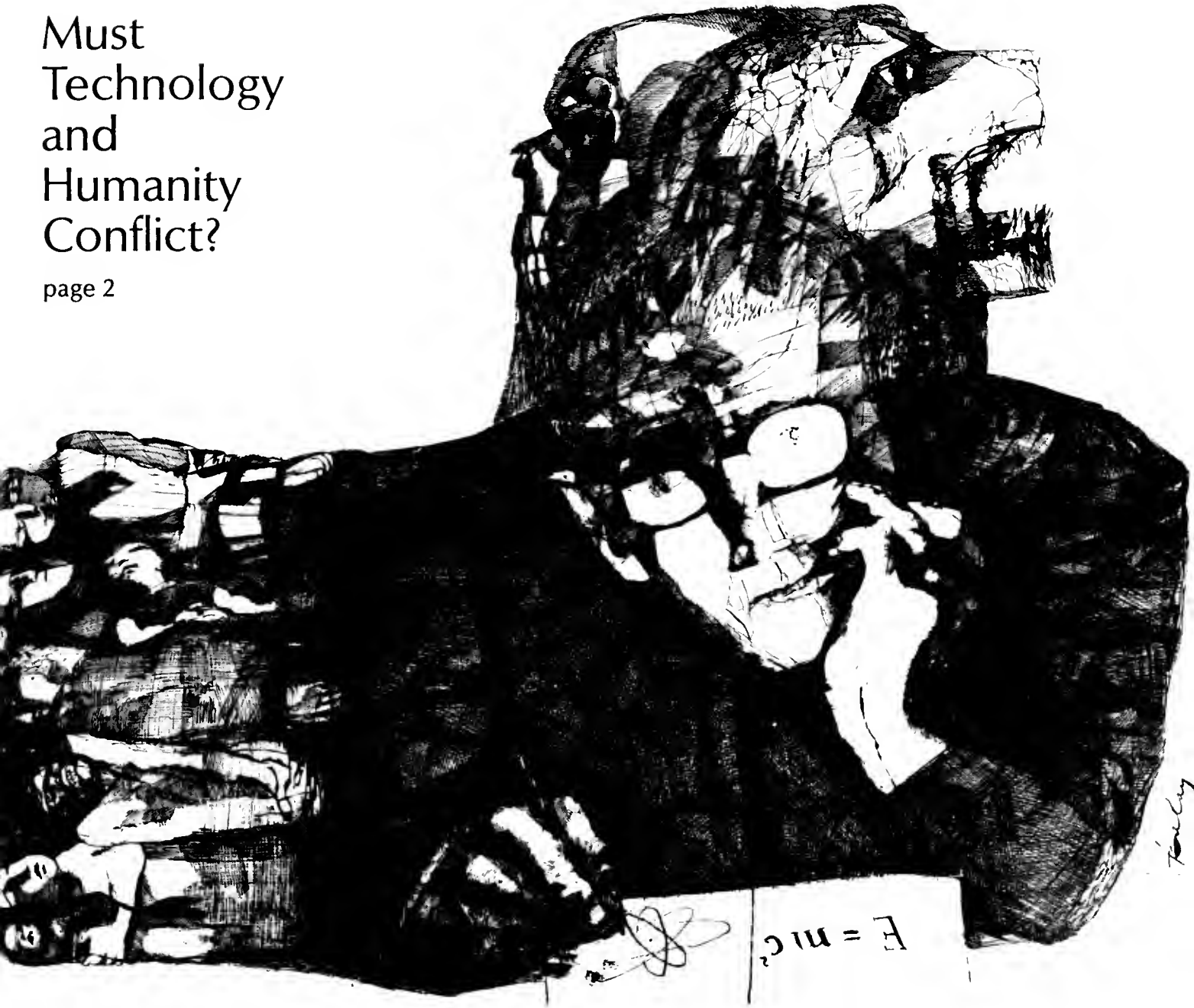
March/April 1969

# BELL

telephone magazine

## Must Technology and Humanity Conflict?

page 2



# Inflation and Telephone Rates

Despite the variety of ways that individuals, the government and the business community seek to combat it, inflation today remains one of the nation's most pressing problems.

In discussing inflation and telephone rates in AT&T's recently released Annual Report, Board Chairman H. I. Romnes stated,

"Over the years, we have had great success in holding down the price of communications service through improvement in technology and operating methods. This unflagging effort was never more productive than it is today. Nevertheless there are times—and now is one of them—when technological advance and increasing efficiency cannot, by themselves, offset the inflationary pace of rising costs."

It is for this reason that a number of Bell System operating companies are finding it necessary to seek moderate increases in telephone rates. Increases have already been authorized by regulatory commissions in a few states, applications are pending in several others, and other applications will be filed later.

In a number of states, it has been a decade or so since Bell System companies have applied for general rate increases. In the intervening years, vigorous marketing efforts to stimulate growth, increased productivity brought about by new methods and equipment, and technological innovations have helped Bell System earnings keep pace. But rising wage costs, increased taxes, and high interest rates on the large amounts of new capital needed for service improvements have made increases in intrastate rates necessary.

Overall rates for telephone service (local and long distance taken together) in the past 10 years have been, in fact, substantially reduced in relation to the price of other products and services. While consumer prices have gone up by 23 percent since 1959, the cost of telephone service has gone down by 4 percent. At the same time, the versatility, performance, and ease of use of the service have steadily improved.

"We feel strongly," Mr. Romnes said in the Annual Report, "that under present conditions Bell System earnings should be in the range of at least 8½ percent on total capital. Every year, to meet demands for service, \$1½ billion or more must be obtained in the financial markets. We must compete for this money at a time when interest rates are the highest in a half century. Further, we must continuously compete with other businesses for the favor of equity investors—share owners—who in these inflationary times look for growth in earnings and dividends to prevent erosion of their investment.

"Under these circumstances," Mr. Romnes emphasized, "past views of what constitutes a proper rate of return on telephone investment are no longer appropriate. They are out of date. We are therefore urging regulatory approval of earnings at least in the 8½ percent range to maintain investor confidence and assure the abundance and quality of communications the nation needs."

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Leighton C. Gilman, Editor

Donald R. Woodford, Managing Editor

Al Catalano, Art Director

George M. Fowler, Assistant Editor

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The quarter century just past has seen advances in science and technology unprecedented in human history. Atomic fission, space travel and, most recently, the discoveries relating to the innermost secrets of life and heredity would hardly have been predicted even a generation ago except, perhaps, for some dim future as far ahead as thoughts can reach. They have come upon us almost unaware, and we hope, of course, that somehow good will be the result of all three. But even the most optimistic are bound to admit that each is also a potential threat. The growing question is: Does our nation need some central advisory body or criteria to judge whether advances in science and technology contribute to human welfare or create still other potential threats?

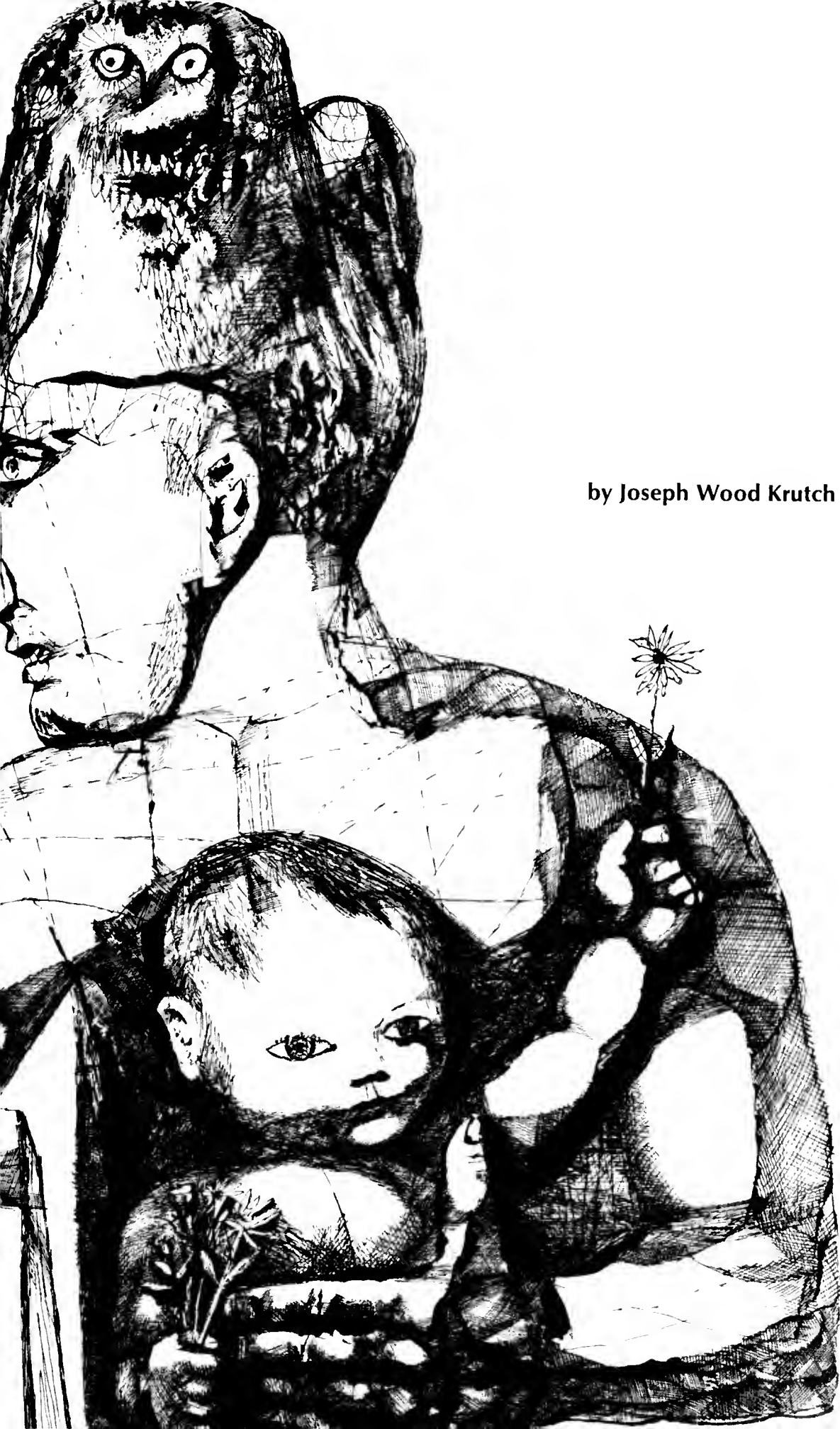
Atomic fission raises the possibility that civilization may be destroyed. A war of the worlds made possible by space travel is not so likely as the possibility that its appeal to the imagination may tempt us to spend the money, energy and brain power on it which might more profitably be employed in solving human problems here on earth. The threat from macromolecular biology may be more remote but is, ultimately, at least equally frightening. If we believe the claims of those in the best position to know, it promises ultimately the power to determine the intelligence, character and temperament of unborn generations. And

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*Dr. Krutch is an editor-at-large of Saturday Review and author of more than 20 books, including The Modern Temper, The Measure of Man, and Human Nature and the Human Condition.*

*Illustrations on the cover and this page were drawn by Lajos Szalay. A collection of his works was published in a book graphically interpreting Genesis from the Bible.*





by Joseph Wood Krutch

*for lay*

that suggests the possibility of a totalitarianism more complete than we have previously dreamed of.

Up until now, there always seemed the possibility that human nature could not be completely controlled either for good or for ill. But what if human nature itself can be changed or abolished?

None of these threats will necessarily become a reality. And in the past, science has bestowed upon us enormous increases in comfort, health and affluence. Yet during the quarter century which gave us atomic fission, space travel and the achievements of biochemistry, some aspects of the human condition have deteriorated. Ours is much more conspicuously an age of anxiety than it was. Specifically, overpopulation, environmental pollution and epidemic violence are all new. They are the most pressing problems of today and are likely to continue to be for a long time to come despite atomic fission, trips to the moon and the sensational discoveries in biochemistry.

It is not necessary to believe that advances in science and technology are the cause of these deteriorations. But one has accompanied the other and the minimum conclusion to be drawn is that advances in science and technology alone are no guarantee of accompanying improvement in the human condition. What is new today is the fact that warnings are now beginning to be heard from within the very professions and organizations which have formerly been most likely to assume that progress is inevitable and that progress in technology inevitably means improvement of the human condition.

As Dr. Laurence Gould, former president of the American Association for the Advancement of Science, pointed out, most great civilizations of the past have succumbed to deterioration from within rather than to attacks from without (see *Bell Telephone Magazine*, January/February 1969).

Dr. Gould's thoughts caused the Institute of Life Insurance to take full-page advertisements in various publications to ask: "Could this happen to us? To our families? To our way of life? Could this happen to America the Beautiful? Well, look around. You can

see signs of it at this very moment in every major city of this country. You can see it in the slums, in the jobless, in the crime rates, in our polluted air, in our fouled rivers and harbors and lakes. You can see it in our roads strangled with traffic. . . . We must all do something about it. While there is still time. Before our cities become unfit places in which to live."

## Many scientists question fundamental assumptions

To be sure, there have always been mavericks (usually men of letters) who expressed doubts about "progress." And there was also the philosopher in Samuel Johnson's moral romance *Rasselas* who had invented a flying machine but refused to reveal its secret because, so he said, men should not be permitted to fly until after they had become virtuous. But despite such grumblers, the generally accepted assumptions ever since the sixteenth century had been that every increase in knowledge, power or technical ingenuity would in the end contribute to the improvement of the human condition; that the extent to which science and technology had developed was indeed a measure of the extent to which a good life was being led in any community; and finally, that, as the Marxists said, all changes in the human condition are simply the inevitable consequences of evolving technology. From these propositions, and especially from the last, there was a tendency to conclude that one need not concern oneself with any other aspect of a good life for the simple reason that the propositions will all develop as byproducts of the advancing knowledge, power and affluence.

Because technological changes have been so accelerated during the past quarter century, responsible scientists and technicians have begun to question fundamental assumptions. And they are suggesting that the time has come when we must realize that certain powers are dangerous, certain inventions are threats rather than promises, and that, in a word, we must begin to ask not simply *can* we do this or that

but *should* we do this or that. We may not be able to wait for men to become virtuous before sending them to the moon, but we realize that sending them there will not necessarily make them more so.

Neither Anthony Weiner, formerly of the Massachusetts Institute of Technology, nor Herman Kahn, formerly of the Rand Corporation, are men whom we would expect to be enemies of science and technology, yet in their recent book *The Year 2000* they issue a solemn warning: "Practically all the major technological changes since the beginning of industrialization have resulted in unforeseen consequences. . . . Our very power over nature threatens to become itself a source of power that is out of control. . . . Choices are posed that are too large, too complex, too important and comprehensive to be safely left to fallible human beings."

## New drugs put godlike powers in medical scientists' hands

Some threats are indirect in the sense that they affect the environment which in turn affects the human being. Those created by biochemistry threaten directly human intelligence, personality and character. They put into man's hands godlike powers he himself is not sufficiently godlike to be trusted with. In April 1968 the University of California psychologist, Dr. David Krech, told a Senate subcommittee that within the next decade medical scientists will be able to exert a significant degree of control over man's mind.

Different drugs, said Dr. Krech, affect different kinds of intellectual activity. Thus an antibiotic called Puromycin prevents long-time, but not short-time, memories. Injected into an animal, it "permits it to put in an ambitious day's work although it will not build up a permanent body of experiences or memories or abilities." It might be used to produce, for instance, a body of subhuman but docile workers much like those who compose one of the biologically established social classes in Aldous Huxley's *Brave New World*, considered wild fantasy only 37 years ago.

## What humans will determine how new powers are used?

Dr. Krech's statement is cautious because it looks a mere decade ahead. His colleague at the University of California, Prof. Robert Sinsheimer, professor of biophysics, raises more alarming possibilities without setting a definite deadline: "Eventually we will surely come to the time when man will have the power to alter, specifically and consciously, his very genes. This will be a new event in the universe. No longer need nature wait for the chance mutation and the slow process of selection. Intelligence can be applied to evolution. How might we like to change his genes? Perhaps we would like to alter the uneasy balance of our emotions. Should we be less warlike, more self-confident, more serene? Perhaps. Perhaps we shall finally achieve these long-sought goals with techniques far superior to those with which we have had to make do for many centuries."

Is such a power too great to be trusted to "fallible human beings?" Will it be used to make us more or less warlike, self-confident and serene? The answer, no doubt, is that this will depend upon whose hands the power falls into. And as things now stand, we who already control so much have developed no way of determining into whose hands any of our new powers will pass.

In its simplest form, the question of proper use arises in connection with what has come to be called "the responsibility of the scientist." Is it his duty, before giving a discovery or an invention to the public, to ask the simple question, "Will this knowledge (or indeed can this knowledge) be well used?" What would have been the nearly unanimous reply until very recently was given a few years ago by Edward Teller in connection with atomic fission and its possible catastrophic effects: "I believe that we would be unfaithful to the tradition of western civilization if we were to shy away from exploring the limits of human achievement. It is our specific duty as scientists to explore and explain. Beyond that our re-

sponsibilities cannot be greater than those of any other citizen of our democratic society." At an opposite extreme, Robert Oppenheimer has confessed to the feeling that he has "known sin" as a result of his involvement in the creation of the bomb.

## We can do more than hope!

One need not question the reasonableness of either one or the other of these attitudes to see that, justifiable or not, neither is really helpful. Neither washing the hands nor wringing the hands solves the problems created by the fact, now plainly evident for the first time in history, that we have begun to assume powers which need to be channeled and not simply turned loose upon the world to see what will happen. Knowledge is power, but it is not equally evident that power is always good. Science is knowledge; technology is doing. But it is no longer safe to say that whatever we can do we should do.

Prof. Sinsheimer is an optimist: "After two billion years, this is the end of the beginning. It would seem clear, to some achingly clear, that the world, the society, and the man of the future will be far different from that we know. . . . We must hope for the responsibility and the wisdom and the nobility of spirit to match this ultimate freedom."

There remains the question of whether we can indeed do nothing more than hope (and perhaps fear). Prof. Sinsheimer seems willing to propose no alternative, but neither Prof. Krech nor the Messrs. Weiner and Kahn are willing to leave to chance the use which will be made of powers still difficult for most of us to imagine. "The issues I have raised," said Prof. Krech, "are much too pervasive and too profound to permit the physician to scribble the necessary social policy on his prescription pad," and he proposes a national commission to determine how the new drugs shall be used. Messrs. Weiner and Kahn go even a step further than that. For the future they suggest that neither science nor technology shall pursue new discoveries or develop new applications of scientific

knowledge without first investigating their possible consequences for evil as well as for good.

In saying that, they go far beyond the mere rejection of Dr. Teller's contention that the scientist should assume no responsibility for the use made of his discovery. They propose the attitude that the philosopher in *Rasselas* assumed when he believed that an invention should not be given to the world until men had become virtuous enough to make only good use of it. It is not likely that Dr. Johnson himself would regard his philosopher's proposal as practicable, and one begins to wonder if any other really is.

It is very well to suggest "a national council to evaluate how mind-influencing drugs shall be used" or to say with Messrs. Weiner and Kahn that the choices are too fateful "to be safely left to fallible human beings." But where are we to find infallible human beings to whom we may safely trust the control of the uncontrollable? A committee invested with the powers to determine just how virtuous mankind had become, how the human mind and character should be changed, or even what technological uses should be made of our increased power over nature would be possible only in a totalitarian society so absolute that its decrees would, in the end, probably be more stupid than those made today by pure chance. The brave new world would already be here.

## Criteria for decisions needed

Obviously we will have to make do with something less fruitful than tight bureaucratic control of science and inventions. On the other hand, there is a desperate need for something more effective than now exists. We need some body or bodies which would at least suggest, influence and direct the ends toward which research and its applications are directed and encourage certain tendencies even if the bodies did not go so far as to forbid others.

The beginnings of the power to do at least this much already exist to a significant extent by virtue of the fact that a large proportion of all scientific and



technological projects now being actively pursued owe their existence to grants from the national government, various foundations, or industry itself. To a considerable extent these institutions determine what enterprises in either pure or applied science will be undertaken. They must have certain criteria on which they make their decisions.

In the case of the government, the criteria are largely those relating to supposed military necessity. In the case of industry, they relate largely to the possibility of ultimate profits. But neither government nor industry follow rigidly these criteria. Both support projects which seem to be simply "in the public interest."

## Central group could advise on threats of technology

Nevertheless and insofar as one can judge, the enterprises which government, industry and the foundations support are selected on the basis of criteria usually not up to date. They are based upon the nineteenth century assumptions: all knowledge is good; even the most useless scientific fact may turn out to be important; every technological advance is beneficial; progress is inevitable, and so forth and so forth. But none of these things is true any longer. There are by now so many things which could be found out and so many things which could be done that we must pick and choose whether we do them on the basis of conscious or unconscious preferences. Unless everything quoted in this article from distinguished contemporary scientists is untrue, there is a crying need for revised criteria to help those who support research and development decide which project should be supported.

Perhaps the time will come soon — perhaps it is already here—when some central advisory committee will both advise and, without exercising any absolute authority, be able to do something more than merely advise, since it will control a good many of the purse strings. But even without the existence of a central body, those existing bodies which control important

purse strings and apply certain criteria could accomplish a great deal by revising the criteria.

The implications of the need for criteria or some controls are strong for the United States and the rest of the world because all mankind faces the same threats. But international controls are almost unthinkable in a time when nations squabble over matters much more petty than the destiny of man. So a start could best be made right here at home.

There are several steps to be taken before either the existing bodies come up with acceptable criteria or a national board is created. These steps consist in recognizing the following facts:

- That science and technology can be catastrophic as well as beneficial.
- That we cannot afford to wait and see what the effects of any specific application of new powers will be because once they have been acquired they cannot be eliminated. Whether atomic fission and the ability to control the mind are regarded as promises or threats, we are saddled with them, and they cannot be abolished now.
- That science for science's sake, the pursuit of knowledge without thought of how it may be applied, are no longer tenable aims.
- That knowledge and power are good only insofar as they contribute to human welfare.

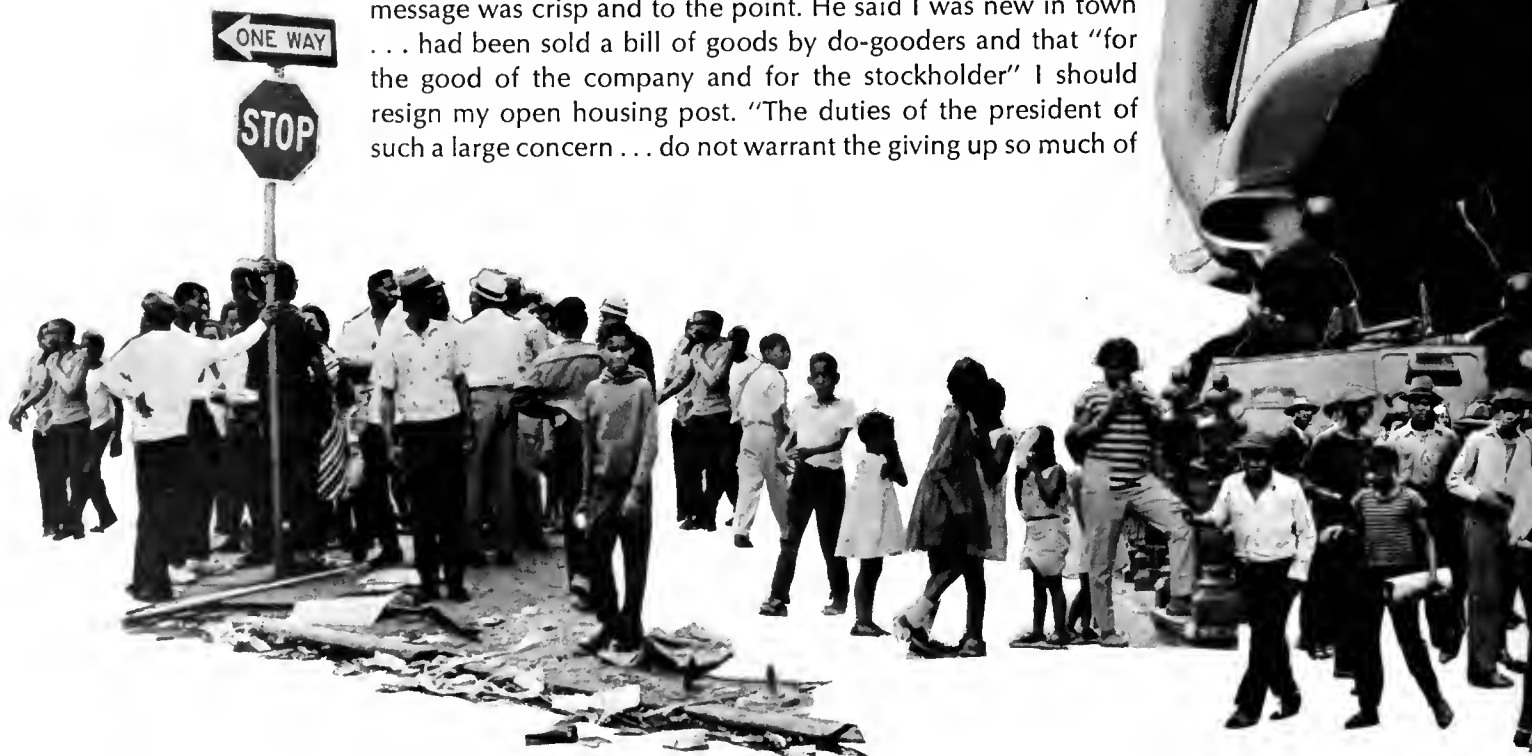
In a sense Congress determines whether certain projects shall be undertaken. It votes money for the space program, the National Science Foundation and so forth. But it does not really establish any priorities except insofar as it votes or refuses to vote funds. Nobody in a position to exercise any real influence ever asks what is, for example, the relative importance of getting to the moon and abolishing pollution on earth. Is it more important to build supersonic transport planes than to clear the slums? Those are questions which should be examined in the light of meaningful criteria. The criteria, however, have never been formulated. A body charged with formulating them and composed of men in the humanistic and the physical sciences could at least make a beginning. □

## Why a Company Gets Involved

Chicago, the scene of some bitter conflicts, is making progress in meeting urban problems of housing, employment and education—and its business community is playing a strong hand. As corporate executives have become involved, however, they've faced some sticky going.

by James W. Cook

A few days after accepting the chairmanship of the Leadership Council for Metropolitan Open Communities in Chicago in 1966, I received a letter blasting my action. The share owner's message was crisp and to the point. He said I was new in town . . . had been sold a bill of goods by do-gooders and that "for the good of the company and for the stockholder" I should resign my open housing post. "The duties of the president of such a large concern . . . do not warrant the giving up so much of





your time, and at our expense," he concluded.

A decade ago, a company president probably would not have involved himself in such a controversial civic matter. What the share owner did not or would not recognize was that times have changed. Most companies have changed with them. Business cannot afford to sit it out while the city's problems proliferate and threaten destruction.

The average executive, in times past, adequately fulfilled his citizenship obligations by serving on college boards, directing the local United Fund and performing in other "safe" capacities. Controversy, it was generally understood, was to be avoided. It might rub off on the company. A few business firms did get involved in touchy civic issues back in the Fifties, but those which did generally had relatively few customers to offend. Some were family-owned with only a handful of share owners to worry about.

There was reason for this caution, especially on Bell's part. As late as 1959 an unhappy customer protested to the Illinois Commerce Commission because the company not only made a corporate contribution, but also lent two executives to the Crusade of Mercy, Chicago's United Fund drive. A waste of customer's money, he said. Fortunately for the common good, the commission ruled that both actions were acceptable business practices.

Today, the climate of society has changed. Illinois Bell and its executives are deeply involved in the problems of the city. We should be because we have a giant stake in their solution.

It must be emphasized at the outset, however, that our involvement does not constitute a cure-all for the incredibly complex problems that plague our cities. Though we consider our effort to be ambitious, we recognize that even an organization as large as the telephone company can hope only to make a dent in these problems. And though a few of our projects have been successful, others have accomplished less than we had hoped. Nevertheless, we are convinced

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*President of Illinois Bell Telephone Company since 1966, Mr. Cook previously was vice president of public relations at AT&T.*

that our efforts — combined with others — can significantly attack some of the root causes of our urban ills.

### **Urged passage of tax referendum**

Last June, for example, we took a firm public stand in favor of a Chicago school tax referendum and urged a "yes" vote through our bill inserts and in a newspaper advertisement jointly sponsored with another major utility. As chairman of the Better Schools Committee and as a representative of the business community, I stated publicly in the City Council chambers that the tax increase was needed.

On another front, we're attacking the problem of the hardcore unemployed and vigorously backing the efforts of the National Alliance of Businessmen. [Until recently Mr. Cook served as both regional and metropolitan Chicago NAB chairman. Ed.] In its first year, the Alliance in Chicago obtained pledges from more than 350 companies to hire 15,000 hardcore unemployables. By January 1, 1969, these firms had hired 11,216, of which 62 percent are still on the job.

Involvement and controversy are no longer things to be avoided at any cost. We've gotten our feet wet and expect to get them wetter. As one of my colleagues recently remarked, "The risk is much overstated, the benefits much understated."

It should be equally clear that this new posture on public affairs didn't happen in a day. Illinois Bell's involvement in urban problems evolved over the years. As the pace of social change quickened, the company's course was progressively altered to fit the needs of the times.

### **Guiding principles put into writing**

One of the first clues to our future corporate behavior came in 1959. During that year, Bill Kahler, then president of Illinois Bell, formally put into writing the four guiding principles under which the company had long been operating. Widely distributed internally and the subject of employee meetings, they delineated a course for the future.

The first three principles recognize the company's obligation to the customer, the share owner, and the employee. The fourth principle, however, clearly states as an Illinois Bell objective — equal in importance to the other three — that we will “actively help the communities we serve.”

At first, most telephone people, including executives, translated the fourth principle as meaning to help the community in noncontroversial ways. Employees were encouraged to serve on civic betterment committees, church boards, little league committees and the like. But activities that might antagonize customers or share owners were frowned upon, even if the employee was involved only as a private citizen.

This attitude was the tune of the times and existed not only within our company but in many others as well. Business had not yet learned that it could not ignore society's most urgent problems.

### New plank for communications policy

Even before publication of the guiding principles, Illinois Bell had decided to make contributions of money only to institutions practicing nondiscrimination. As Hale Nelson, who was then public relations vice president, relates: “We sort of waded into it, like walking into the ocean. As the majordomo of our contributions policy, I introduced in 1958 an anti-discrimination plank in our contributions policy. We said we wouldn't give money to any institutions that discriminated against nonwhites. We said, ‘Look — our employees are all colors and stripes. We aren't going to give you any money if you won't take care of all our employees.’ So we eased into becoming a positive rather than a passive force while trying to follow a fair employment policy.”

A turning point in the Bell System's posture toward employee participation in public affairs was a speech by Frederick R. Kappel, then president of AT&T, before the Bond Club of New York on Nov. 20, 1958. Mr. Kappel observed that businessmen as citizens should not “lie down and play dead.” He went on

to say: “. . . business and especially big business has been criticized, and it seems to me with justice, for making it difficult for people in management to take part in public affairs. The net result, says the criticism, is that far too many of us — managers and employees alike — are politically inert. . . . I see every reason for encouraging people in business to engage in political affairs, as individual citizens, and no possible reason for discouraging it.”

### Social problems get more recognition

Sweeping into the Sixties, the social climate in the country was rapidly changing. The voice of America's black people was heard clearly as they protested segregation through boycotts of buses and business establishments. Parents in black neighborhoods and elsewhere, too, were becoming aware of the inferior education most ghetto youngsters were receiving. Throughout America citizens began to realize that their streams and lakes were choking from pollution. A growing demand was in the air for something to be done about these problems.

In Chicago, business people began to respond. Memberships in such organizations as the Chicago Commission on Human Relations, the Chicago Conference on Religion and Race and the Community Renewal Society kept them tuned to the mounting turbulence in the inner city.

It was into this climate that John deButts came to Illinois Bell as president. In 1965, at the request of Chicago's mayor, Richard J. Daley, he organized and headed the Chicago Merit Employment Committee. This organization of businessmen was set up to encourage hiring throughout the Chicago area without regard to race, religion or national origin.

Bob Bushelle, now public relations manager in the company, was executive director of the committee. As he recalls: “During the meeting before the committee was launched, I got the impression that this subject was very touchy. Businessmen, I found, had many stereotyped notions about Negroes as workers.

One prospective employer told us he might be willing to hire some disadvantaged people — ‘but not if they’ve had any illegitimate children!’

“We had to equate the idea of hiring more Negroes with ‘apple pie and motherhood.’ And we had to do it in such a way that businessmen couldn’t attack it any more than they’d attack the American flag.”

The committee, which is still operating, was highly successful in that it changed the average businessman’s feeling and attitude about merit employment. Its leadership posture convinced businessmen and the Negro community that it was serious.

Slowly at first, then rapidly, the big companies and then the smaller firms joined the action. Today, more than 1,500 firms have signed Merit Employment pledges. An increase of an estimated quarter of a billion dollars annually today pours into the Negro community as a result.

In 1966, protests and demonstrations racked Chicago as the Rev. Martin Luther King Jr. led his followers through the streets of the city in their demand for open housing. The demonstrators had the power to disrupt, even to destroy.

A group of businessmen realized the situation was desperate. Through their efforts, the Chicago Conference on Religion and Race, a politically neutral organization, called a summit meeting. The participants were of diverse interests and influence, of every shade of opinion, but they had one common denominator: they wanted to save the city from a holocaust.

Out of the summit conference came the Leadership Council for Metropolitan Open Communities. To the Council was delegated the assignment of finding solutions to the housing problem of minority groups in the Chicago area.

I had a number of reasons for accepting the chairmanship. One was that Illinois Bell’s roots like those of other Bell companies are deep in the city. More than 75 percent of the company’s investment of roughly \$2.5 billion is within 35 or 40 miles of our downtown headquarters building. Unlike many businesses we cannot pull up stakes and move away.

There were risks from a corporate viewpoint. Naturally, people identified me with the company, and we were aware that few issues are more charged with emotion than open housing.

And I was very visible as I spoke on behalf of the council’s aims in many communities. I am sure I made some enemies, both for the company and for myself. There were mutterings from some employees. A few crank calls and letters came from the public. But I am equally sure we made far more friends. Generally, criticism was much less than expected. Solid advances were achieved in the field of open housing.

### Lose fear of conspicuousness

Today — under the continuing efforts of the council — 70 more Illinois communities have open housing ordinances than had them before the council’s organization; 48 are in the Chicago Metropolitan area. Some 30,000 citizens have signed pledges affirming their belief in the principle of open housing. And black people are moving into a number of previously all-white areas.

If the change in our company’s contribution policy in 1959 gave promise of a fundamental change of attitude toward social involvement, my acceptance of the chairmanship of the Leadership Council in 1966 could be considered an even sharper break with the past. Before this time we had played it conservatively. We wanted to be involved, yes; but not too conspicuously. We didn’t want to be far behind, but neither did we want to be too far ahead of others. We stayed in the middle and were practically invisible. Public opinion surveys prior to 1966 showed that only 25 percent of the public credited us with helping the community. Businessmen, of course, knew what their peers were doing. But the community at large did not. Today, everyone can see our involvement.

Like many firms, Illinois Bell and the other Bell System companies are reexamining hiring standards and practices, taking a fresh look at recruitment, developing significantly different on-the-job training

for new workers and constantly improving techniques to make employees more sensitive to the problems and ambitions of black people.

Our business and others also have been involved with education for some time. Many progressive firms realize that until urban schools, especially in the ghetto, more adequately and realistically educate students, the problem of unemployables will remain.

But Illinois Bell, as the state's largest private employer, has a greater stake in the quality of secondary school education than most firms. In an average year, for example, we hire more than 2,000 graduates of Chicago's public high schools.

Educators familiar with the situation in Chicago unanimously agree that better facilities and teachers are desperately needed in the inner city. Recognizing this need, I accepted chairmanship of the Better Schools Committee — a group devoted to helping the Board of Education solve its knotty fiscal problems.

### Net gain in public esteem

Higher taxes are never popular. Thus, I was prepared for considerable criticism last June when I urged an affirmative vote on school tax increases. Fortunately for our school system, voters approved the referendum. The company received a handful of critical letters and phone calls, but we had some favorable comments, too. On balance, we feel we gained in public esteem.

We continue to work with Chicago's Board of Education in efforts to implement a master plan to improve the quality of education in the city. At the same time we are working with other organizations, including the state superintendent of public instruction and committees of the state legislature. Basically our role is that of applying the businessman's systematic approach to the many problems plaguing public school educators today.

Illinois Bell is attacking this problem on other fronts, too. Since early last year we've been part of a creative partnership with three Chicago high schools,

the Board of Education and local community organizations to see what we can do to help. We provide a range of corporate resources — people, equipment, facilities and other assistance — in this project, which we call BEACON (Business, Education and Community Opportunity Network).

The program is taking several forms. For example, at Crane Tech High School, which is largely black, the company has helped school authorities gain more recognition for Merit Scholarship winners, and it assigned a telephone employee to the school to help students find jobs.

### More willingness to get involved

At another school, with a large Puerto Rican student body, discussion disclosed a major language barrier in some classes because some teachers couldn't speak Spanish. To assist, Spanish-speaking management volunteers teach classes in their specialties. Other ways we can help are sure to come along.

As we moved from the ideal of simply providing good telephone service to the broader concept of service to the community, we sought a justifying philosophy. There was a time when we felt obliged to explain everything we did on a basis of "enlightened self-interest." This is no longer necessary. In the past two or three years, businessmen have become increasingly sensitive to the fact that whatever concerns the community where they do business concerns them. The public not only approves corporate involvement in the community's problems, it relies on this involvement more every day.

Admittedly this involvement is not always effective; some of it might even be somewhat selfishly motivated. But like other segments of American society, business is learning. More important, it is demonstrating greater willingness to get involved than before.

As Ted Sorensen said in *Saturday Review*, "Forty years ago Calvin Coolidge could make his famous remark that 'the business of America is business.' Today, the business of business is America." □

# WHY IS YOUR HAIR LONGER THAN MINE?

BY JOHN JUSTIN SMITH

**A**merican men by the many thousands, if not millions, suddenly have rediscovered hair, their own hair. Oh, they've known about their hair all their lives as they variously had it cut, shaved it off, plastered it down, oiled and scented it or tearfully watched it fall into the washbowl. But now, in this rediscovery, men are taking fierce new pride in hair.

You can see this Great Hair Revolution on nearly any street in the nation. Here comes a man with the full beard of a Siberian bear hunter, while there goes one with the sleek and devilish beard of a desert sheik.

A middle-aged man appears behind a walrus mustache that makes him look like his own grandfather. A young man comes along with hair hanging to his shoulders, and he looks like his own kid sister.

There are many variations . . . handle-bar mustaches . . . goatees . . . Rudolph Valentino sideburns . . . Van dykes . . . pencil-line mustaches . . . even bangs.

If you poke into the causes for the Great Hair Revolution you find that nobody seems to have the precise reason for this sudden fascination with hair.

Dr. Thaddeus Kostrubala, assistant professor of psychiatry at Northwestern University and former director of mental health for the City of Chicago, makes this estimate of the situation:

"It apparently has something to do with a renewal of a spirit of adventure. As you may have noticed, many men came home from the Korean War with beards and mustaches. I believe this has to do with a longing for the adventuresomeness and free spirit of perhaps the last century."

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*Mr. Smith is associate sports editor of The Chicago Daily News. Of himself, he says: "Oh, yes, I do have a beard. I sprouted it last spring for reasons I don't know. It is subject to being propelled down the washbowl drain at any time."*





Ah, so. But why does Dr. Kostrubala have a beard? "Well, uh, yes," he says. "You see, I grew mine one summer while sailing on Lake Michigan because it was easier than shaving. When I got home, I found that I had been appointed to the city job as mental health director and some photographers came over, took my picture and put it in the newspapers. I couldn't shave after that. People would ask me what happened to my beard.

"Besides, it looks pretty nice, doesn't it?"

Darker implications are seen by Dr. J. Dennis Freund, psychiatrist and director of the Fairview Hospital, Chicago, who sees the revolutions as "a confusion of identities between male and female."

**H**e estimates that men are letting their hair grow to get back to the male-dominated society of Victorian times. In short, they're saying to heck with the matriarchy of recent generations.

(Dr. Freund also noticed a counter revolution. "Look at the women's pants suits," he said.)

If the doctors of the mind seem a little up in the air about the causes for the Great Hair Revolution, so are the participants. Some examples:

- Office clerk, 22, with hair to his shoulders. "I don't know why, man, but it sure saves on barbers. Anyhow, I like it and so does my girlfriend."

- Executive, 49, with a precisely-trimmed mustache and limited chin whiskers. "I looked in the mirror one morning and wondered what I'd look like if I didn't shave it all off. Now it's just there."

- Newspaper reporter, 28, with small beard and mustache. "I'm trying to say something, but I'm not sure what. It has to do with the freedom to do what you want."

- Advertising copywriter, 31, with bushy sideburns. "Maybe I'm trying to bridge the generation gap . . . to show younger people that I'm with them in spirit."

**O**ne man who was bogged down in stop-and-go traffic on a Chicago expressway heard a girl of about 12—on a school bus that also was stopped—lean from a window and holler: "Your beard looks very nice, mister." She seemed genuinely sincere so he thanked the girl and told her she looked very nice, too.

This is very pleasant, but less pleasant is the fact that if you wear a lot of hair, you'd better be ready to take your lumps. This is the thrust of a survey made by Chicagoan Jack Baxter, president of the Advertising Talent Center, which specializes in finding jobs in the ad field.

Mr. Baxter surveyed ad agencies in the United States and Canada on the subject of wearing apparel and hair, and heard back from an impressive 142 agency executives, including men of the top 15 agencies in billings. Some findings:

- Long, long hair a la Tiny Tim: Only one executive approved, while 120 disapproved and 21 said they didn't care.

- Long hair in the fashion of the early Beatles: 47 percent were opposed.

- Beards, mustaches, etc: About 33 percent disapproved of beards. They also tossed in long mustaches. Short, trim mustaches were approved by 92 percent. Sideburns were outlawed by 18 percent.

Mr. Baxter reports that one agency turned down an applicant for a job as an artist because he wore a beard, and one of the agency's executives said: "It's okay to wear a beard— as long as you don't wear it in the office."

Such disapproval has caused some hair to go underground. Beards in all styles are available from wigmakers for men who want to wear falsies evenings and weekends.

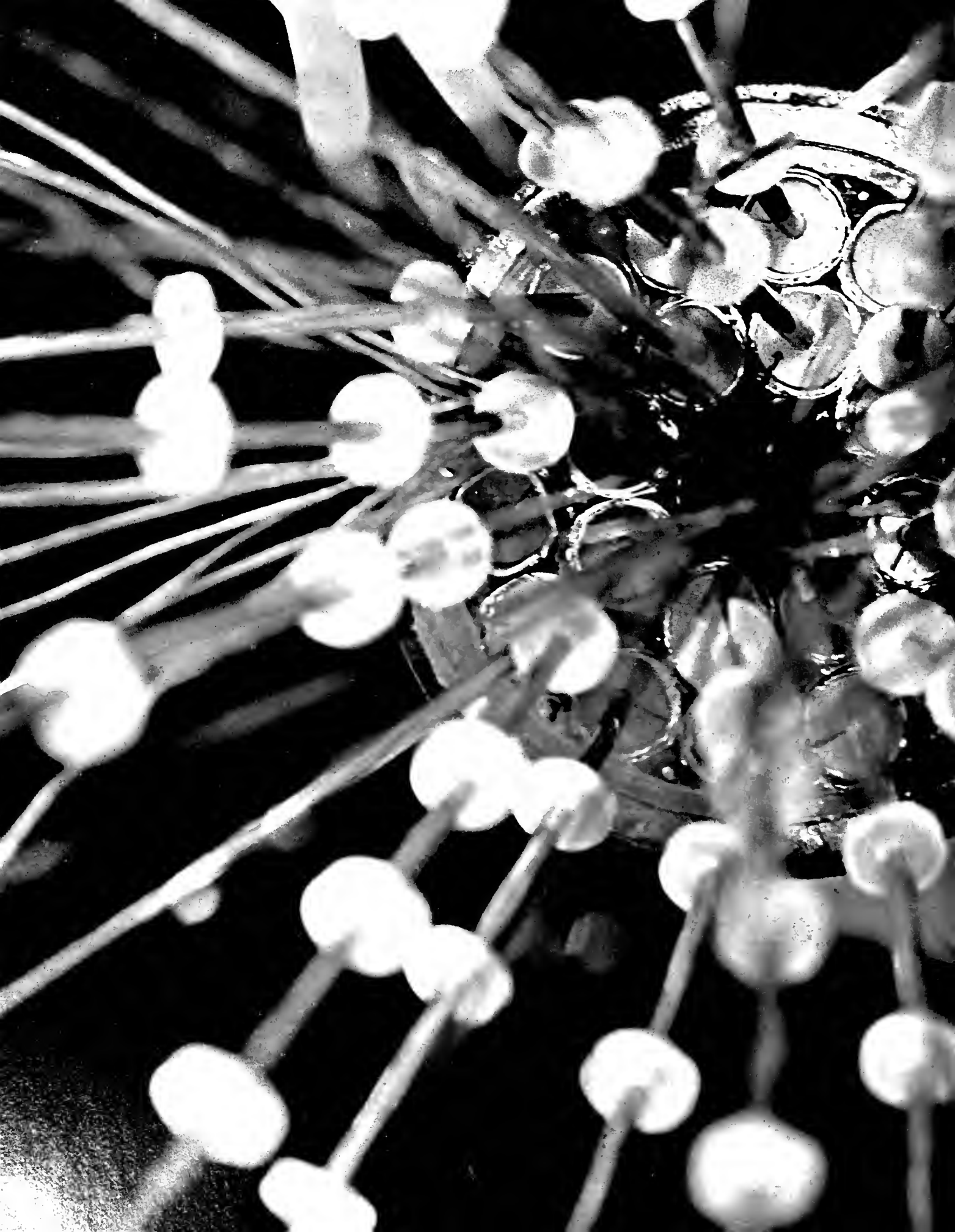
A major jolt to the prestige of the Great Hair Revolution was delivered last October by the general managers of big league baseball. Meeting in Colorado Springs, they passed a resolution introduced by John Holland, general manager of the Chicago Cubs, calling for the American and National Leagues to outlaw beards and mustaches on players. The baseball men somehow felt that all that hair was not appropriate to baseball players, the supposed heroes of American youth.

Whether the big leagues will take action remains to be seen, and, indeed, it also remains to be seen whether there'll be any place for them to take action. A few ballplayers wear sideburns, but there are no beards and the only mustachioed player in 1968 was the oh-so durable Satchel Paige, who is not expected back in the big leagues again . . . maybe.

**T**here certainly isn't any relationship between hair and the ability to play baseball. The general managers seem to have forgotten the late Adrian C. (Cap) Anson, who played for the old Chicago White Stockings at the end of the last century. Cap had a great handlebar mustache and hit a .400 clip for several years—a performance that causes today's owners and managers to drool.

But you can't take a look at hair without considering the ladies. How do they feel about the revolution? You get all sorts of answers, but perhaps the best came from the wife of a man who has sprouted a beard.

"It's not too pleasant," she said. "But I put up with it because it's what's underneath that I'm after." □





## Development Decisions and Expanding Communications

Engineers are continually faced with the problem of deciding whether to try the new or adapt the old. The evolution of increasingly larger cable systems illustrates how to minimize risks and maximize new technology.

**by George A. W. Boehm**

Like a perfect butler, a communications system is usually taken for granted. It is expected to anticipate every need, provide efficient service, and remain utterly unobtrusive.

But like getting a new butler to work in well with an already smoothly functioning household, designing, manufacturing and installing a major new communications link without disrupting a nationwide switching network can cause some uncertainties.

The secret to success of both projects, however, rests with adopting a plan that minimizes the risks. Without planning the steps to be taken, chaos may result. With effective plans — and the determination

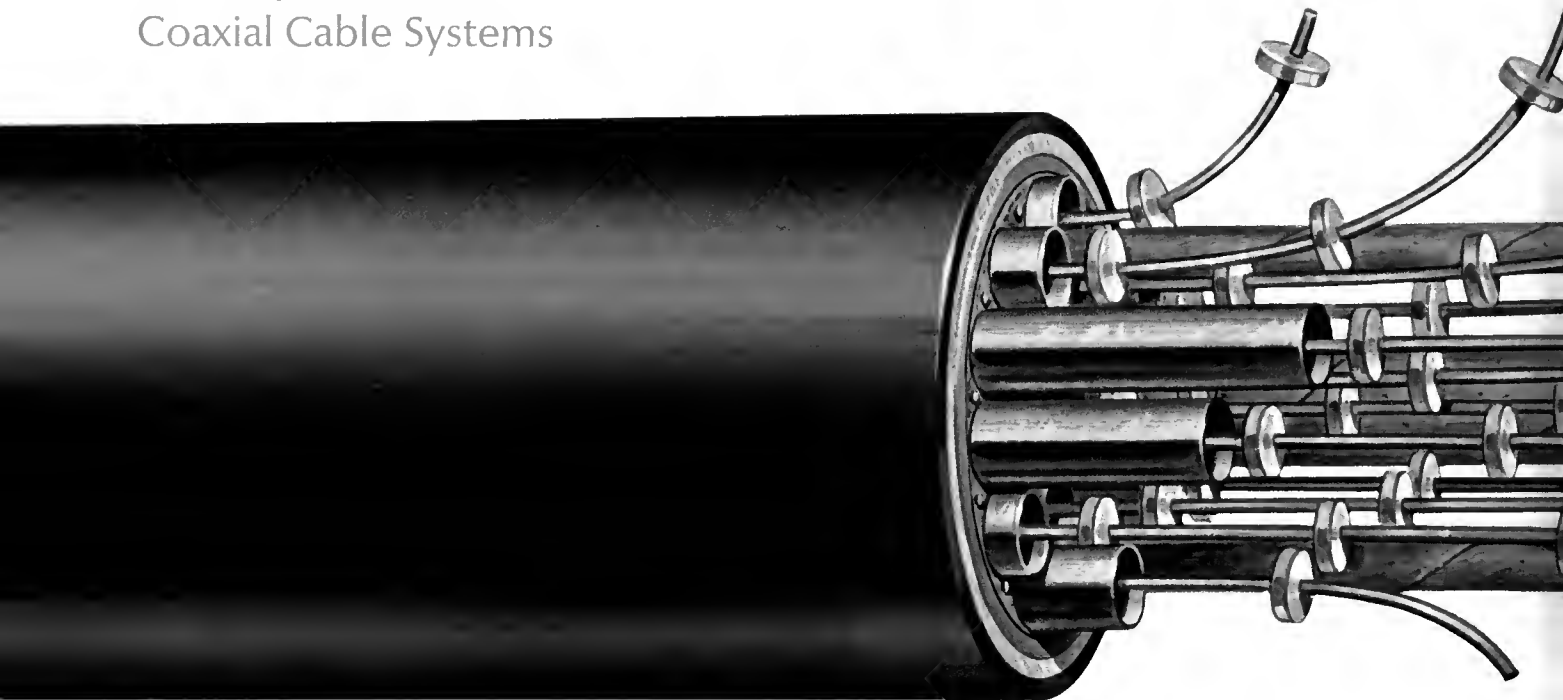
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*Mr. Boehm, former science editor of Fortune, is a frequent contributor to publications like Scientific American, Reader's Digest and The New York Times Magazine.*

# Development of Coaxial Cable Systems

1920s  
Bell Telephone  
Laboratories begins  
study of  
coaxial structure.

1929  
First long  
coaxial  
demon



1929  
Bell Labs scient  
apply for pate  
on coaxial cab

The modern coaxial cable consists of, for the most part, a group of  $\frac{3}{8}$  inch copper tubes, each with a copper wire held exactly in the center by small plastic disc insulators spaced about one inch apart. Since both the tube and the wire have the same center or axis, the name "coaxial" describes the arrangement.

These tubes are wrapped with steel tape for additional strength, protection and electrical shielding. The tubes themselves shield the transmitted signal from electrical interference by outside sources and prevent energy losses by radiation. Transmission is one-way over a tube, so a telephone conversation requires the use of two coaxials.

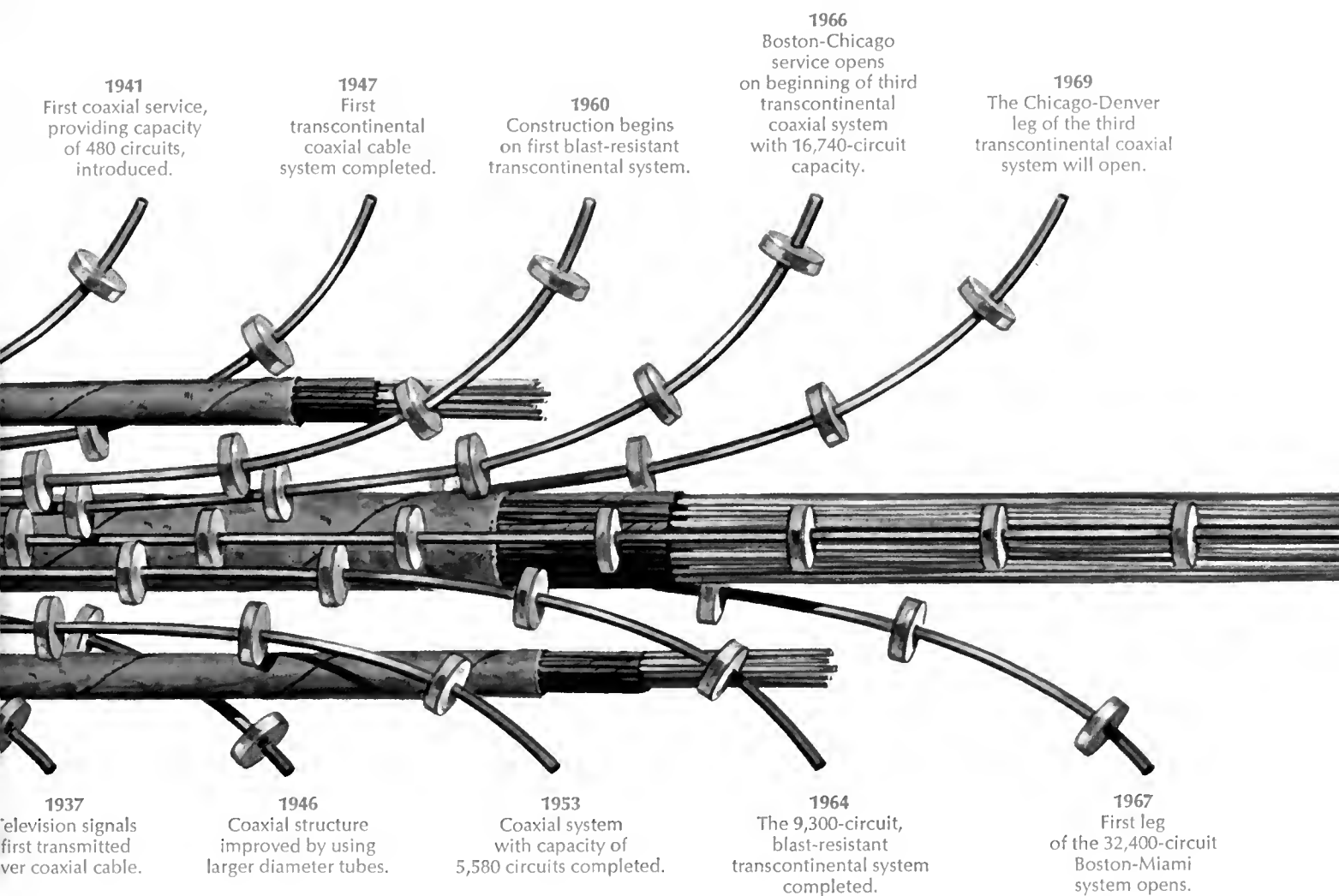
Today, a coaxial cable consists of up to 20 coaxials arranged in tight rings sheathed in polyethylene and lead.

This illustration highlights the development of coaxial cable transmission systems.

and talent to make it work — a smoothly functioning system will result.

Such was the case with a rather typical Bell System project: A \$210 million coaxial cable system stretching from Boston to Miami and capable of carrying 32,400 messages simultaneously — twice the capacity of earlier cable systems.

Planned more than five years ago, when there was still adequate spare transmission capacity along the East Coast, the new L-4 cable system came into being just in time to avert serious traffic jams along this 1,800-mile route. It has already carried thousands of long distance calls and data messages, yet it dovetails so neatly with the rest of the network — other cables and microwave radio links — that few users realize it exists. In fact, a telephone customer cannot tell how



his call has been routed over this system, and usually thinks little about communications service unless it is bad. But to date, the L-4 is proving to be remarkably dependable, and therefore unnoticeable.

### Progressing from wires strung on poles

Blending the cable into the Bell System network without a moment's disruption of service and exactly when needed belies the enormous complexities involved in creating it. To call the new cable "revolutionary" would be a backhand slap at the men who planned, designed, and built it. In engineering, as in politics, revolutions are almost always bloody melees. Sometimes they are unavoidable, as when a nation launches a crash program to develop an elaborate defense against a complex weapon. In contrast, the

L-4 cable was intended to be a logical and comfortable step in a progression that began with telephone wires strung on poles.

Because it is evolutionary, rather than revolutionary, the L-4 cable is cast for a key role in the steady improvement of the whole North American transmission network for years to come. Many of the older L-3 coaxial cables, installed as far back as the early 1950s, will be refitted with L-4 electronics to increase their reliability and message-carrying capacity. And L-4 lines are so designed that they in turn can be upgraded by still more sophisticated L-5 electronics, which are being developed with a 1973 target date.

A capacity for evolution has been built into the designs so that changes and additions can be made at minimal cost and with no interruption of service.

The method of augmenting transmission routes by simply adding more potent electronics to cables already in the ground is so economical that engineers refer to it as “mining extra circuits” and compare it to finding money in the street.

In the case of any new transmission system, planners have to weigh many diverse factors, including demand for transmission capacity in the years to come, development and manufacturing costs, operating economy, availability of manufacturing facilities, quality of service and dependability. Everything has to be considered in relation to the existing network and to technological developments that might occur over several years. Calculated risks have to be taken because of the inevitable uncertainty of economic and technological expectations.

### Buying time for irrevocable decisions

This kind of planning in the Bell System calls for intricate coordination among AT&T’s Long Lines Department, Bell Telephone Laboratories and Western Electric, the manufacturing unit. All along the planners try to remain as flexible as possible—to postpone irrevocable decisions until they absolutely have to be made. The longer they wait, the surer they become of the systems requirements and the technology that can be used in design and manufacture. By buying time they are able to make a much better system than what might originally be envisioned.

The men at Bell Labs who did the initial systems design for the L-4 cable system started off on solid ground. They knew that traffic along the East Coast would increase by about 15 per cent annually. At this rate existing facilities — cable and radio — would be overtaxed by 1968, and not long after that there would be similar trouble in other parts of the country. Service would deteriorate unless extra circuits were added. How best to add them was the problem.

One possible solution was to install an L-3 cable system. Another was to try to develop a new cable system with considerably greater capacity. Still an-

other was to look for ways of adding more radio channels. Systems engineers weighed the pros and cons and quickly eliminated the third possibility. Although radio is economically attractive for the simple reason that the transmission medium, air, is free, the day is swiftly approaching when the air between Miami and Boston will be so filled with microwave signals that interference will become intolerable.

### An economic target and a time limit

The problem could have been solved reasonably well by using L-3 cables. The capacity of coaxial cables has been gradually increased since the first ones were installed. Late models carry more than 16,000 voice messages simultaneously, and can be built at a cost of about \$6 per circuit mile. If the required capacity were to be supplied by L-3 cables, Long Lines economists were ready to recommend spending up to \$30 million per year during the late 1960s to make the necessary additions.

Systems engineers at Bell Labs consequently had an economic target and a time limit when they started thinking about developing the new system. Could a new system do the job more cheaply (in terms of dollars per circuit mile) and could it be designed and manufactured to meet a 1968 service schedule? Design engineers were confident this was possible, and in early 1962 a feasibility study was started.

The study took into account several basic constraints dictated by the nature of the nation’s communications system as a whole. The first was quality of service. Standards had been defined in terms of seconds a customer is likely to wait for a free circuit and the degree of distortion in a signal.

Another major constraint was technical manpower. “We always have more excellent ideas than we can exploit,” says Kenneth G. McKay, AT&T vice president of engineering. “It takes so much time and talent to develop an idea into something practical that we have to be careful in choosing which ones to work on.”

Within a year after the feasibility study began, the

basic concept of L-4 became crystallized. It was in several ways a major departure from L-3.

First, the system was to have twice the message capacity of L-3 and was to use transistors and other solid state devices. To carry more message circuits, the system had to have a much broader bandwidth and therefore used higher frequencies. This alone posed a major problem.

Message signals are weakened as they travel along a cable and must be electronically amplified periodically. L-3 had done this satisfactorily with vacuum-tube amplifiers spaced at intervals of four miles. But the higher the frequency, the more the signals are weakened. Therefore L-4 would have to have amplifiers every two miles. If vacuum-tube amplifiers were used, the total failure rate would have been so high that the system would not have met telephone standards for reliability.

Solid-state technology solved the problem. Since transistors have roughly 1,000 times the life of vacuum tubes, it is possible to use many more solid-state amplifiers in long systems and still achieve greater reliability than can be realized with vacuum tubes.

### When do you freeze the design?

Cost was another important consideration. In a system such as L-4, the coaxial cable itself, including the copper and insulation, installation and purchase of rights-of-way, is the most expensive item, representing about 80 percent of the overall system costs. Since L-4 has twice the message capacity of L-3, appreciably lower costs were expected even if the L-4 repeaters were more expensive than L-3 repeaters. (Repeaters are the amplifiers and other electronic equipment that compensate for loss of signal power and other distortions that occur when a signal passes through a cable.) Actually, the L-4 repeaters were less expensive because of their simpler electronic circuits and mechanical design. Consequently, the cost of L-4 message circuits is one third that of L-3, or about \$2 per circuit mile.

Time was also a critical consideration. The penalty for lateness would be about \$30 million a year—the amount that would have to be spent to handle traffic demand with additional L-3s.

“In a project of this kind,” says Mr. McKay, “the biggest problem is to decide when to freeze the design.” If the decision is made too early, he explains, engineers lose the opportunity to incorporate the latest technological improvements. If it is made too late, the final phases of the project are likely to bog down in confusion.

### Problems suggest design modifications

Solid-state electronics at that time were not quite equal to the task of manipulating signals in the high frequency range contemplated for L-4. For example, the germanium transistors which were initially used could not satisfy the stringent requirements placed on distortion. Nevertheless, men at Bell Labs who were pushing the development of devices and components were confident that suitable solid-state devices would be ready in time to meet L-4's deadline. Shortly after, the germanium transistors were replaced by new and appreciably better silicon transistors which satisfied the distortion requirements.

Once the technology seemed possible, Western Electric engineers were called in at an early stage and foresaw no insuperable manufacturing problems. But later, when problems did arise, they often suggested design modifications that made L-4 easier and cheaper to produce.

Engineers at Western Electric's Merrimack Valley Works in North Andover, Mass.—where Bell Labs scientists and engineers work under the same roof with Western Electric manufacturing men—were given leeway to make literally hundreds of modifications. Changes were proposed mainly to make L-4 equipment easier or cheaper to manufacture, another major consideration in the overall development.

Throughout the feasibility study, engineers were able to retain almost complete flexibility. In fact, the

basic decision to proceed with L-4 was not a firm commitment, but rather a form of insurance. The total development budget amounted to only a small fraction of the money Long Lines had been willing to allocate to L-3 cables. If a better scheme had suddenly cropped up, L-4 could have been abandoned with relatively little waste.

### Option to abandon runs out

By late-1964 the option to abandon L-4, or even to change it drastically, had to be dropped. At that stage, time would scarcely have permitted the manufacture and installation of enough L-3 equipment to meet demands. Although minor modifications were still possible, L-4 was committed.

L-4 got its first test under fire when a prototype was installed over a stretch of more than 100 miles near Dayton, Ohio. No one seriously expected this early version to work perfectly, and it didn't. There was trouble with the repeaters. Engineers know from experience that troubles have a way of snowballing unpredictably when thousands of laboratory-tested units are assembled and operated in the field.

Enlightened by this test, designers went back to work to correct the subtle flaws in the electronics. The field trial paid a major dividend. Designers from Bell Labs, production engineers from Western Electric, and representatives of operating companies got a clear idea of the practical problems involved in making L-4 behave on a much larger scale.

The importance of the field trial became increasingly evident as L-4 came down to the wire. The final staging of the project was concentrated at Western Electric's Merrimack Valley Works where a group of engineers were indoctrinated in every aspect of L-4 so there would be no gaps in the chain of responsibility. During the hectic last phase, 40 of these men formed a trouble-shooting cadre. Known as the "Flying Forty," they attended to such vital last-minute details as training operating and maintenance personnel in the new techniques.



Even now the engineering work on L-4 is far from finished. Conscientious engineers always have afterthoughts — new technological developments they would like to incorporate in the design, slightly different manufacturing procedures. With L-4, re-engineering is part of the total systems planning. The groups that designed and built it have been given responsibility to continue their work without interruption, albeit on a reduced scale.

### Successor well under way

Meanwhile, work on L-4's successor is already being stepped up. This coaxial cable, called L-5, has still greater bandwidth—enough to carry more than 90,000 voice messages. And it is likely to cost only \$1



The Bell System's communications network consists of 8,000 switching centers and more than 700 million miles of circuits that can carry printed, data or voice messages anywhere anytime.



per circuit mile. Because it will exploit still higher frequencies, repeaters will be spaced at intervals of one mile, instead of two miles as with L-4. This is the result of overall systems design, looking to the future. The job of upgrading L-4 cables with L-5 electronics will be simplified because new repeater stations can be inserted midway between old ones.

Engineers, considering the transmission and switching network as a whole, have been looking far beyond L-5. Today more and more traffic arrives in "digital" form—that is, as pulses not so different from Morse code. Thus a contemporary of L-5 will be a new high-capacity cable designed for economical transmission of digital messages, including data from computers and Picturephone® signals.

The men who do long-range systems planning have

taken out still other options to satisfy demands that seem likely to occur in the more remote future. Starting about 1980, it is likely that many new major transmission arteries will be circular waveguides, which are hollow pipes electronically equipped to transmit digital messages. Such a system could have a message capacity greater than one quarter million circuits.

Nothing is definitely scheduled for development beyond waveguides because extremely long-range projections of demands and technology are so hazy that attempts to evaluate them systematically would be fruitless. But somewhere in the future, probably before the end of this century, looms still another major advance. It is theoretically possible to send messages over a beam of laser light. In fact, laboratory experiments have been successful on a limited scale. One optical channel, perhaps a slender pipe buried underground, would be able to carry the equivalent of more than 10 million voice messages.

### Big question: improve old or design new?

All these future developments will presumably mirror the development applied to L-4 and the other communications transmission systems that preceded it. The broad-gauge problems will be strikingly similar. One of the most crucial is stated by A. C. Dickieson, vice president for transmission development at Bell Labs: "Development groups always have to make hard choices between putting their efforts on improving older systems or designing new systems. . . . This question will continue to challenge the best judgment of systems planners and development engineers."

And planners will continue to face the problem of calling their shots precisely. Pressed by continually growing demands for service, they will have to meet deadlines. Yet to install much more capacity than is needed for immediate growth is as wasteful as building an eight-lane highway when only two lanes are needed. Such is the challenge to the Bell System as it meets responsibilities for abundant, versatile, high-quality, low-cost communications services. □

# BELL

## reports

### Computer-to-home Teaching Tried

The nation's first large-scale experiment in computer-to-home teaching has been launched by the New York City public schools in cooperation with New York Telephone Company.

Called Dial-A-Drill, the experiment provides drills in arithmetic for 2,450 children from the second through sixth grades, with special emphasis on youngsters in disadvantaged areas.

For a five-month period each participating child is receiving a five-minute drill, three times a week, at home. Attendants at the computer location call the pupils at prearranged times and connect them to the computer, which then presents the students with mathematical problems. The students answer by pressing buttons on a modified, 12-button Touch-Tone® phone set installed as an extension to the telephones in their homes.

### System Sponsoring TV Programs

Two Bell System-sponsored programs will be shown on the NBC Television Network in April.

The last of a three-part documentary on the urban crisis will be telecast April 22 from 7:30 to 9 p.m. EST.

Filmed in the San Francisco area, it will deal with sociological and psychological factors at the root of the crisis and suggest possible solutions.

The series, an outgrowth of the Bell System's continuing, long-term study of the urban dilemma, is entitled "White Paper: The Ordeal of the American City."

Something of a contrast will be provided four days later (April 26) when the System will play host to another coast-to-coast television travel tour of the U.S.A. entitled "A Look on the Light Side."

Also scheduled at 7:30 p.m. EST, this program stars Bill Dana on an eight-state trek designed to prove that Americans know where the lighthearted action is. It is a sequel to the "Discover America" special aired last May.

### Plastics, Metals Tests Developed

Because the Bell System uses millions of pounds of plastics each year for numerous outdoor applications, Bell Telephone Laboratories researchers have designed a new method to measure "weatherability" of plastics. They have also devised an advanced technique for testing durability of metals.

The new plastics test uses internal reflection spectroscopy to detect surface changes caused by ultraviolet light emitted from the sun, which is the chief culprit in the degradation of plastics outdoors.

This technique finds the changes soon after they begin, measures them, and estimates the rate of degradation. It is superior to outdoor exposure studies, which often require several years, and accelerated aging methods, which give only approximate results because outdoor environments aren't duplicated exactly. The new method is fast and doesn't destroy the plastic.

Lensless, three-dimensional photography known as holography is the key to the improved metal toughness tests. A technique called holographic interferometry is being used for the first time in fracture mechanics, which establishes conditions under which a material will or will not fail by cracking.

Demonstrated at Bell Labs and elsewhere in 1965, holographic interferometry permits patterns of permanent strain to be seen "live" as they spread over the surface of metal.

Observing the formation of these patterns, as a metal sample is loaded beyond the point of permanent strain, allows investigation of the strength of the metal in a particular design before it is committed to manufacture.

Present conventional methods of making such patterns visible are more limited in scope, require more time, and are of questionable accuracy.



*A new fad in mod glasses? Nope. These odd-looking prism goggles are designed to provide a weird, new outlook on the world as part of an experiment to find out how people cope with visual distortions. The Bell System has long studied sensory perception — the basis of all communications.*

### Agreements Signed for TWX Transfer

Bell System Companies and Western Union recently signed agreements relating to the purchase of Teletype-writer Exchange Service (TWX) by Western Union.

This action followed approval in principle of the terms of agreements by AT&T directors and Western Union in mid-January.

Included were purchase, operating, training and patent agreements. The acquisition would enable Western Union to integrate its present Telex service with TWX to provide customers of both with benefits similar to those that integration of the nationwide switched telephone network today provides telephone users. TWX presently has about 40,000 stations; Telex, 26,000.

The sale, involving an estimated \$80 million, is contingent upon regulatory approval. Completion of all phases of the transfer is expected to take 18 months or more.

### New Coaxial Readied for Trials

Operating with the knowledge that even small amounts of money saved, capacity added, or strength gained will be multiplied millions of times by the vast needs of the Bell System, Bell Telephone Laboratories engineers are readying a new laminated-corrugated coaxial cable for field trial in 1969.

Rapid growth in long distance calling, television, and data signals being transmitted by the Bell System will soon require carrying more signals on each coaxial in a cable. More signals per coaxial means increasing the bandwidth, which in turn necessitates the use of higher frequencies.

At high frequencies, the signal flows along a thin surface area of conductors

and in the space between them. Making the outer conductor of steel lined with copper, rather than of pure copper, allows a two-thirds savings of the more valuable metal.

The steel makes the coaxial stronger, and to provide greater bend and crush strength, the outer conductor is also corrugated. The inner conductor is solid copper. A soldered seam fixes the diameter of the coaxial and seals against electrical interference.

### World Phone Total at 222 Million

The number of telephones in the world increased by 14 million in 1967 and totaled 222 million at the start of 1968. More than half of these are in North America, where there is one telephone for every two persons.

The statistics are included in "The World's Telephones," an annual review compiled by AT&T. Since it takes nearly a year to gather such information from telephone administrations and companies around the world, figures are a year old when released.

United States telephone users can call 96 percent of the world's telephones, and international calling from

this country increased 23 percent during 1967 to 12.3 million calls (in 1968 that figure rose again by 24 percent, to over 15 million calls).

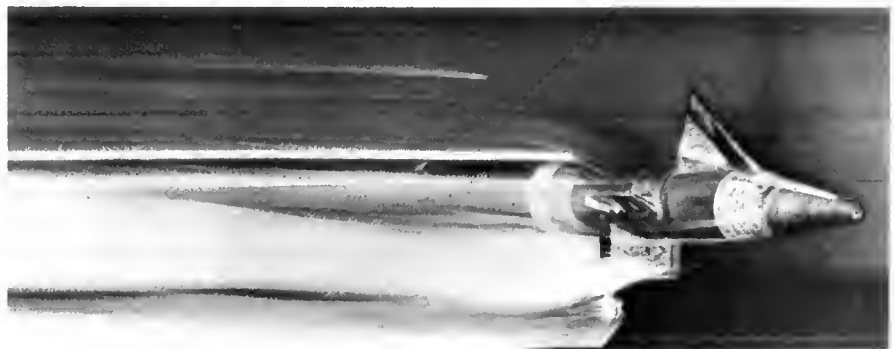
In telephone usage, Canada leads the U.S. by a narrow margin. Phone conversations per year averaged 667.7 per person in Canada in 1967, compared with 667.0 here.

By early 1968 the U.S., with nearly 104 million phones, had five-and-a-half times as many phones as Japan, second in the ranking of countries. The U.S. is also first in the number of phones on a per capita basis with 51.8 phones for every 100 persons.

### Mobile Coin Phones Unveiled

Mobile Touch-Tone® coin telephone service was unveiled in January with the inauguration of high-speed train service between New York City and Washington, D.C.

The single-slot phones, housed in special booths, enable passengers on the Penn Central's new Metroliner, which travels the present rails at speeds up to 110 miles per hour, to place calls directly to any part of the nation without having to deposit coins



*Photometrics, a technique for obtaining visual data needed in research, development and testing activities, is used by Sandia Laboratories to "freeze" shock wave detail and incendiary effects of this high-velocity Sandia Rocket Sled. Sandia is a Western Electric subsidiary operated for the Atomic Energy Commission.*

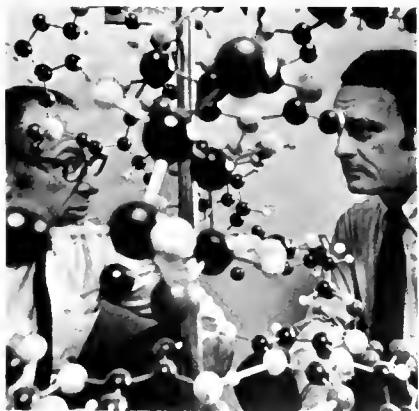
in advance. As the call speeds to its destination, a Philadelphia operator intercepts briefly to collect initial charges or request credit card, collect or person-to-person information. Incoming calls to the trains are answered by car attendants, who page the passengers being called.

Antennas on towers at nine locations along the 225-mile route receive and transmit signals between the trains and the telephone network.

### Mysteries of Genetics Probed

Deoxyribonucleic acid — or DNA — is a molecule that carries from generation to generation the genetic information that is needed to reproduce life. For the past few years researchers at Bell Telephone Laboratories have been experimenting with it and other biological molecules in order to understand them from a physical, rather than biological viewpoint.

They realize that an understanding of DNA as it works in the cell may



Bell Laboratories scientists, Josef Eisenger (left) and Robert Schulman, discuss their work on DNA, the molecule which carries genetic information in the cell. They hope to discover new ways to improve man-made communications. A model of the DNA molecule is in the foreground.

one day be useful to engineers and scientists trying to improve man-made communications systems.

DNA is the key structure in a cell which confers hereditary individuality to all living things. To store its hereditary message, it uses a "language" composed of four different "words" or organic compounds. When one of these compounds is altered, eliminated or inserted, the genetic message is changed causing biological mutation.

The Bell Labs scientists have been studying changes that result when, upon absorbing ultraviolet light, electrons in certain parts of the DNA gain energy and sometimes cause chemical changes. This results in a mutation in the genetic information.

Using this information the scientists have obtained a clear understanding of the biological consequences of the changes, but other mysteries about the DNA remain to be solved.

### Several New Offerings Listed

Several new services will be offered generally by the Bell System during the next few months.

**Apartment Door Answering Service.** A Touch-Tone® phone in an apartment house lobby and a building directory using three-digit numbers allows a visitor to dial appropriate number, identify himself, and wait for tenant to dial the digit "4," which opens lobby door. The tenant can also complete outside calls while talking to a lobby visitor by putting one or the other on "hold." This service is already in use in Illinois, New York, and Missouri.

**Receive-only Dataspeed® printer terminal.** This is a non-impact, character-by-character printer that can provide copy at transmission speeds from 750 to 1,200 words per minute. The printer forms characters by draw-

ing a stream of charged ink droplets past deflecting electrodes. It is virtually silent in operation.

**Page Key for PBX service.** A page key provides private branch exchange attendant with push-button access to a customer-owned loudspeaker paging system. It has been added to several types of switchboards used for manual or dial PBX service.

**Low-speed, originate-only data set.** A compact, portable unit weighing about six pounds, data set 112A transmits data by acoustical coupling with a conventional or Trimline® telephone handset. The handset rests in a cradle of the data set, which is designed for use where portability or mobility of data terminal equipment is important.

### Bell System Gets 'Apollo 8' Awards

Bell System contributions to the success of Apollo 8's epic moon flight were rewarded recently with four citations from the National Aeronautics and Space Administration.

NASA's Public Service Group Achievement Award was presented to the Apollo 8 Communications Network, for which the Bell System was the major supplier of circuits and facilities. The citation was accepted by Herbert Kertz, AT&T vice president.

Kenneth McKay, AT&T engineering vice president and Chairman of the Board of Bellcomm, Inc., and Ian Ross, president of Bellcomm, received individual awards for "outstanding contributions" to the "exceptional success" of Apollo 8. Bellcomm, an AT&T subsidiary, provides systems engineering planning services for the project.

William Schockley, Bell Telephone Laboratories executive consultant, received a Certificate of Appreciation for his work on NASA's Scientific and Technology Advisory Committee. □

# Reflections of a 21st Century Manager

by George Kozmetsky

the  
end

of the  
20th century

was duly marked by global celebrations. But for a relatively small group of Americans there were special satisfactions in entering the year 2001. They were the managers of various enterprises—in business, government and industry—whose careers extended all the way back to the late 1960s. Now in their fifties, they could look back on a period of extraordinary change. The manager's responsibilities had changed drastically while the composition of industry itself

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*Dr. Kozmetsky has taught at the Harvard Business School and written books on the computer. He was a co-founder of Teledyne and left the company with a personal fortune of some \$25 million. Now as dean of the University of Texas Business School he is building what he hopes will be one of the top business schools in the United States.*

was marked by numerous stages of transformation.

Back in the early 1970s, they recalled, managers began to recognize new kinds of organizations. For convenience, these developing organizations were known as *nonroutine industries*.

Those nonroutine industries were made up of units of government, industry and education engaged in nonrepetitive or "nonroutine" pursuits. The education industry itself was a leading nonroutine industry. The defense and space industries were certainly nonroutine industries, and so were large segments of the medical, electronics, oceanography and "urban problem" industries. So were many areas of government.

The new industries had certain common characteristics. Often, for example, they were working on problems that required new orders of solutions. No textbooks held the answers to questions that arose in planning and building livable megalopolies, exploring the reaches of space or controlling the environment. Frequently, answers had to be improvised. The temporary solution to the problem of air pollution in Los Angeles, for example, was typically makeshift and typically "messy." When the pollution index struck a certain level, motorists were required to pull over to the curb and turn off the engine. As pollution grew worse, power plants were required to switch from diesel fuel to natural gas. Solutions to many such problems, ranging from garbage disposal to land pollution, were frequently patchwork and "messy," offensive to anyone who liked solutions to be "clean" and permanent.

Nonroutine industries were also technologically based; their products were the end result of much labor and thought by scientists, engineers and other technical and professional talents. Even as early as 1969, 70 percent of the available scientists and engineers were hired by the "nonroutine" industries.

Another characteristic of the new industries was that the number of units they produced was not very large. Sometimes, in fact, the "unit" consisted only of a program or a plan. If the "units" were products, they ranged from one-of-a-kind to small production runs. The computer industry, for example, produced only 14,300 units in 1968, after 20 years of existence as an "industry." In contrast, the old mass-production auto industry turned out 10 million units.

Still another characteristic of the emerging industries was that their new products or proposals often required the cooperation and coordination of segments of government, education and industry. Problems associated with urbanization, for example, involved a large amount of interaction among public and private organizations. So did problems related to transportation, space exploration and health.

The rise and spread of such new industries gradually changed the nature of the manager's tasks.

In the old, mass-production industries, the manager was principally a supervisor of specialists. To his office came the experts in his company, the profes-

"Even as early as 1969, 70 percent of the available scientists and engineers were hired by the 'nonroutine' industries."

The ability to manage intellectual resources assumed overwhelming importance in the decades of the 1970s and 1980s.”

sionals in such fields as accounting, personnel, marketing, finance and production. But in the nonroutine industries, the manager had a different set of appointments. His office visitors were men in government, university professors, the many scientists and engineers within his own company, and numerous outside consultants.

More and more, it appeared, the manager of a nonroutine industry was not merely the supervisor and motivator of an assortment of talents; he was also a man with the ability to break across the artificial barriers among disciplines and professions. His experiences in education and government, as well as in business, enabled him to locate and tap expertise on short notice. He was, in fact, a manager of *intellectual resources*.

The ability to manage intellectual resources assumed overwhelming importance in the decades of the 1970s and 1980s. By then, education had unquestionably become America's leading industry, requiring a vast number of skilled managers. In 1980, college enrollments were three times higher than in 1970, and they advanced even faster in later decades. (In the year 2000, for example, the University of California had 275,000 students, compared with 99,000 in 1969, and that was fairly typical of the larger educational units. Education was a life-long process for virtually all of America's 400 million people.)

Even as early as the 1970s, it had become quite common for a manager to leave The Company after five or six years in the demanding top echelons. Sometimes he went off to serve in government; often he joined a university. But in any kind of organization he was marked by his ability to tap intellectual resources, in the interest of solving problems and creating new knowledge.

The university was the ideal place for honing his abilities as a manager. The campus was obviously rich in intellectual resources. It offered him the chance to bring together different disciplines in an informal atmosphere and get them to work on a particular problem. The solutions they found — often unusual — could perhaps be applied in a few years to some industry, just as space technology and techniques had been adopted by industry in the 1960s.

Of course, the manager who could shuttle easily among government, industry and educational organizations was not particularly new. Such managers appeared noticeably in the 1960s. People like John Gardner, Robert McNamara, George Romney, Daniel Moynihan, Sol Linowitz, Dean Rusk, Orville Freeman and McGeorge Bundy were merely a few of the managers who could move gracefully — and successfully — from campus to a foundation, from business to government. Behind them were hundreds of lesser-known managers with similar adaptability. Increasingly, the business manager in most demand was one who could skillfully bring together experts of government and education into the planning stages of a project, drawing on *their* intellectual resources. But as the one-of-a-kind projects so typical of the nonroutine industries became more common in the 1970s and 1980s, the manager's tenure with a particular

“Increasingly, the business manager in most demand was one who could skillfully bring together experts of government and education into the planning stages of a project....”

organization was significantly shorter than it was in the 1960s.

The need for managers of intellectual resources was intense, even in the 1960s. The shortage of such managers would have been worse, however, if the nation had not embarked on the era of manned space flight. With that era came the rise to prominence of the interdisciplinary scientists.

What America needed and got in that period was an increasing number of Leonardo da Vincis—people who could work across the sciences; people who could comprehend the subtleties of cellular biology and at the same time design the mechanical apparatus needed to keep living organisms alive and normally adjusted to the hostile environment of space. In addition, these same individuals were expected to manage and integrate their portion of the operation with the longer range objectives.

At the same time, a number of corporations—particularly those in the mass-production or routine industries — were themselves busily training future managers, even if they sometimes failed to realize the fact. It was occasionally noted, even in the 1960s, that systems experts quickly learned many of the essential details of running a company in the process of analyzing systems and structuring problems. As problem-solving by computer became more general in the 1970s, the systems experts were logical candidates for top management. It was they, after all, who could superbly perform what was to become the manager's chief function — the structuring of problems. And so, between the space programs and management training by computer, America had developed at least a stopgap supply of managers for the 1970s and 1980s. By this time, too, the leading university business schools had modernized their programs and were training many managers for the new-style enterprises.

One of the particularly vexing problems for nonroutine industry managers in this period involved an essential segment of their intellectual resources—the scientists and technicians. In the 1970s, most technically trained people had become even more mobile than managers.

The tenure of technically trained people on a project often lasted for just a few years. As soon as their specialized knowledge was exhausted, they found it necessary to acquire some other specialty—for their specialties were often usable for one project only.

For all the talk about shortages of engineers and scientists in the 1960s, for example, there began to appear a kind of occupational unemployment; like actors, scientists found themselves “at liberty.” When England found it couldn't compete in atomic energy and in the aircraft industries, the requirements for technical people were cut back 50 percent. Job switches and “brain drains” became common.

Motivating people to do their best in short-term projects was particularly trying for managers in the 1970s. In those years, however, enormous strides were made in understanding how people store and process information internally—

“For all the talk about shortages of engineers and scientists in the 1960s... there began to appear a kind of occupational unemployment.”



“Back in the 1960s corporations were becoming aware of what was popularly called ‘social responsibility.’”

in other words, how they think. The psychology developed from research in that area also was applied to problems of human behavior; and by the 1980s, knowledge of learning and motivation was as advanced as were chemistry and biology in the 1960s. By the end of the century managers in both routine and nonroutine industries were superior motivators.

The motivation question affected entire organizations, of course. Back in the 1960s, corporations were becoming aware of what was popularly called “social responsibility.” Many companies quickly laid claim to the virtue; others said they had it all along. In any case the question became increasingly academic as corporate policies and activities seemed increasingly to involve the public interest. By the 1980s and 1990s the largest corporations squarely identified their goals with social objectives, and the manager became concerned with developing industrial strategies that would mesh with the goals of raising the quality of life. The motivating force behind his company, as he saw it, was the need to furnish people with the things that gave full meaning to life. Philosophical questions found a permanent place on the agenda of board meetings, and the chairman was as concerned about them as about return on investment.

On the eve of year 2001, a manager could take some satisfactions in the ways that some of the fears of the 1960s and 1970s had disappeared.

In those years, he recalled, there had been widespread concern that automation would create disastrous problems of chronic unemployment. When it developed that computers could not only think but could also frame questions better than most humans, there was further alarm. And when automated equipment began to produce automated equipment—in effect, a machine with the human power of reproduction—there was something akin to terror. Was man becoming obsolete?

In retrospect, the fears were groundless. The machines were actually helping to open up new opportunities and force the continuous upgrading of tasks.

Some of the biggest changes of all had occurred within the old mass-production industries. A third of all working people were in these industries by the year 2000, and virtually all could be considered supervisors or middle-managers. The 40- and 35-hour work week had disappeared many years before; supervisors and maintenance workers were in the automated factory only four hours each day. A typical factory had six shifts, five days weekly.

The managers at middle levels handled actual operations of the factory. They turned their tactical problems over to self-organizing computers, which in turn put the solutions into automatic operation—subject, of course, to the middle-manager’s veto.

The top manager had an enormous amount of authority, compared with the top manager of the 1960s. All lines on the organization chart led to his office. The trend really started in the 1960s with the centralization of certain operations, like payroll and billing, that was made possible by computers. As com-

“The managers at middle levels handled actual operations of the factory.”

puter applications spread during the 1970s, companies recentralized authority and control. By the year 2000, the top manager and the machines were directly responsible for virtually all decision-making. The authority of middle managers was severely limited.

A high percentage of the top manager's time was devoted to strategic planning. He was concerned with the day-to-day operations of the company only to the extent of monitoring performance—to make certain that decisions were in line with his company's goals and policies.

Top managers had ample time for such strategic planning. Committee meetings and routine briefings had long been eliminated. The chief executive carried out communications with a voice-writer, color TV-telephone and computer display board. In strategic planning, he concentrated on formulating specialized management principles which would eventually be built into the computer; the computer could then offer solutions to specific problems in line with management principles and company goals.

When he wasn't planning, the manager was studying. His administrative aide (upgraded from secretary) helped assemble research and study sources.

His study efforts were considered an essential part of his daily chores. For in the nonroutine industries, a manager needed a deep knowledge of the natural sciences, the arts, the social sciences and the physical sciences. All in all, he needed to keep abreast of 10 different fields in detail, and he needed a good conceptual knowledge of 90 others.

Other things had changed for the manager too. Communications had removed the necessity for most face-to-face meetings, and communicating itself was much briefer. And the proliferation of governmental authorities, with their overlapping jurisdictions, finally gave way in the late 1970s to a balance of federal and regional authorities, making communicating with government easier.

Solutions to problems were still tailor-made, but they were no longer "messy." With government, industry and education working toward the common goals of improving the quality of life, conflict of interest — that had made for patchwork solutions in the 1960s — had been largely eliminated.

Not all problems had been ironed out in the last third of the 20th Century, of course. The knowledge explosion, for instance, was never really tamed. Despite the compression and fast transmission of data in forms other than the old printed word, managers had still to find some way to keep completely current, because knowledge kept doubling at ever faster rates. The typical manager in the year 2000 was more or less resigned to the idea that he would never know all he needed to know.

But, on the whole, for the manager, the satisfactions in reaching the 21st Century far outweighed any yearnings for simpler times. His skills had played no small part in easing burdens so that people had more meaningful control over their lives, enabling them to manage their own destinies. □

“Committee meetings and routine briefings had long been eliminated.”

“The knowledge explosion... was never really tamed.”



## Molly makes us run

We've had to run to stay ahead of the high-speed nanosecond world that Molly was born into. In just the 11 short years of Molly's lifetime, our business has more than doubled in size.

And our nationwide phone network will continue to grow.

Day after day, an avalanche of new innovations—new ideas, new products and services—rolls onto our network. Pictures and diagrams and heartbeats and voices are switched instantly over it from anywhere to any of 110 million telephones and telecommunications devices.

As we continue to innovate, the network will be able to do more things for more people. For instance, we're getting ready to provide you with Picturephone® service, connect you with library or teaching sources, or enable you to draw a check on your bank, or talk directly with your bank's computer by

Touch-Tone® telephone.

This growing versatility and flexibility stimulates still more growth and more innovation in both services and equipment. Our network thus becomes both the cause and effect of better communications.

Growth in population, growth in human communications, growth in machine calling, all of these things, indicate that the job of universal communications will more than double in the next ten years alone.

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May/June 1969

Landing  
Men  
on the  
Moon

page 2

# BELL

telephone magazine



# Inflation's Disquieting Signs

One of the basic goals of economic enterprise is to offer people a good range of choice in goods and services. No business can afford to take for granted the prospects of expanding opportunities of choice. Expanding opportunities takes work—unrelenting, purposeful work. And it requires an economic environment that provides incentives for innovation.

There is a very real risk that we in this country—after nearly a decade of steadily expanding opportunity—may come to take the process for granted and fail to heed the disquieting signs of inflation. Inflation is more marked than any we have experienced in 15 years and threatens the stability of our economy and its prospects for growth.

We need a chorus of voices and a weight of opinion that will strengthen the determination of policy-makers to bring and keep the problem under control.

Grounds for pleading the need for control of inflation are not determined only, or even mainly, by the problems of the telephone business and others like it. Certainly even steady progress in introducing more efficient, productive equipment and methods in the telephone business cannot offset the effects of wage increases of 6½ percent a year and rises in interest rates on new capital into the range of 7 percent and even more. Try as we will, and as we continue to do, we have to look for increases in rates to supplement our efforts under these circumstances.

But grounds for pleading the need for control of inflation are broader than that—and broader too than the traditional emphasis on the inequities inflation creates.

Certainly inflation penalizes thrift. Certainly it strikes most heavily at people with fixed incomes, and at the poor. Certainly it provides, for some others, speculative opportunities that dramatize the contrasts of gain and loss. These are all good, strong reasons for combating inflation.

But other problems are becoming more and more prominent. For example, and fundamentally, how are we to maintain a balanced economy and reasonably stable economic growth in an inflationary climate?

It is not only that financing problems are aggravated for prospective homeowners, for the construction industry, for utilities, for state and local governments. It is not only that skyrocketing costs threaten municipal solvency.

In addition, expectations of inflation create build-ups of inventories and advance buying of both capital and consumer goods. This in turn creates build-ups of industrial capacity, and so on and so on, to the point where market uncertainties will sooner or later take over and decline begins. In short, inflation can well generate undesirable economic growth and undue, unwanted, and unhealthy swings in the economy. For it distorts business decisions. It encourages mistiming of effort and misallocation of resources. And it can also bring to the peril point our position in international trade and the balance of payments problem.

In the past year we have seen the beginnings of an inflationary psychology in the United States. Fortunately we are still in the early warning stage. There is still time to act—to slow this current inflation in ways that will not cause undue hardship. But we must act with resolution. The danger lies in not acting firmly, for if we do not act firmly the day of reckoning will be severe.

We have so many necessary and worthwhile things to accomplish in this country and such need to build and apply our resources well. One thing we surely don't need is the growth of inflationary psychology to get in the way.

*Excerpts from a speech by AT&T Board Chairman  
H. I. Romnes to the North Carolina Citizens Association.*

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telephone magazine

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In late July, according to present plans, three Americans — civilian Neil A. Armstrong, Air Force Col. Edwin E. Aldrin, Jr., and Air Force Lt. Col. Michael Collins — will seek to push back the limits of human exploration as no man has done since the time of Columbus. On their space flight Mr. Armstrong and Col. Aldrin will ride their lunar module (the landing craft known as LM) down to the moon's barren and airless surface, the first men in history to set foot on solid ground outside their native planet.

But unlike Columbus, who had only crude navigational instruments and courage to keep going, the astronauts, before they set out, will know with great precision where they will land and what to expect on

the lunar surface. And detailed knowledge of the moon is exactly what was lacking just a few short years ago at the start of the moon program.

In 1961, when President Kennedy made what was then a bold proposal to send men on a round trip to the moon in this decade, there was reason for confidence that the technology for a moon mission was within reach. But there were also serious uncertainties about hazards to human beings in space from radiation and meteorites, and fears that conditions on the moon might simply prove too formidable for a first-generation moonship.

From the beginning of the program, mission plan-

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*Mr. Walsh is news editor of Science, the magazine of the American Association for the Advancement of Science.*





ners gave high priority to a quest for knowledge about the lunar environment so they could choose landing sites on the moon.

Selecting a site for the first moon landing doesn't mean simply picking the flattest area with the most unobstructed approach and making it the bull's-eye. The lunar module in which the two astronauts will descend to the moon's surface is a very sophisticated piece of equipment that nevertheless has performance limitations, which, along with operational con-

siderations, strongly influence the selection of early Apollo landing sites. In fact, because of these constraints, the choice of landing sites is controlled less by the topography of the moon than by the means of getting there.

Who then selects landing sites? In a narrow sense geologists have a strong voice because of their understanding of the lunar landscape. But, in effect, the



Apollo hardware, the physics of the earth-moon system, and characteristics of the lunar surface taken together as a system determine where the LM can land. Because of the interdependence of technical decisions in the space program, representatives from almost every part of NASA and from many of NASA's industrial contractors were drawn into the moon survey and site selection process. So were people with special skills and knowledge in such organizations as the U.S. Geological Survey and the Army and Air Force mapping services.

### **Bellcomm helped pick landing site**

One participant in the site selection process was Bellcomm, a subsidiary of AT&T and the Western Electric Co. and one of the smallest Bell System companies. Although a private company, Bellcomm is considered, in its systems engineering role, a part of NASA's organizational structure. And in providing systems engineering advice to the manned spaceflight program, Bellcomm is concerned with the whole Apollo system rather than with any single aspect of it.

Bellcomm was established in 1962 at the request of NASA Administrator James E. Webb. What Mr. Webb looked to Bellcomm to provide was, in his own words, "experienced men capable of giving the responsible NASA officials the most advanced analytical procedures and factual base they need to make the wide range of systems engineering decisions required for the successful execution of the manned spaceflight." Bellcomm's function was to be advisory; government officials would make the final decisions on technology, engineering and procurement questions.

Bellcomm was established on organizational lines not too different from those of Bell Telephone Laboratories and with a nucleus of Bell Labs staff members. The organization has been deliberately kept small. Some 475 people currently work for Bellcomm, about 300 of them technical staff trained in a wide range of scientific and engineering specialties.

The landing site selection process has been one of Bellcomm's continuing interests, but has accounted

for only a small part of the organization's total activities. Because of its systems responsibility, however, Bellcomm has figured at every stage in site selection work, which, incidentally, provides an excellent example of systems engineering in action.

When Bellcomm came into being in 1962, NASA's experts were making the first great formative decision of the moon program — the "mode" for the moon flight. Astronauts would first orbit the moon. Next, two of them would descend to the lunar surface in a separate spacecraft, and then, after planned surface investigations, rejoin the mother ship in orbit for the journey back to earth.

For the safety of the astronauts, scientists and engineers endorsed the so-called "free-return trajectory." On this course, an elongated figure 8 trajectory linking the earth and moon, the astronauts can elect to power themselves into orbit around the moon, or, if conditions are unfavorable, simply continue on the free return trajectory which will take them on a looping path around the moon and allow them to return to earth safely. This free-return trajectory carries the Apollo spacecraft into orbit near the moon's equator, where landing sites had to be found because of the necessity to conserve fuel.

### **Several site "candidates" considered**

A landing on the far side of the moon had been ruled out from the beginning because it was essential to maintain communications to earth during the critical landing, exploration and takeoff phases on the moon. Communications are "blacked out" when the LM is on the far side of the moon. This meant sticking to a time when the earth-facing side of the moon is lighted, and to a position not too near the edges of the moon where communications difficulties begin. Engineers therefore sought "candidate" landing sites, in the "Apollo Zone," a fairly narrow region some 45 degrees east and west and 5 degrees north and south along the lunar equator.

In the early days of the moon program there was some question as to whether it would be possible to

find a landing place on the equatorial belt or indeed anywhere else on the lunar surface. Most troubling was the theory that erosion from the lunar highlands had caused debris or "moon dust" to drift deep in the level areas so that a spacecraft might be swallowed up. Other theories suggested that the lunar subsurface might be honeycombed and the ground might collapse under a landing moonship.

As Apollo hardware took shape, its designers made urgent demands for information on what sort of surface conditions the astronauts would have to contend with. But the moon seemed stubbornly reluctant to reveal its secrets.

It is true that the site selectors were not starting from scratch. They had access to observations and speculations of astronomers from even before the time of Galileo, and, more important, to the gallery of lunar photographs made through modern telescopes.

### Surveyor, Orbiter supply crucial facts

Planners believed that the best potential landing areas lie in the dark areas visible on the moon's face. These dark expanses had been called *maria* after the Latin for seas, because early astronomers thought they actually were seas. The terminology remains. The brighter "highland" areas apparently had much rougher terrain. The *maria*, the hypothesis goes, were probably formed by lava, perhaps flooding through fissures in the lunar surface. The surface of the moon is pocked with craters everywhere, but the lava flow which formed the *maria* was thought to have wiped out much of the inherent roughness.

In the early 1960s the belief that the lunar *maria* were hard and smooth had gained some ground. But the optimism of this "Daytona Beach" theory faded with the lack of supporting evidence. Earth-based photographs usually showed no lunar features smaller than a half mile in size and even under perfect conditions craters smaller than 600 feet to 800 feet across were not visible. What were badly needed were high resolution pictures and what scientists call "tactile

data," that is, evidence to show whether the moon's surface is in fact hard or soft.

NASA's unmanned spacecraft, which had been counted on to provide the crucial closeup pictures of the moon, however, were compiling a history of disappointments. The Ranger series, designed to impact the lunar surface, suffered repeated setbacks of the kind that caused one to be wryly nicknamed "the lonesome Ranger" as it missed the moon and soared silently off into space. Failures are often instructive, however; by 1965, improvements brought results from Ranger at last. Then began two years of extraordinary success and by 1967, with the success of Surveyor and Orbiter, the site selectors had the information they required.

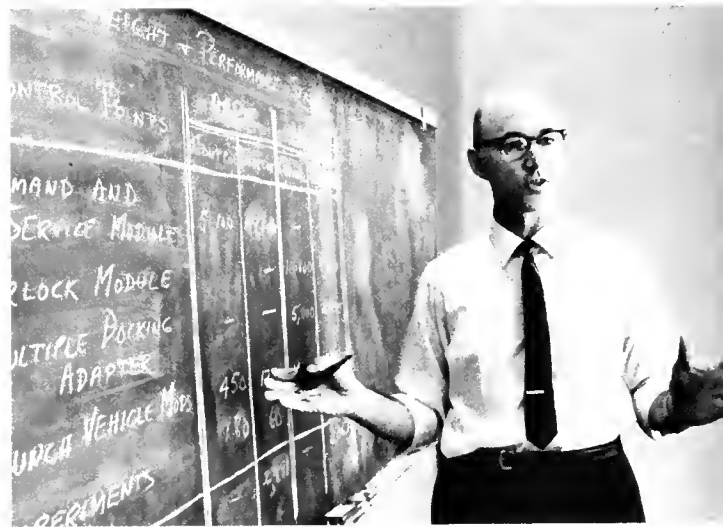
Ranger VII dispelled fears that the lunar surface might be too rough everywhere for a safe Apollo landing. The ensuing Surveyor "lander" series, that touched down in the principal mare areas suitable for Apollo landings, provided reassurance on the strength of the lunar surface and transmitted closeup pictures showing that debris on the surface was compacted, and that a landing spacecraft would not sink.

Subsequently, the Lunar Orbiter spacecraft sent pictures of selected swaths of lunar terrain in the equatorial belt. Scientists and engineers planning the mission used these photos to narrow down the number of potential landing sites to five candidate sites in mare areas, from which to choose the three or four alternatives for the first actual Apollo landing.

### Alternative sites widen "landing window"

While the unmanned spacecraft proved that an Apollo landing was possible, their pictures also confirmed that even the smoothest areas of the lunar surface might have craters or other hazards which make it necessary for the astronauts to be able to control their final touchdown.

The moon is not a friendly place for a pilot. As the Apollo 8 astronauts uneasily observed in their flight last Christmas, the surface of the moon is almost colorless and offers none of the *(text continues on page 8)*



## Many Talents at Bellcomm Contribute to Problem-Solving

The problem is how and with what to go to the moon and return to earth safely, and to do the tasks — the scientists and engineers at Bellcomm who contribute heavily to the solution.

(1) Faruk El-Baz of Bellcomm's Lunar Explorer Department discusses the problems of interpreting and evaluating photographs that lead to more precise maps of the moon.

(2) Anthony Kontaratos of the Space Sciences Department tells about the sciences and space physics that are studied so men can work in outer space.

(3) Walter Strack of the Program Requirements Department shows why the total weight of a rocket's components is an important consideration when evaluating the functions to be performed in a space flight.

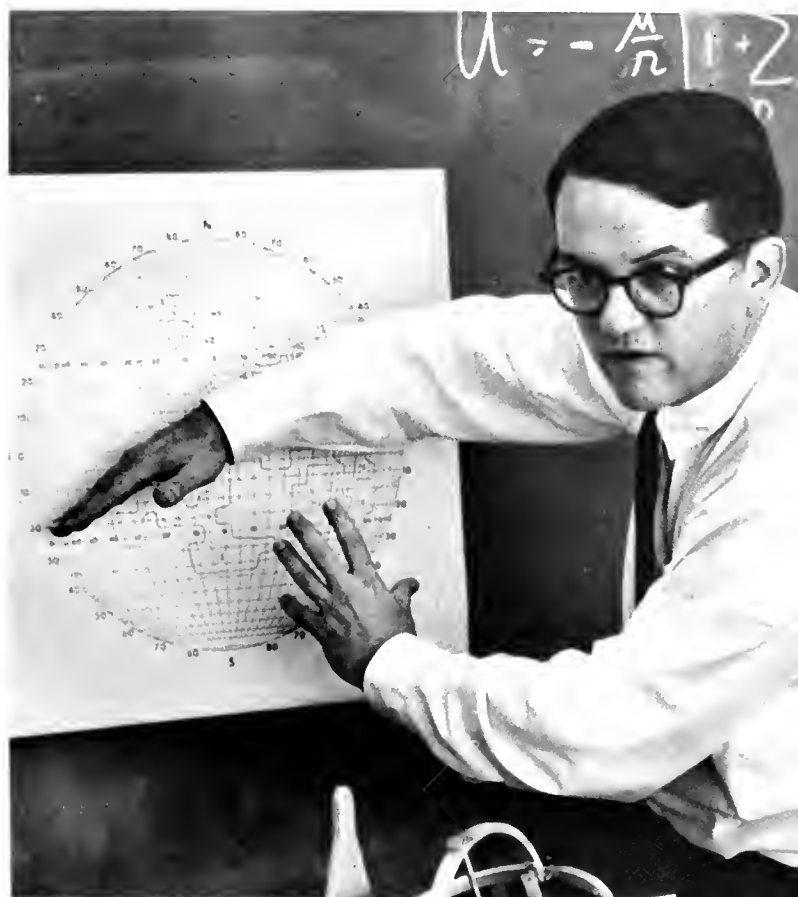
(4) Another part of the Bellcomm organization examines the interactions of launch conditions before a rocket leaves the ground. Clarence Bibb of the Launch Systems Department looks at the Saturn rocket that carries astronauts into space.

(5) Guidance and navigation also are problems that Bellcomm scientists study. Gordon Hefron of the Guidance and Navigation Department outlines a space route around the moon.

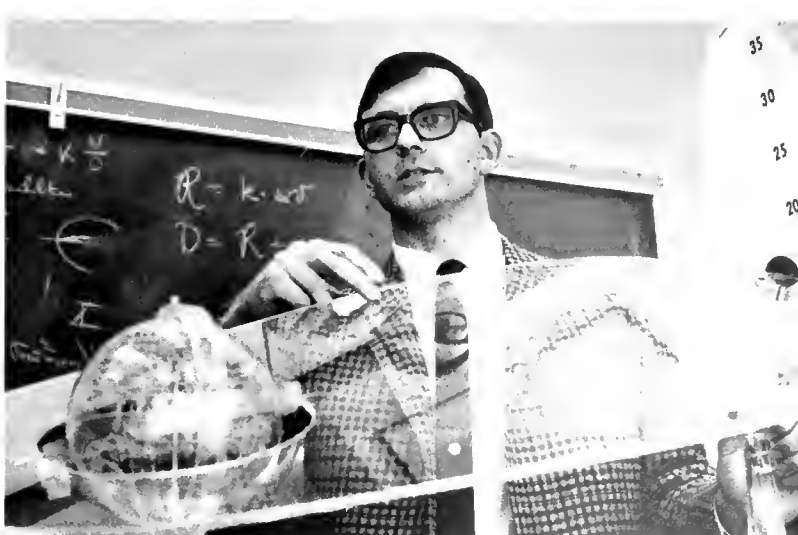
(6) Analytical mathematics is part of the work at Bellcomm. Donald Anderson of the Mission Analysis Department explains a three-dimensional earth-moon model that illustrates several potential paths to the moon.



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## Communications for Apollo

Before each major step is taken in Apollo flights, men on the ground who make the "go" and "no go" decisions must have full, exact information instantly available on the spacecraft's position in space, on how its systems are functioning, and on the astronauts' condition. This information and much more moves over a worldwide network provided

by the Bell System and other organizations. The network involves every type of electrical communications — voice, data, video, telemetry, telephoto and teletypewriter.

The communications paths of NASA's network connect the Houston Control Center to 14 ground stations, four communications ships and eight airplanes which receive the spacecrafts' signals. The underseas cables, satellite radio links, and high-

frequency radio circuits provide the world all converge through the Bell System network at the Goddard Space Flight Center in Maryland. The communications gathered at Goddard go on over the Bell network in Houston, where the controllers watch the progress of the flights.

The Bell System provides the largest share of the communications paths—about a half-million circuit miles, or roughly the equivalent of a round trip to the

moon. Since reliability is important, NASA has alternate routes so communications can be carried on different facilities and switched at separate points so that problems on one circuit will not affect the back-up circuit.

Thus the decision-making of the men at Houston Control and the logic of the computers which calculate what commands should be sent to the spacecraft extend in an unbroken path from Texas to the moon.

floral contrasts of light and dark we are familiar with on earth. To cut the chances of pilot error, astronauts at least would have to see craters and other large features on the moon in relief, by shadows. Mission planners therefore decided that a landing should be made just after dawn on the lunar surface when the sun was between 6 and 20 degrees above the horizon. They chose lunar dawn so the astronauts would not remain on the lunar surface into the lunar night, and because at dawn the sun would be at the astronauts' back rather than shining in their eyes.

Although there are desirable lighting conditions on any particular landing site only one day in the lunar month, there are eight days in each month when lighting is suitable for a landing at some point along the 90-degree-wide Apollo Zone. If only one landing site per mission were picked, landing opportunities would be limited to one day a month. Because problems in the countdown or illness among the astronauts could force a delay of a full month, it made sense to take advantage of the eight-day "landing window" by picking more than one possible landing site for the early missions.

### Landing site determined by launch day

The spacing of landing sites on the moon turned out to be directly influenced by what happens on the ground during launch operations. Since there is only a four-hour launch "window" each day, a serious failure or malfunction in the countdown may well mean losing the launch opportunity for the day. "Backout" procedures would go into effect and the launch would have to be rescheduled two to three days later. Consequently, there is little point in picking landing sites less than three days apart — which means that three or four landing sites should be picked for any one Apollo mission.

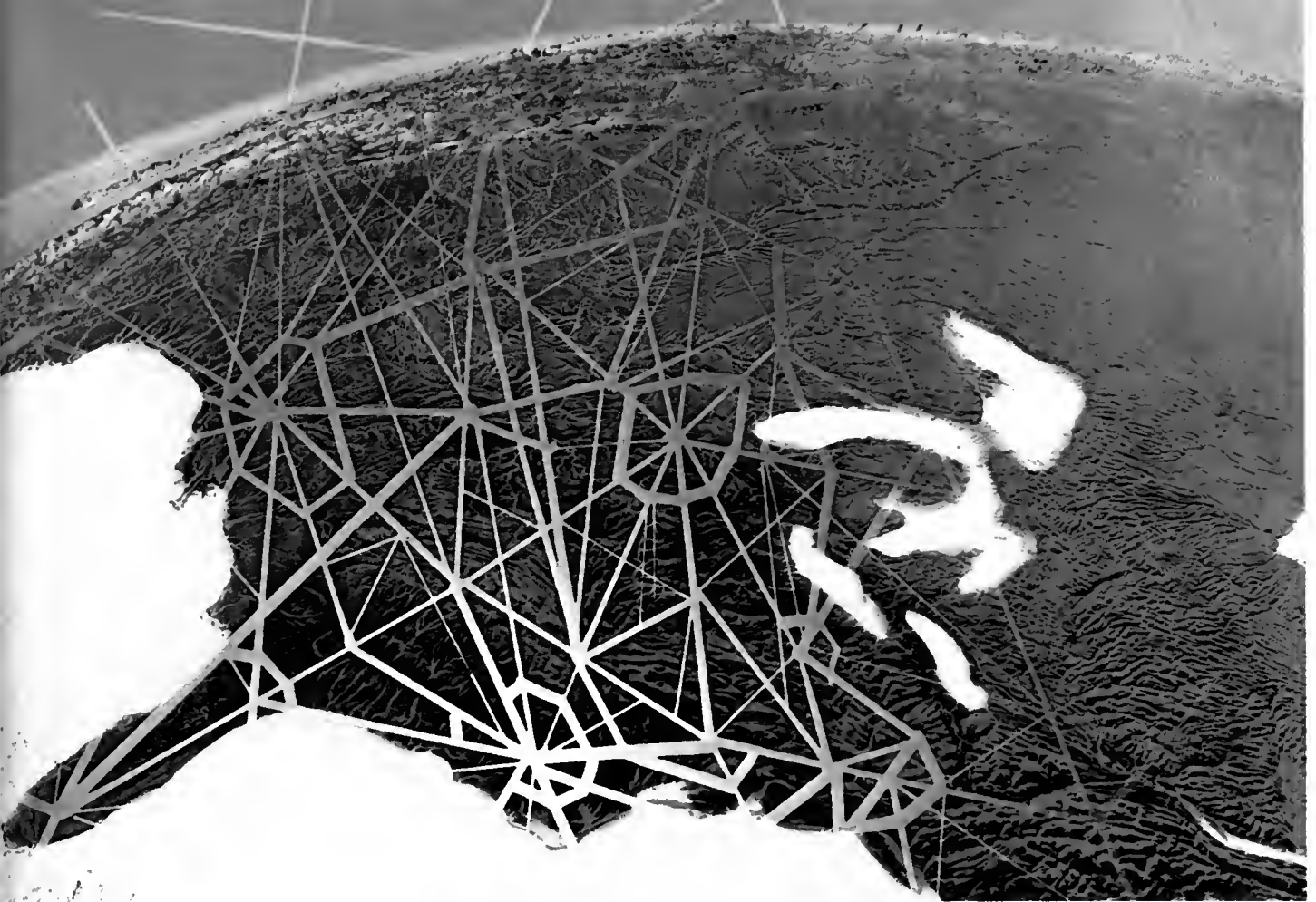
Bellcomm people working on landing site selection realized the full implications of the fact that moving the launch day entails moving the landing site. That

was back in 1963, before there had been any experience with an Apollo countdown, but it was supported by knowledge gained in the Ranger program. Bellcomm engineers saw that planning of launch operations assumed that the launch would go off on the first day scheduled. Questioning this assumption triggered considerable effort in "hold and recycle" studies in NASA Centers. These studies produced, among other things, the finding that the turnaround process took longer than had been assumed. It was a good example of how systems engineers, with their special perspective, can provide early warning of possible difficulties.

### "Spider" can land on slope

The kind of interaction which Bellcomm seeks to orchestrate influenced, in the site selection, the design of the spindly-legged landing gear of the lunar landing module, which Apollo 9 astronauts called "the spider." The wider the landing gear the steeper the slope on which the LM could settle safely. Since weight is a premium factor on a flight to the moon, engineers had to scrutinize tradeoffs between weight, stability and site survey. At one time, when little was known of the lunar surface, Apollo's planners proposed that the LM be designed to land almost anywhere, on slopes up to 23 degrees. But there was a high penalty in weight to meet this requirement; and studies of the moon showed a number of areas where the slope was less than 12 degrees and where, by careful navigation and piloting, the astronauts could land. The design of the LM was consequently relaxed to cope with only a 12-degree slope.

Navigation capability was still another factor interacting with landing site selection. Prior to the moon landing, the Apollo ship will be placed in an orbit which passes directly over the chosen landing site. The command and service module will separate from the LM and the LM's computer, which will have coordinates of the landing site, will order the LM to



change its orbit when it reaches the correct position on the far side of the moon. The LM will coast in its orbit and the descent engine will be fired again at an altitude of about 50,000 feet to begin the so-called “braking phase.”

Then, at about 10,000 feet, the “visibility phase” will begin as attitude control rockets fire and the LM tilts upright so the astronauts can assess their landing zone, an ellipse about three miles wide and five miles long. At about 150 feet above the landing site, the LM’s forward motion will have slowed to nearly zero and the craft will be ready for its helicopter-like descent to the surface. All of this implies the need for maneuverability and instant control. The assumption is that navigation will have brought the LM well within the landing zone at the end of the descent, and the astronauts will use manual controls only to avoid local obstacles.

It is a long trail from the comparatively scant knowledge of the moon only a few years ago to the pinpointing of exact spots on its surface where it will be

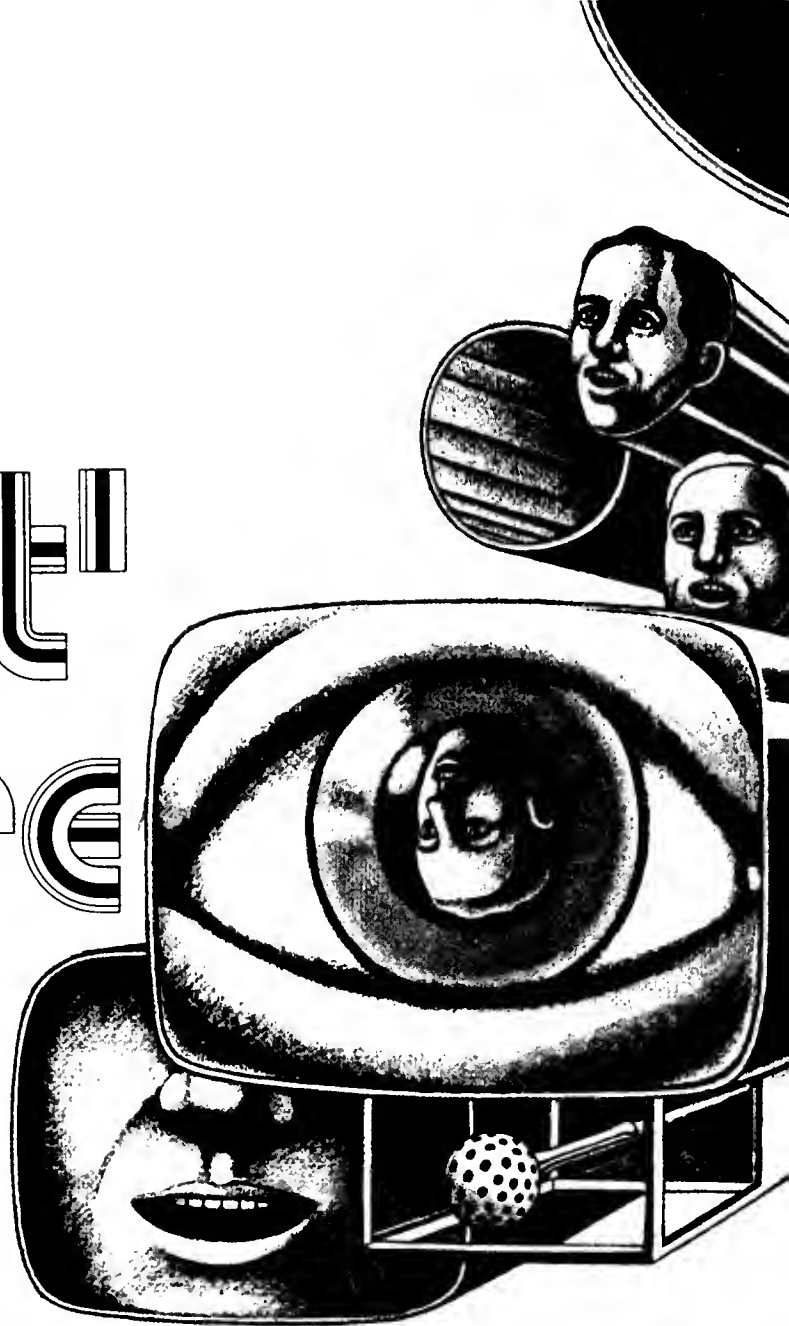
safe for men to land. The role of systems engineers in solving — often in describing — the thousands of problems encountered over those years has helped make it possible to set a time, a date and a place for the historic touchdown of Apollo 11 on the moon. In analyzing choices and comparing advantages and disadvantages of each, systems engineers cut across many disciplines to give planners the overview they need to make vitally important decisions.

And these decisions are literally vital, for there is more than the possible loss of two spacecraft to fear; the lives of three men are at stake as well.

Bellcomm’s contribution to the selection of landing sites on the moon is only one “input” in the whole space program. But what is most significant about Bellcomm’s part is that it looks at the total picture — the Ranger, Surveyor, Orbiter and Apollo programs, and the lunar surface — as a *system*. In this sense, the systems engineers have a unique place in the space program, which in scale, complexity and cost — as in its goal — is a new kind of human undertaking. □

# "Sprint" Culture

by W. Donald Heisel

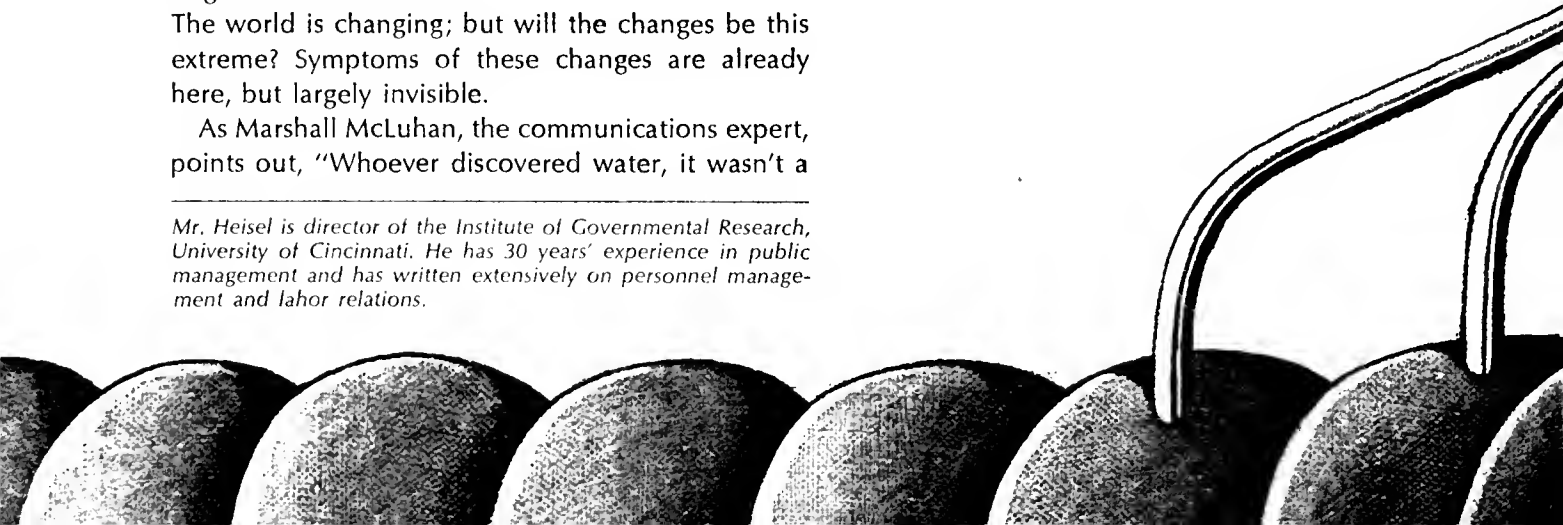


Employers without employees?  
Business without reports?  
Organization without rank?  
The world is changing; but will the changes be this extreme? Symptoms of these changes are already here, but largely invisible.

As Marshall McLuhan, the communications expert, points out, "Whoever discovered water, it wasn't a

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*Mr. Heisel is director of the Institute of Governmental Research, University of Cincinnati. He has 30 years' experience in public management and has written extensively on personnel management and labor relations.*







*Perzatti*

fish.” We see the world as it was, not as it is, for we cannot detect our environment until we are out of it. And, like the out-of-water fish, we are floundering around in a totally new environment which seems to contradict all the rules in which we had placed our confidence.

Management needs to keep up to date, yet managers have the same human problem that Prof. McLuhan pointed out: being unable to see the present. In effect, management can become aware of what’s going on only by realizing that the present requires predicting as much as the future.

The most traumatic change in the present that has not been realized is the abrupt decline of the power of print to convey information. Electronic media have changed us from a word-trained culture to a sound-and-picture-trained culture. Today we have a “sprint” culture that combines sound and print, and print is rapidly losing valence as a change agent.

Prof. McLuhan makes the claim in his book, *Understanding Media: The Extensions of Man*, that the “. . . most potent gift bestowed on Western man by literacy and typography [is] his power to act without reaction or involvement. It is this kind of specialization by disassociation that has created Western power and efficiency.”

**S**pecialism, objectivity, detachment, and the machine as the model of the perfect employee came to be values only after linear, sequential patterns of thought induced by print pulled us toward sequential assembly lines with their ideals of efficiency. But in recent electronic years, we have watched the erosion of this machine pattern. The current thinking is along the lines induced by the last 20 years of intensive training that electronic media have given us. Today, management faces the need for personal involvement, the relaxing of rigid divisions of work, or what might be referred to as “humanizing” work assignments.

This is another way of saying the machine no longer works as either model or ideal. Psychologically, Prof. McLuhan points out, reading has produced a pattern

of thinking which is not only impersonal and sequential, but linear. Because we learned through print, we had to wait until knowledge was printed before we absorbed it. This delay produced a detachment from the events studied. We were not involved in events simply because they were over before we learned about them. We had no role in the happenings, but linked them casually on a sequential time-basis which we called “logical.”

With the advent of electronic media, however, events are reported as they occur. The telegraph began the process of narrowing the time lag. Then came radio, which opened new vistas in providing instant communication of information. Everybody listened (staring at the radio with the old habits learned by reading). Then came television, which capped the change by letting us see the events as well as hear them described.

This ability to be globally present has produced a change in our psychic stance — involvement by millions in the happenings of the day. Detachment, objectivity and analysis are replaced by involvement, subjectivity and intense personal concern.

Prof. McLuhan describes the post-print or electronic culture as a return to the mental perceptions of primitive culture. He is not suggesting loincloths and spear fishing. He refers only to the means of communication and the effects of communication on personality. In preliterate cultures, communication was face-to-face within the confines of a village. Communication produced immediate reaction; the listener answered the speaker then and there. TV provides this sense of participation and the involvement of all senses. Today we must have this involvement, and we want it in all facets of our lives.

The TV generation is obviously the under-25 people who have had TV’s influence in their formative years. These young people have not seriously affected the world of work yet. They are still a small minority of the work force but the number will grow.

Will management be able to cope with a major influx of sound-oriented employees? Will sound peo-

ple adjust to bureaucratic divisions of labor? Will they produce necessary specialists, or will the desire for total involvement prevail? Proven answers to these questions are beyond us. But we can speculate about at least five directions management can take to accommodate itself to the "sprint" culture.

The first direction is a lessening of sensitivity to the written word.

How many personnel executives have decried their inability to find young secretaries who could spell, or young administrative assistants who could write a decent report? It is customary to blame the school systems. But the schools cannot be blamed if these young people are predominantly sound-culture oriented. They are learning from television and spoken word more than from the printed page. Many spend more hours watching TV than studying in the classroom. Even college instructors bemoan their inability to get students to read. Students cannot read simply because they do not read enough to become sensitive to the written patterns of words. Many use written English with about as much skill as a high school junior uses French.

**I**f Prof. McLuhan is right, the young people entering the work force will be more and more sound-oriented. What, then, can be done about it? One obvious but partial solution is to reexamine the need for so many written documents. Most of us probably prepare more written reports than necessary. Another partial solution may be to put more information in the form of charts, graphs and other pictorial presentations. Such presentations get away from the sequential (one-word-at-a-time) discourse which runs counter to the way situations are perceived by most people under 25. There can also be greater reliance on phone calls or other oral media.

A second direction management can take is to recognize that roles will replace jobs.

In a completely print-oriented society, the concept of specialization produced the classifications "employee" and "employer." A person had to be one or the other. If he was an employee, he did not hesitate

to "goof off" at management expense if he could get away with it. He joined a union to protect himself against the employer, perhaps during an organizing effort in which the union successfully painted the employer as the bad guy.

This classification never worked except as a machine dream model. As with many print-culture classifications, the employee-employer dichotomy ignored the fact that some persons defied such pigeonholing. A supervisor, for example, was the boss to his crew. But to the chairman of the board, he was just one of many faceless subordinates.

**T**he print-era man left home in the morning, spent his eight hours on the job, and returned home determined to put work out of his mind. His ability to forget the day's cares is still considered a sign of good mental health.

What changes will come as print takes a back seat? First, we can expect a lessening of the print tendency to separate things into categories. Thus there will be less interest in separating parts of the day into "work" and "nonwork." Workers will more likely meld their work and leisure-time activities. Roles will replace jobs. Work hours will become less important, as has always been the case in some Eastern sound-cultures. People will not necessarily work longer hours, but their working lives and nonworking lives will be intertwined. Many may work at home and contact associates through "phonovision" and computers.

We can also expect a greater intermixture of continuing education during the regular employment. Industry already spends billions on employee development and this may increase to a point where education and work will become almost synonymous. It is even possible that young people may start to work earlier in life and continue their education after employment in much the same manner as is now done in colleges having a cooperative education plan.

A third direction management can take is to recognize a considerable rise in employee involvement.

Some jobs will prove difficult to adapt to this "role" concept. Yet the desire will exist for involve-

ment of all workers. This desire can be satisfied in at least two ways.

One means to greater employee involvement is through participation in unions, and thus involvement in the determination of one's conditions of employment. It has been recognized for some time that many persons join unions because of the psychological satisfaction they get from union leadership. An increase in unionism is not necessarily a reflection on management or its personnel policies. It is simply a change in the workers' sound-culture orientation.

The desire for involvement through unionism may trigger greater pressure for expanding the scope of negotiations. Already, teachers' organizations are stretching the definition of bargainable "conditions of employment" to include such items as textbook selection, curriculum, and educational policy. The more bargainable subjects, the greater the degree of involvement.



A different means of increasing an employee's sense of involvement is through job enlargement ("Motivating People," July/August 1968 *Bell Telephone Magazine*). Job enlargement is simply a means of building job interest by providing a variety of tasks; like typists doing file work and file clerks doing some typing. In primitive societies, most members participated in a broad segment of the group's economic activities ranging from fishing, hunting, and farming to toolmaking and home-building. In medieval times, a craftsman did everything required within his craft. Job fragmentation did not come into business until industrial engineering saw economic advantage in dehumanizing work. But the pendulum is swinging back. Young people will not accept narrow, tightly-defined jobs. And tomorrow's workers will demand even more latitude in work assignments, perhaps comparable to the old guild craftsman.

A fourth direction management can take is to recognize an abandonment of the hierarchy.

Most contemporary businesses and governments are organized on a pyramid type of organization

chart. One person is in charge; he delegates authority and responsibility downward as necessary. The boss is in charge of everything, even though he may not be qualified in all facets of the work.

It was not always thus. Less sophisticated societies chose their leaders for specific purposes. One man might be in charge of a hunting party because he is accepted by the men as best qualified. The next day, he might be subordinate to another while working in the fields.

Emphasis on the sound culture may bring a lessening of the established hierarchy. This is already apparent in government where the task force is gaining acceptance. In the task force, the leader is chosen for his competence in the given task. Today he may lead, tomorrow he follows.

The task force not only changes leadership patterns, but it also modifies the bureaucratic separation between departments. Participation is based on expertise regardless of the department.

The task force is more than a committee. The committee is generally a sounding board, whereas the task force is usually an action group, with each member given a specific assignment.

The task force provides young workers the opportunity for involvement in a wide variety of activities. But it also weakens the typical lines of authority. When a subordinate is loaned part-time to a task force chaired by someone from a different part of the organization, the boss loses control and the traditional lines of authority will grow more faint. However, it is doubtful that the traditional lines of authority will disappear entirely. Military services, police agencies, and fire departments, for example, need elements of authoritarian direction and communication. Such agencies will attract those on the sound-print continuum who internalize the values closest to print.

A fifth direction management can take is to recognize a growing interest in the total environment.

There is already a trend toward greater interest in our environment. Support for Senators Kennedy and

McCarthy is ample demonstration of how young people seek involvement in the governmental and political processes. This trend is likely to grow.

The modern American has been characterized as materialistic. The concept of accumulating private possessions has been labelled an American obsession. We not only want a private home, we also put a fence around it. We want air-conditioned cars, but complain about taxes for roads to drive them on. We spend hundreds of dollars designing our own gardens but assume little or no personal responsibility for public parks.

**E**arlier man did not pay so much attention to private possessions. They were not communistic, but communalistic. Possessions were private, but held only for the common good. No one stepped on others to accumulate more. Doors were not locked.

The rejection of materialism is already noticeable among younger people. They join the Peace Corps, or VISTA, and work for the right cause for almost nothing. Hippies leave comfortable middle-class homes to live in comparative squalor to underline their rejection of materialism. Bright college graduates reject lucrative business offers to work in challenging service fields.

One of the ways business can accommodate to the changes is through increasing its social sensitivity. Business is currently taking some interest in the problems of hardcore unemployment, inner-city housing, and public education, but its involvement began long after the problems appeared.

A second means of accommodating to these changes is through increased public expenditures for service used in common — education, recreation and public improvements. In the recent past, industry has resisted tax increases that improved public services require. The tax level of a community has influenced many industrial relocations. Now, industry is beginning to recognize the total community needs, even to the point of locating plants in ghettos. This trend is likely to increase.

We can also anticipate a greater citizen involvement in the processes of government, particularly at the local level. Already there are more citizens' advisory committees. These come from ghettos as well as the business community. Involvement in governmental decision-making is not limited to antipoverty programs. It extends to planning capital improvements, to organizing government for greater effectiveness, and to selling programs to the electorate.

Universities will also get more involved in the community; many are already doing so today. The old concept of the university as a monastic retreat is disappearing. Faculties are advising school systems, doing applied research in urban problems, and guiding public programs. This trend will increase as sound-oriented faculties reject the isolation of the classroom.

As electronic media alter our sense ratios "steadily and without resistance," as Prof. McLuhan emphasizes, the people most affected by media changes will not be content with the old ways of doing things.

**T**he future is here. We are now in a transitional era, the era of "sprint" (sound-print) culture. We should not delude ourselves by searching for examples of youthful print types to prove Prof. McLuhan is wrong. We should not delude ourselves by assuming that future generations will not change simply because reading and writing will continue.

The point is that our thought patterns will be dominated by our different method of learning, even though a portion of our learning will be from print. It is the change in thought patterns to which we must address ourselves.

We cannot stop this change. We can, however, accommodate to it. The revival of sound as a primary means of transmitting learning is unquestionably traumatic to those over 25. With more thought, more insight, and a strong desire to understand young people, even those of us who are essentially print-oriented should be able to make the new world brave instead of baffling. □

In my new book, *Mrs. Parkinson's Law*, the attempt is made to study the problems which arise from the housewife's relative isolation. In the modern and western world her husband goes to work, his children to school, and she is left in a state of more or less solitary confinement, alone in the suburban home or still more alone in the city apartment. Until the evening she may have nobody to whom she can turn for sympathy or counsel.

Elsewhere in the same book the further point is emphasized that communication, when established, is of two kinds. We use speech from child-

hood to flush our emotions. We learn rather later to speak with a purpose, striving as it may be to inform or instruct, entertain or impress.

Among the sophisticated, practically everything said has a purpose but among people in general, and among women especially, the more primitive kind of chatter will often prevail. This is obviously so when two people talk simultaneously, neither listening nor even pausing for breath. The urge on

either side is not to convey a message but simply to empty the overspilling mind of what it can no longer retain with comfort.

People are thus said to be bursting with indignation or self-importance, an apt description of emotions which have to find expression before there

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*Dr. Parkinson, British author, historian and humorist, wrote Parkinson's Law. (Work expands to fill the time available for its completion.)*

ON INFORMING.



is an actual explosion. Those most anxious to talk are normally, therefore, those who have least to say.

For those working in isolation (as our grandparents seldom did) the telephone serves the same double purpose as any other form of communication. To the housewife it represents, first and foremost, an "earth" in the electrical sense; an instrument into which she can discharge her pent-up emo-

tions. It also represents, although this may be of secondary importance, a means of summoning the fire brigade or making a hair appointment.

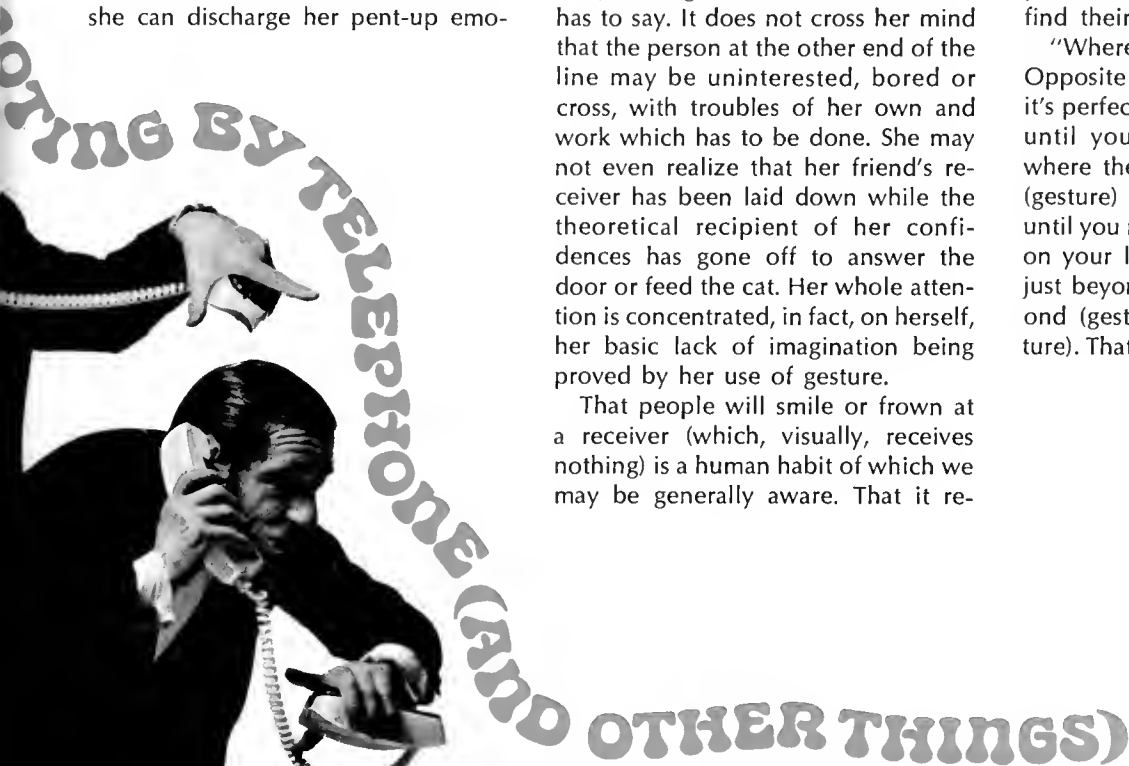
The difference between these two types of message must hinge upon the strength of our imagination. The person who merely wants to babble for a given period of time is unable, as a rule, to imagine the effect of what she has to say. It does not cross her mind that the person at the other end of the line may be uninterested, bored or cross, with troubles of her own and work which has to be done. She may not even realize that her friend's receiver has been laid down while the theoretical recipient of her confidences has gone off to answer the door or feed the cat. Her whole attention is concentrated, in fact, on herself, her basic lack of imagination being proved by her use of gesture.

That people will smile or frown at a receiver (which, visually, receives nothing) is a human habit of which we may be generally aware. That it re-

veals, above all, a lack of imagination may be less widely known; and yet the fact would seem to be obvious.

The telephone babbler has so far been assumed to be female because the housewife suffers more from isolation, but men can be almost equally unimaginative. Watch, for example, a host who is directing, on the telephone, a couple who have failed to find their way to the cocktail party.

"Where are you now, then? . . . Opposite the Public Library? . . . Well, it's perfectly simple from there. Go on until you come to the Town Hall, where the road forks. Bear *left* there (gesture) and drive for about a mile until you reach a new apartment block on your left (gesture). Turn (gesture) just beyond it and then take the second (gesture) turn to the right (gesture). That is Sycamore Street, a cul-de-



MOVING BY TELEPHONE (AND OTHER THINGS)

sac, and ours is the very end house on the left (gesture). Got it? That's fine then. We'll see you in about ten minutes."

But will the guests be there so soon? The weakness of this directive lies in the fact that the host is waving his hand about instead of concentrating on verbal precision. In this instance he has omitted an essential word, relying upon a gesture which his guest cannot see.

There is the further possibility that he has said "left" at some other point where he should have said "right." Passers-by often do that when asked the way and they frequently point at the same time in the other direction. When this occurs we know from experience that the gesture will be correct and that the word will be wrong. Over the telephone, however, the word flies on its way uncorrected by its visual counterpart.

Still more misleading is the indoor telephonic directive, as when Professor X tells a student where to find (in Castle Y) the little-known portrait of Archbishop W, which is usually, if doubtfully, attributed to the artist Z.

"You cross the second courtyard, go down the steps and bear right. Go up the spiral staircase (corkscrew gesture) and you will find yourself in the Armory. To the left (gesture right) of the fireplace there is a door which

leads into the Tapestry Room, from which another staircase (gesture, spiral upward) leads you to the Muniment Room—originally a chapel—and there (gesture, upwards, left) you will find the picture. It is about this size (gesture) and must not be confused with a rather similar portrait on the opposite (gesture, right) side of the room."

In this sort of attempted description the speaker cannot apparently put himself in the place of the person he is trying to direct. To do that would require an effort of imagination of which the professor, we must suppose, is incapable.

Our criticism of the handwaving habit is based not merely on the fact that it argues a poverty of language but that it is allowed to take the place of words which ought to have been uttered. Gesticulating at a receiver is only slightly more absurd than gesticulating in ordinary conversation. If we would only pay attention to what we are saying, our words should be enough to convey what we mean.

A telephone may be said, then, to serve two purposes. It is at once a safety valve for the lonely person's emotion and a means of conveying an actual message. But that is not all, for its third use is to impress a third person who is present but not on the line.

This listener (whether a visitor or one's secretary) hears only half the conversation and has to imagine the rest. Many of us thus speak to A with half our attention given to the impact that the conversation will have on B, who does not even know to whom we are speaking.

"Get me the White House," we say curtly and, a second later, "Extension 33 please. That you, Dick?" There may

be a score of men called Richard at the White House, down to and including the janitor, and it is not your fault if your visitor (a prospective client) leaps to conclusions. "Mark Upton here. Can you give me a minute?" ("What in hell for?" asks the janitor). "Thanks. Well, it's about the proposed loan to Indonesia. I am, frankly, unhappy about it." ("Look, son, I'm only the man who cleans the toilets.") "I fully realize that, but what about the reaction in Malaysia?" ("Well, what about it? Why not ask for Secretary Snodgrass?") "I don't think he would really understand the situation." ("Why, for heaven's sake, do you think that I do?") "Well, we must be guided by you, of course. But we are worried, some of us, and I thought it fair to let you know." ("For Pete's sake, why don't you go chase yourself?") "See you on Friday then and let's hope the weather will let us have our game. Goodbye, Dick, until then!" ("Goodbye yourself and go home to the nut-house!")

"Do forgive me," we say to the prospective client, "you wanted to see me about a property deal? I think it can be arranged provided etc., etc. . . ."

Without a lie, without even the merest suggestion of a falsehood, we have contrived to suggest that we are not wholly without influence. There are people so crude as to speak through a dummy receiver to an accomplice in the next room, but the example given is enough to prove that a real telephone will do as well or better.



As regards impressing one's secretary, it is a known fact that the letter dictated into a machine loses half the vigor that typifies the letters taken down by an attractive and admiring girl. In the same way, a telephone conversation is twice as dramatic if the



same girl is discreetly applauding our turn of phrase.

"Do you mean to tell me," we ask, "that the goods have not even been dispatched? Am I to understand that you have taken no action of any kind? Do you admit, in effect, that your office is in a state of organized paralysis? Do you wish to convey the idea that you are completely ineffective, totally useless and inept? Is it your policy to become a laughing stock among the city's retailers, a byword for incompetence and neglect? . . . It is not? Then pull yourselves together, wake up, concentrate and (bawling) *GET ON WITH IT!!!*"

Even when alone at one's desk there may be a certain gloomy satisfaction in firing off such a broadside. You have to reflect, nevertheless, in those circumstances, that only one man has received the full impact. It is infinitely more rewarding to see the awestruck look on your secretary's face and realize that the story will have gone round Head Office by lunchtime.

"Don't get on the wrong side of Mr. Savage," the clerks will say to each other, "He'll kill you!" And the story of what you said to that executive at Dithering and Dropout will be not only repeated but improved. In the final version, as it reaches the mail room, your victim will have had a heart attack and been removed to hospital.

For maximum effect from such a verbal explosion you need a witness and

you cannot assume that anyone is listening on the switchboard. You need to see — without appearing to notice — that the conversation has left your secretary spellbound. Without that encouragement you would have said far less than you meant and given your victim no more than he deserved.

A final characteristic of the telephone is that we cannot always identify the person to whom we are speaking and that, conversely, our own identity may remain unknown. This was illustrated recently when a relatively junior officer had occasion to call the Pentagon.

He was passed from one extension to another and ended on a bad line, talking to someone who appeared to be deaf. "Who is this?" said the junior officer repeatedly. "For the love of Mike, *speak up!*" he shouted in the end. At that instant the line became perfectly audible and clear, and he was being addressed. (he became aware) by someone whose patience had been strained to the uttermost.

"Do you realize who I am?" said the voice from the Pentagon, with the sort of emphasis which sends a shiver down the spine.

"No," said the lieutenant, truthfully. "I am General Westmoreland."

There was a pause in the conversation while the young man digested this unwelcome piece of information. Then he asked, with the same sort of emphasis that the general had used:

"And do you know who *I* am?"

"No!" thundered the General.

"Thank God for that!" said the lieutenant and rang off. □

The disabilities of old age and ill health can be conquered soon if Americans insist on enough resources being devoted to solving the problems, a noted medical researcher asserts.

# How To Live To A Healthy 105

by Denham Harman, M.D., Ph.D., as told to James C. G. Conniff

**H**ow would you like to live to be 105—and enjoy it, free of the chronic ailments which now afflict two out of three elderly people? No aches and pains for you, or failing memory. Instead, mental alertness, physical vigor, buoyant all-around good health.

Don't laugh. It could happen fairly soon if (and this may sound strange) you really want it to happen.

Allow me to explain. For almost 3,000 years medicine has consciously put its main effort into making sick people well again. Until recently, it did not have much choice. On balance, this "philosophy of repair" has produced commendable results.

But in an era as sophisticated as our own, are these good results enough? Shouldn't a nation with the know-how to put men on the moon apply its technol-

ogy to a challenge every bit as urgent and exciting as the exploration of space: how to keep well people healthy — longer?

Of course we should. And if enough of us insist on it, we will. I don't mean just people in the so-called health establishment. I mean laymen too, thinking men and women at home and in education, research, government and industry. Even more than doctors, in a way, they wield the power to upgrade our national health situation — not least because they pay the bills.

I like to think that people will respond positively when they realize the kind of health care, including ways to delay the onset of old age, which lies just around the corner.

They — all of us actually — can respond in several ways. First, we can assume greater individual responsibility for maintaining good health. Second, we can demand that schools do a far better job of positive health education than even the best schools today

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*Dr. Harman is professor of medicine and biochemistry at the University of Nebraska College of Medicine. His research has focused largely on aging and degenerative diseases such as hardening of the arteries and cancer.*

*Mr. Conniff is an assignment writer specializing in medicine.*



RH+O<sub>2</sub> - RHO

HARD AT WORK - AT 93

POWER

ANOTHER WAY  
a prom se we have not

RHO  
RHO<sub>2</sub>

Don't let  
America's  
Number 1 and 2  
millionaires

McConnell

# “Test programs outdistancing anything medical science has achieved,”

attempt to do. And third, we can bring frank political pressure to bear, for example, on legislators who appropriate funds for medical research and can influence its direction along preventive rather than merely remedial lines.

If people grasp and act on the importance of such vigorous new approaches, we can mount *tomorrow* a campaign for habitual good health as ambitious as our campaign to conquer space — and make it pay off, figuratively, the day after tomorrow. We can do it, moreover, at a mere fraction of the cost of the space program.

In a sense, cost is the least of it. To get total preventive health care — including a slowdown of the aging process and its disabilities — we must first find a way to reconcile a rare mix of warring elements. Then we can talk money.

**O**ne element is the individual's belief (or nonbelief) that he can enjoy lifelong good health, and may even have a right to expect it. Another element is his willingness (or nonwillingness) to do his part early in life to help achieve a state of “chronic well-being.”

There is the problem of the doctor's own frequently distorted self-image as godlike healer rather than as preserver of health. There is also the public's share in perpetuating that distortion by hero worship of heart transplant surgeons, for example, instead of respect for unsung pediatricians who give penicillin to squalling babies with sore throats and, as Yale's Dr. Adrian M. Ostfeld has pointed out, prevent infinitely more heart disease. There is, finally, what medical education itself does to help create this distorted self-image in the first place.

Where health is concerned, government almost certainly exerts disproportionate influence in determining research parameters. One example is government arbitrarily identifying for conquest “killer dis-

eases,” which, even if conquered, would enable us to add at most a year or two to the life span, and do little or nothing to cut down on the physical and mental debility which accompanies aging.

**L**ast but, lately, far from least of the elements delaying the advent of full-scale preventive medicine is industry. As a heavy contributor to environmental pollution, industry has too often become an antifactor in health. Yet our best hope for finding a way out of the mess of soil, air, and water pollution may lie, paradoxically, in industrial laboratories as industry awakens to its responsibilities.

Despite all these problems, I am not alone in thinking we can achieve a health establishment geared primarily to prevention — one that also will yield us workable answers to the challenge of old age. Take just the dramatic avenue opened up by technology. Informed medical men have for some time been urging us to use it to go beyond today's outmoded treatment-and-cure approach to health, and develop a true space-age medicine. They feel, as I do, that to do this we must take the systems engineering and other technological refinements our space effort has produced, and join them to related advances in management technique.

Dr. William L. Kissick of the University of Pennsylvania, for example, is a health-services planner who sees our \$50 billion-a-year health organization, with its nearly four million personnel, as a single-entrepreneur type of “cottage industry” left over from the 17th century, that is unable to meet the nation's mushrooming need for ordinary medical care, much less grapple with prevention.

He feels that for satisfactory, care even in today's terms, we will soon require a nationwide health-data computer complex, with regional storage centers to speed retrieval and communication. Currently, there is increasing reliance on remote-computer help from

te can blaze a trail toward complete prevention immediately.”

big medical centers in such delicate matters as diagnosing electrocardiograms and confirming analysis of laboratory-processed medical information. Spin-offs from this would enable a central computer to tackle trickier problems, such as interpreting X-ray shadow densities in mathematical terms. The computer could then flash its error-free readings anywhere over long distance telephone lines as it does now with EKG and laboratory data.

The famed Automated Multi-Test Screening Program at the Kaiser Permanente Health Foundation in Oakland, Calif., is an example of what such applications of technology are already doing to bring preventive health care to large numbers of people. So are the four Automated Multiphasic Health Screening demonstrations currently being supported by the U.S. Public Health Service in Milwaukee, Brooklyn, New Orleans, and Rhode Island — all modeled on the work of Dr. Morris Collin at Oakland.

Technicians at Oakland help patients with self-administered questionnaires, then introduce blood and urine specimens into a multichannel, automated chemical analyzer (still under development, like the rest of the program) that screens for a series of two dozen diagnostic studies in 2½ hours. A computer blends the questionnaire and analyzer data and interprets the results. The program “processes” 25,000 people a year.

*Dr. Denham Harman*



The screening not only saves precious time of physicians. It also allows them to deal with the patients' conditions early enough to head off serious illness. And the data from the patients help identify and measure disease factors more precisely. That, in turn, will lead to a more scientific basis for telling people how often they need to have checkups at different stages of life to stay healthy.

Before we can do that with any assurance, however, we have a lot more to learn. For instance, Dr. Kenneth Rogers of the University of Pittsburgh, as president of the Association of Teachers of Preventive Medicine, feels the gaps in our knowledge include the precise role of environmental factors in disease, such as the subtleties of water, air and pesticide pollution; the internal mechanisms of degenerative and malignant diseases; and the critical point at which intervention in early stages of a disease process identified by meticulous screening will produce results.

**D**r. Rogers sees as one of the main obstacles to such research and screening the high mobility of both our population and the medical researchers themselves. One solution to this, he believes, might be to miniaturize personal medical records, including one's status in any given test program, and imprint the data on a wallet-size film negative to be carried on the person at all times. That way the individual, no matter where he moved to, would be certain of proper medical care because his doctor could get his total health picture, literally, by visualizing it from the negative on an office projector and integrating it with his own findings. The patient could also participate in any similar test program in his new neighborhood without breaking stride.

Test programs outdistancing anything medical science has achieved to date can blaze a trail toward complete prevention immediately. But we must overcome our inertia and take advantage of advanced lab-

“...a single year of useful life added to our work span could e

oratory work reported at such institutions as Stanford, UCLA, John Hopkins, The Gerontological Research Center of the National Institute of Child Care and Development, The Bjorksten Research Foundation in Wisconsin, Brookhaven National Laboratory on Long Island, and here at Nebraska.

In these laboratories, years of painstaking inquiry into the impact of nutrition, radiation, stress, exercise, heredity, and other factors on life processes within the cell are already paying off with results which can be duplicated (a scientific must). These studies point the way to potentially epic developments in preventive health care, including extension of the life span.

**S**tarting about 15 years ago we began to evaluate the possibility that highly reactive molecular “chips” or “splinters,” formed continuously throughout our bodies, might have adverse effects. Some of these chips, known technically as “free radicals,” lash around inside and outside of cells, setting up disruptive chain reactions leading to impaired cellular functions and, in some cases, cell death. The rate at which these deleterious reactions go on contributes to the rate at which a person ages.

To slow down this “free radical” warfare on the body, we added to the diets of different strains of mice compounds such as 2-mercaptoethylamine (2-MEA), which is a good radiation protection agent, or the familiar BHT, used to retard spoilage in food. Both are capable of “soaking up” free radicals. The result: 2-MEA extended the life spans of the mice by about 30 percent and BHT by 44 percent. I am confident that with further research along these lines, the life span of humans can also be increased.

Unfortunately, the exciting vistas of preventive medicine which these studies have opened up are only dimly known even to practicing physicians, and sometimes not even to them. Before the layman can afford to take a superior attitude from disclosures of this kind, however, it behooves him to acquaint him-

self with certain fundamentals. These, if he takes them to heart, will enable him and his offspring to get maximum benefit from scientific marvels now in view. It will also help them become widespread sooner.

In my opinion, the first thing we have to do to get these fundamentals across is to educate the American public by all-out Madison Avenue methods about how indispensable to staying healthy it is to eat the right kind of food, in the right quantities, and to exercise *enough* (walking cannot do the job by itself). Such a campaign would drive home also the need to cut down sharply on dietary fat — and I don’t mean just to substitute polyunsaturates. I mean to *cut down* on all kinds of fat.

Advertising is already proving its worth in exposing the risk that cigarette smoking represents as a factor in lung cancer and heart disease. At least one employer who got the message offered his workers a bonus if they’d quit smoking. Quite a number did. For a few thousand dollars, this man not only lowered absenteeism among ex-smokers in his plant. He also made a contribution to saving lives that others would do well to emulate.

**W**e should also, in the interests of keeping people healthy, be able to use some of the communications media to alert parents, for instance, about the importance for their children of proper instruction—and good example—in such areas as diet, exercise, adequate rest, self-discipline, and so on.

We can warn mothers, in terms they will remember, that a child kept excessively fat is by no means necessarily well-nourished, and is also a candidate for obesity in adulthood, with all its attendant disorders of mind and body. These include, by the way, an accelerated rate of aging as overweight and loss-gain dieting cycles take their toll of abused, and in many cases irreplaceable, vital-organ cells.

We can and must educate our schools to develop and use textbooks that will engender a “preventive

gross national product by a million million dollars annually.”

medicine” outlook from the earliest years, with more frequent on-site talks by doctors. Medical men, busy as they are, enjoy talking health to youngsters, but school authorities too seldom invite them.

Until automated, large-scale screening refines what we know about how often we *should* see a doctor at a given age, schools can also do more to encourage the annual checkup. Later insistence on this laudable routine by industry continues health education in two ways: (1) by motivating people to report the unusual at once and not wait until too late, and (2) by helping to set a pattern which the intelligent adult will maintain even after he leaves a particular company. For best results that pattern should begin in childhood.

Ideally for better mental health, we ought to do more to restructure society’s values so that a person can be happy with a job well done instead of being constantly distracted by such artificial stratification as white-collar and blue-collar. We should also try to get over the related idea that *everybody* must go to college. It takes a lot of ability to be a good carpenter or sheet metal worker. (I know, because I went to adult education school at night to learn sheet metal working. I’m not good at it, but I’ve come to respect those who are.)

There is now abroad in the land a powerful flow toward total preventive medicine. As Dr. Rogers has noted, “it did not exist five years ago.” Clearly, it demands from all concerned — the public, government, industry, and the medical profession — a commitment to prevention-minded research. And it demands upgrading personal and environmental health.

It demands also, I am profoundly convinced, that we recognize as scientifically well-founded the opportunity our research laboratories have provided to develop one or more anti-aging drugs. These could make it possible for many, if not all, of us to enjoy physical and mental health for a longer span of years. This would be especially true of the upcoming gener-

ation because the aging process has actually begun to make its inroads by age 20 or earlier.

A breakthrough of these dimensions, now within reach, could also bolster the economy, which is already ominously burdened with a rising population of unwell elderly people, most of whom have only dwindling resources to pay their own way. Over and above savings on Medicare and related old-age benefits now funded by the long-suffering taxpayer, it has been estimated that a *single* year of useful life added to our work span could enrich the gross national product by a *million million* dollars annually. If begun now, an all-out research effort to achieve pharmacological blockade of the aging process would permit us to envision for mankind as many as 10 to 15 more productive years within the next decade.

We spend 2½ cents per American a year on aging research. To develop an “anti-aging pill,” Dr. Steven Lunzer of Duke Medical Center, longtime advocate of such an effort, recently proposed increasing this sum to a still modest \$25 annual research outlay per American—a sixth of what we’re spending in Vietnam, and about what a moderate cigarette smoker spends in a month. Dr. Lunzer regards the distinct possibility of reaching that goal as “the most spectacular conceivable breakthrough in preventive medicine,” not least because the necessary stepped-up research in biochemistry and molecular biology would benefit all aspects of health care. Britain’s august medical journal, *The Lancet*, declared support of such an effort in a lead editorial last December.

But until we catch up with science and come to realize that penalties of old age can be conquered, we are self-doomed to mark time. And as we do this our only avenue to the rewards of staying healthy — and youthful — will continue to be such measures as dietary restraint, enough regular exercise, avoiding cigarettes, and the good night’s rest that our complacency about health doesn’t really entitle us to. □

# BELL

## reports

### Rate, Service Improvements Listed

Station-to-station service to Libya, major cuts in rates for overseas transmission of television and radio program material, and a proposal for lower rates on some telephone calls to Canada have been announced by AT&T.

A circuit in a new Mediterranean undersea cable, built by the Italian and Libyan governments, will be used to improve service between the United States and Libya. Telephone calls to Libya will travel by satellite circuit to an earth station in Italy, where they will connect with the new cable. Previously, calls were carried by transatlantic cable to Europe and continued to Libya by high-frequency radio, which is sometimes affected by atmospheric conditions.

AT&T has joined ITT World Communications Inc., RCA Global Communications Inc., and Western Union International Inc., in listing plans for rate cuts ranging from 40 to 60 percent for color and black and white television and audio channels between the U.S. mainland and Europe, South America, Australia, Japan, the Philippines, and Hawaii. The four companies, using transmission facilities of the

Communications Satellite Corp., provide these services on a weekly rotation basis. Under the new rates, transmission of color television will cost no more than black and white.

A proposal that would lower rates for customers dialing their own calls to Canada during late night hours has been filed with the Federal Communications Commission. A similar proposal is being filed by the Trans-Canada Telephone System with Canada's regulatory authority. Savings to United States and Canadian customers are estimated at \$160,000 annually.

### New Private Line Service Proposed

AT&T has proposed a new high-capacity interstate private line service for data and voice use that would allow customers to share the service with other users.

The wideband capacity may be ordered in units having a maximum data transmission capability of either 250,000 bits per second, equal to 60 voice-grade channels, or 50,000 bits per second, equal to 12 voice channels.

Under a three-year trial offering, service will be available for the 250,000-bit capacity among 47 cities in Illinois, Indiana, Michigan, New Jersey, New York, Ohio, and Pennsylvania. These are locations served by Bell System high-capacity microwave and coaxial cable transmission facilities. The 50,000-bit channel size will be made available to extend service of lesser capacity from these locations to other service points.

Bell telephone companies will arrange each wideband channel, according to the customer's choice, to provide wideband data capacity, voice-grade channels, or wideband data with alternate voice-channel use.



*The minute device resembling an earring is a monolithic crystal filter which now does the same job of controlling frequencies in the telephone network as the equivalent conventional filter on the right. Developed at Bell Telephone Laboratories, it is being produced by Western Electric.*

### Tiny Filter Does Big Job

A monolithic crystal filter, more efficient and economical and one-twentieth the size of an equivalent conventional filter, is now being manufactured at Western Electric's Merrimack Valley Works near Boston.

The tiny filter, about the size of a dime, is capable of replacing the combinations of individual inductors, resistors, and capacitors used in conventional filter designs.

Its job is individualized service. During a long distance telephone call, a person's voice travels through Bell System switching centers to an entry point on the long distance network. There its normal frequency of several hundred vibrations per second is boosted to about 10 million vibrations and channeled over coaxial cable carrying thousands of other voices at the same time. The filters keep all the conversations separate by carefully controlling the individual frequencies.



### Jelly Preserves Telephone Cable

Polyethylene-petroleum jelly is now being used in telephone cable to prevent damage caused by two chief menaces to buried cable in many rural areas — gnawing gophers and seeping water.

Western Electric's Omaha Works is adding the new ingredient in the manufacture of cable for Bell System field trials. Test runs have confirmed that the new cable shows a high degree of dependability.

While a strong sheath is usually sufficient for protection, it occasionally gives way to a gopher, lightning, or a misguided digging tool; water, which is extremely difficult to remove, sometimes soaks into the cable causing transmission problems and corrosion.

The jelly compound fills the air spaces between the individual insulated wires within the cable and shuts out the weather like the paraffin on an old-fashioned jar of preserves.

A development group at Bell Telephone Laboratories hit upon the petroleum jelly idea while searching for a material which would not conduct electricity, would repel water, and would handle easily without adding too much to the cost of the cable. Pure petroleum jelly was tried first, but the polyethylene blend proved to be better.

### Coin Service Gets New Feature

"Dial Tone First," part of a long-range Bell System program of coin telephone service improvement, is being introduced in various parts of the nation following successful trials in Connecticut, Illinois, and New York.

Already available in sections of New York City and Washington, D.C., it will be added generally across the coun-

try during the next several years at a cost in excess of \$100 million.

The new service enables a coin phone user to determine immediately if the phone is in working order, and it allows him to place credit card, third number, collect, and operator assistance or emergency calls without having to deposit a coin first.

### Overseas Network Activity Swells

Rapidly growing demands on the overseas network are being met by Bell System expansion and improvement of its message capability.

Some 720 voice channels to Europe will be added next year when the new transatlantic cable to Spain is cut into service. By the end of next year the number of ground stations serving the satellite network is expected to increase by more than 100 percent, from 22 to 45 stations.

AT&T has requested authorization from the Federal Communications Commission to increase the use of satellite circuits by more than a third — 468 circuits to 643 — by the end of this year. The new circuits would be allocated to Europe, the Mid-East, Africa, South and Central America, the Caribbean area, Hawaii, and the Pacific area.

Through the use of improved control units at sending and receiving stations, AT&T also plans to upgrade the quality of more than 100 high-frequency radio circuits this year. These circuits link the United States with 25 countries in South America, Europe, Africa, and the Pacific.

Last year more than 15 million calls were placed to overseas points — a 25 percent increase over 1967. Overseas television service has nearly tripled each year for the past three years.

### More New Offerings Announced

A new aid for the hard of hearing and a six-button wall telephone set are among the new or upcoming service and equipment offerings of Bell System companies.

Since impaired hearing is more common at higher frequencies, a plastic gong has been developed to provide a low-frequency ringer tone for customers who have difficulty hearing present metal gongs.

The new six-button key wall set is designed primarily for businesses that need wall-mounted, multibutton phones. It combines functions now available only through the use of a general purpose wall set and a separately mounted multibutton key unit, and is available in rotary dial or Touch-Tone® models.



*This integrated circuit, made up of nearly 600 electronic components in less than a square inch, controls all timing actions in the camera of the Bell System's Picturephone® set. The closeup lens of the set is used to show the thin connecting prongs of the circuit. AT&T recently began a trial of Picturephone service between the New York and Pittsburgh offices of the Westinghouse Electric Corporation. □*

# Educating Engineers

by E. E. David, Jr.

The role of engineering school graduates in research and development and in the operation of technical enterprise is taken for granted. But less well known is their role in the executive suite and in making vital decisions in business and government. Today well over 30 percent of the nation's top executives come from engineering backgrounds.

Since engineering education provides a prime source of managerial talent, the health of enterprise and society is tied closely to the well-being of engineering education. And the well-being of engineering education is a subject of concern today among businessmen, government people and educators alike.

This concern is not new. Indeed, engineering education is among the most studied educational topics. In the past 50 years, seven searching and extensive studies have been issued. The first was the Mann study of 1918, and the most recent was the study, "Goals of Engineering Education," carried out by the American Society for Engineering Education and directed by Dr. Eric A. Walker, president of The Pennsylvania State University.

Whether these reports are influential or not, engineering education has changed dramatically over that same 50-year interval. To simplify a bit, engineering education has evolved from a vocational subject to a full-fledged academic discipline with its own research. Formerly the emphasis was placed on the "how to do it" approach; now knowledge and understanding are featured.

However, many industrialists and some educators think this trend has gone too far. Modern engineering school graduates, they say, are too fascinated with pure principle and are often not willing to undertake the work-a-day jobs that need doing. Today's engineering graduates are also often criticized for being

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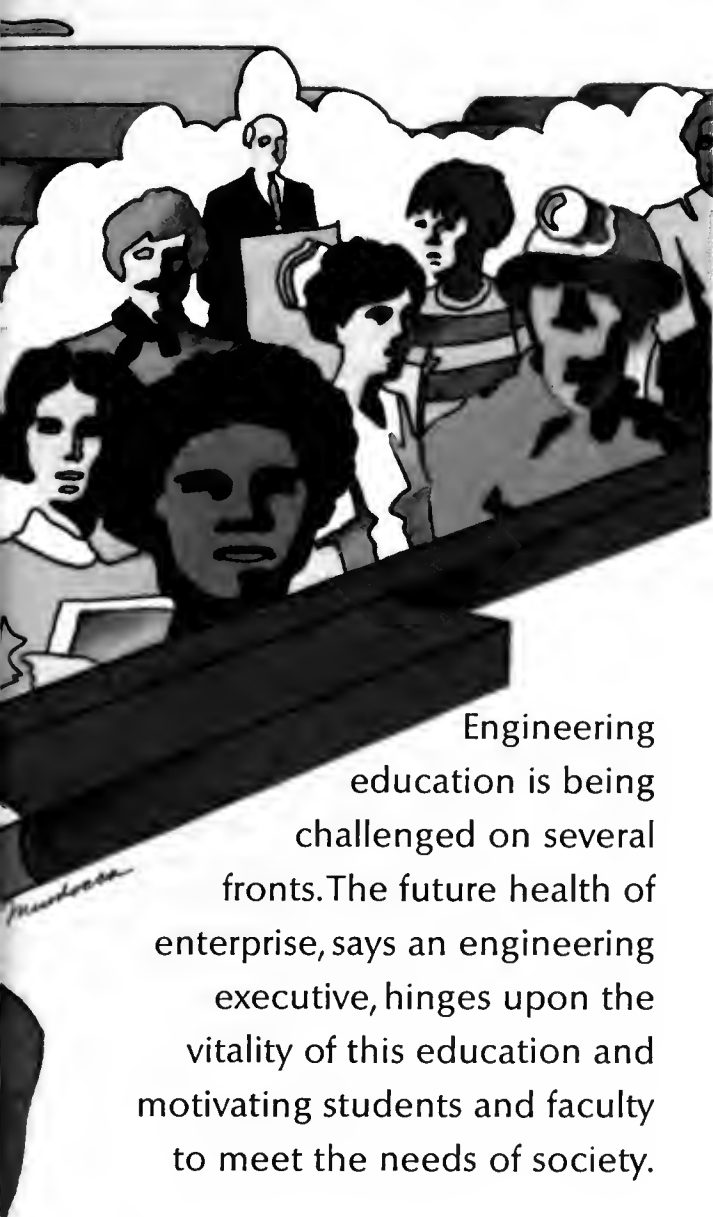
*Dr. David is executive director of the Research Communications Systems Division at Bell Telephone Laboratories. He was chairman of the Institute of Electrical and Electronic Engineers' ad hoc committee to review the "Goals of Engineering Education" report of the American Society for Engineering Education.*



neither first-rate engineers nor first-rate scientists. To balance "knowing and doing" is only one challenge for engineering education.

Another concerns the proper role for the social sciences and the humanities in engineering education. Engineers are increasingly called on to decide not only what technical feats are feasible, but which of the almost endless possibilities are preferred for society as a whole. The values that such decisions involve are outside technical subject matter. Yet, the engineer's first duty is technical competence.

Another challenge to engineering education is the diversity of engineering itself. Engineering activities span a tremendous range of subjects; not only the



Engineering education is being challenged on several fronts. The future health of enterprise, says an engineering executive, hinges upon the vitality of this education and motivating students and faculty to meet the needs of society.

classic electrical, mechanical, civil, chemical and aeronautical engineering, but also environmental, computing, nuclear, ocean, ceramic, mining and petroleum, systems, astronautical, industrial biomedical and materials engineering to name a few. Also, engineers carry out a variety of functions including design, development, operations, research, teaching and planning. Can a single engineering curriculum satisfy such a growing collection of specialties and functions? It seems unlikely, though a few universities and colleges do attempt such a synthesis.

Still another challenge to educating engineers is the volatility of engineering subject matter. Hardly anything in the curriculum today was there in 1935.

Among the new subjects since World War II are computers, both analog and digital, solid-state devices such as transistors and integrated circuits, the molecular and crystalline structure of plastics and metals, optoelectronics, supersonic aerodynamics, astronautics and many more. Keeping the curriculum current in the face of such rapid change is not the only problem. As great a challenge is keeping the engineering graduate professionally competent through some kind of continuing education.

Finally, recruiting students for engineering is increasingly difficult. Both sheer numbers and quality are at issue. Students are shying away from the physical sciences, mathematics, and engineering. The reasons are debatable, but the trends are clear. Ten years ago some 21 percent of male college freshmen enrolled in engineering; in 1968, only about 12 percent did. The percentage of National Merit Contest male semifinalists going into engineering dropped by a third in the same interval. Many people who have examined this situation believe that its roots lie in students' increased social and humanitarian consciousness and engineering's apparent lack of response to social issues.

The Goals of Engineering Education report speaks to many of these challenges, though, in most cases, somewhat obliquely. As the title implies, there has been no consensus over the years on the results to be achieved by engineering education, let alone any agreement on how to reach the goals. This stems probably from the nature of engineering itself.

Engineering is mission-oriented; engineering enterprise is purposeful. On the other hand, science tries to uncover new knowledge and understanding; it is not concerned with missions for society and the individual (though, of course, many scientists are highly public-spirited and socially concerned). As the great engineer Theodore von Karman said: "Scientists study the world as it is, engineers create the world that never has been." In doing so, engineers use whatever resources can contribute to their purposes. Knowledge is vital, but so also are technique, intui-

tion, invention and ingenuity. And even “black magic” helps sometimes. A mix of all these is needed in engineering. Little wonder that there is less than agreement on educational goals for engineering.

Even without agreeing on specific goals, there are directions engineering education must take if it is to meet the demands of the future. Certainly, engineering education must become more flexible by augmenting the humanities and social science content, by encouraging a wider range of subject matter in both undergraduate and graduate programs, and by recognizing careers in design, development management, and all engineering functions as desirable educational objectives.

### **Student individuality needs recognition**

Indeed, engineering education traditionally has been stereotyped just as other professional curricula are. There has been little room for electives or non-technical subjects. This situation has been leavened in some recent curriculum revisions, but increasing liberalization is necessary as engineering specialties and functions proliferate and as engineers shoulder their social responsibilities.

Furthermore, students are individuals, as many administrators are discovering. Through liberalization, engineering education should be able to capitalize on both individuality and engineering's broad scope. Students should be encouraged to tailor programs suited to their interests and talents.

Recognition of student individuality may pay substantial dividends in bringing more of the top students into engineering.

In this same flexible spirit, continuing education must be recognized as a distinct function in engineering education. Education is not a finishing process but merely a start. Students must be converted to this view as part of the educational process. In this day of changing technology, they must be convinced early in their careers that continuing study is the engineers' only salvation. Correspondingly, academic institutions, professional societies and industries must

provide appropriate opportunities for continuing study. The pedagogical approach for continuing study courses is not the same as for undergraduate or graduate study. In continuing education, the degree of rigor and formality can be reduced and implications for technology and society can be emphasized.

The key to broader and more flexible engineering education lies in faculty competence and involvement, which in turn hinge upon the criteria for faculty promotion. Today these are slanted toward research and publication. The “publish-or-perish” syndrome is widely evident in the universities and colleges. A better balance is needed between research and accomplishment in teaching as well as public service, social involvement and engineering practice. Broader faculty horizons are a requisite for successful broader educational programs. A closer student-faculty relation is also essential. Faculty excellence in the appropriate dimensions is difficult to achieve; many educators believe it is the major hurdle to educational development.

### **Hire competence, not degree**

One of the stumbling blocks lies in the “union-card” aspect of the doctorate degree as a faculty qualification. For example, it has become the fashion to favor doctorate-level degrees for new faculty in all curricula. Yet, important aspects of engineering instruction can best be imparted by engineers who have worked in industry, regardless of their degree level. In acquiring new faculty, competence in the subject should be the criterion, not degree-level.

For example, in teaching engineering design, theoretical knowledge is not sufficient; a familiarity with state-of-the-art technology is vital. Fortunately, academic institutions are recognizing this fact and exchanges of people between industry and the universities are on the upswing as a result. During 1968, some 16 professors spent from three to 12 months at Bell Telephone Laboratories while 42 Bell Labs people taught at universities. Programs of this kind can provide an important dimension in engineering educa-

tion, but the number of exchanges is still too few to make a major impact. Industry could provide vital help to engineering education by sponsoring more such arrangements.

### Students want to influence events

So, faculty excellence on a broad basis is fundamental to more flexible engineering education. Excellent and motivated students are the other essential element. Students today are impatient; they want to influence events and are not satisfied to contemplate anonymity in some bureaucratic organization. There is no reason that they should because young engineers can have a profound impact on events through their ideas and accomplishments.

For example, R. W. Lucky of Bell Labs invented a technique for automatically adjusting transmission paths to increase their capacity to carry data. His work resulted not only in professional recognition, but his invention is at the root of new high-capacity computer-communications systems coming into widespread use. Yet, Mr. Lucky was younger than 30 when he made this contribution. This is one example of how young people can influence the world, but of course, Mr. Lucky is not alone. Young people are shaping the future by their ingenuity and their fresh approach. Indeed, engineering is a powerful tool in influencing the world for those who want to grasp it.

This observation implies that modernization of the undergraduate curriculum is increasingly crucial. A critical examination of the educational goals to be achieved and repackaging the relevant subject matter to attain those goals are required. Attempts in this direction are often stifled by faculty factions with vested interests in antique courses. Instead, a lengthened degree program (five years) is sometimes advocated and actually practiced in a few places.

While length and content in course work have a positive correlation, there is not a one-to-one relationship. A five-year curriculum full of irrelevant formalities is not likely to appeal to students. A five-year undergraduate curriculum is justified only when the

combination of educational goals and curriculum values dictates it, and few, if any, instances have been convincingly demonstrated to date.

On the other hand, more and more engineering students are going on to graduate school. Today between 30 and 40 percent of engineering graduates do so. Though this percentage might be increased somewhat, say to 50 percent, not all engineers should aspire to graduate work. The scope of engineering activity implies that no single educational level will be uniformly appropriate. The level will depend upon the engineer's function — research, teaching, design, development or operating. There are many engineering tasks which require only a four-year degree supplemented by on-the-job training and education.

### Grad school is not finishing school

In fact, in many practice-oriented instances, or where highly specialized knowledge is required, the on-the-job aspect is unique to the engineering environment and at best can be imperfectly imitated in academic environments. For example, engineering production techniques for telephone handsets, oscilloscopes, television sets or automobiles require much experience in addition to technical insight. Academic institutions are not well suited for providing this experience. So, graduate education is not the "finishing school" for all engineers.

It is commonly said that the number of engineering graduates must be increased. Indeed, there have been many projections showing vastly increased needs for engineers in the coming decade. Many signs do point in that direction, but better management and clearer goals for engineering enterprise would partly satisfy this need. So, too, will graduates from two- and four-year technical institutes. These people are increasingly able to take over more and more routine engineering functions and some that are not so routine, too.

Hopefully, schools will find ways to retain a larger fraction of students who matriculate in engineering. Today between 30 and 40 percent of entering freshmen drop out before graduation. Since engineering

freshmen are a highly select group, strenuous efforts are justified to see that each develops to his full potential. Thus, in satisfying society's need for engineers, there are several dimensions to exploit in addition to expanded student bodies and facilities.

Certainly in the near future, the number of high-quality engineering graduates will be limited less by the available facilities and more by the number of qualified students who can be induced to undertake an engineering career. Much of the image of engineering is neither complimentary nor accurate. Steps to improve this situation among precollege students, teachers, parents and career counselors are a vital beginning. What is required is not a Madison Avenue publicity campaign, but an honest attempt to project bona fide information about engineering. In particular, the public needs to understand the role of engineering as a bridge between society and its values on one hand and science and technology on the other.

Attempts in this direction should be viewed less as *recruiting* than as *guidance*. Recruiting campaigns based on salesmanship are apt to attract a large percentage of fringe students with less than the best qualifications. Yet, students have little chance before entering college to study engineering as the process of matching human needs with technical possibilities. They can take physics, chemistry and biology, and they must take mathematics. These courses are typically quite specialized, the modern versions having been inspired by professionals in these fields. Often the relevance of the topics studied to controlling man's environment for his benefit is not pointed out. Consequently, students are left with the impression of an unabridged cleavage between science and technology on one side and human values and esthetics on the other.

Over the past four years, the Engineering Concepts Curriculum Project, supported by the National Science Foundation, has developed a course for high schools designed to fill this void. The course, entitled "The Man-Made World," is not a recruiting nor even a guidance instrument. Rather, it is an essential part

of the general curriculum since it endeavors to introduce students to engineering-scientific thought as a part of modern culture. The basic themes are modeling as an aid to thinking, organization as a means for controlling complexity, and the relation between men and machines. These are applied across a variety of topics, including transportation, economics, computers, public health and many others. Students come to see the broad relevance of concrete thinking and experimentation as a necessary supplement to intuition.

"The Man-Made World" is being taught this year in 100 high schools to 4,000 students and is just emerging from the testing phase. As it is adopted across the country, it will provide a fundamental instrument for bringing the role of engineering into focus for the most important element in education; namely, students.

### Industry-education exchange necessary

In summary, the future health of industry, government and technical enterprise generally hinges upon the vitality of engineering education which is under challenge on several fronts. Among the issues are: Achieving a balance between knowing and doing, finding an effective role for the social sciences and humanities, keeping the curriculum current and comprehensive without allowing it to grow wildly in length, and attracting students in sufficient quantity and quality.

Measures to meet these challenges must concentrate on the two vital elements in any educational process; namely, the faculty and the students. Faculty horizons must be expanded beyond their particular disciplines and students must be motivated to accept responsibility, for meeting the needs of society with technical excellence and humanitarian values. Industry must aid in these efforts by exchanges with universities and by effectively communicating the social relevance of technical enterprise. Only with such aid will engineering education be able to fulfill its ambitions as a dynamic, flexible and evolving resource for the nation and the world. □



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July/August 1969

# Thinking Sideways

The Court Jester's First Job

page 26

# BELL

telephone magazine



# RADIO COMMERCIALS BRIDGE CAMPUS-CORPORATE GAP

There are more than seven million students in American colleges and universities. The recording included here contains five 60-second radio commercials aimed at a representative slice of those students.

The message is the Bell System network. The words, music and style, as you'll quickly note, are in youth's idiom, not ours. But there's an urgent need for less distinction between the two. These lively, lilting productions are designed to help bridge the campus-corporate gap.

They were played recently in six cities for a test period of eight weeks over 15 stations. Most were campus stations. The balance were stations which program a large percentage of their material for college listeners. The spots are the first AT&T-sponsored informative radio advertising aimed directly at college people. Their objective: To show that Miss Bell is where it's happening. And they do.

Bell personnel people know that this business is respected for engineering and technical achievement, especially by engineering students. But among liberal arts scholars we are sometimes looked upon as a less stimulating and satisfying place to work than we are.

These attitudes are held most strongly by the more intellectual students who are in college for more than a ticket to a good job. *Fortune* magazine calls these students "forerunners" because their attitude is expected to become more prevalent. Forerunners comprise about two-fifths of the college population, and they frequently lack the desire to understand our business.

Thus this collection of commercials. Surveys are still under way to measure the response in the six college cities. But the early returns look good. The first reaction was from a Southern Methodist University student who called the Southwestern Bell Dallas office.

"I couldn't believe it," he said, "they're the best commercials I've ever heard."

The editors hope you enjoy them too. If you don't, lay 'em on your kids.

# BELL

telephone magazine

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JULY/AUGUST 1969

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by Norman Cousins

## Restoring Rationality to a Tumultuous World

A noted editor says student activism is but part of a broader pattern—irrational response to questions crucial to survival. He advocates world law as the only effective force against irrationality—and potential holocaust.

A deep historical and philosophical dimension appears to underlie student activism today. This dimension applies in a very real sense to our national security.

Much of what is said about the students is true. There is a specific, deliberate, and organized attempt on the part of some ideologists to organize the students and point them in a certain direction. And it is true the students are responding in a way that 10 years ago we might not have thought possible. But this response is not the basic problem, nor is it the basic issue.

Similarly, most prescriptions for meeting these situations seem to be falling short. For example, it is said that if only the university would give the students a greater sense of participation in the affairs of the university community, a major cause of the riots would be removed.

But recent experiences at Berkeley, Columbia and Wisconsin where student participation in university affairs has been encouraged indicate that such remedial measures are not enough. The same is also true of the criticism that university presidents don't maintain enough of an open-door policy for students. Buell Gallagher, former president of the City College

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*Mr. Cousins is editor of Saturday Review.*





of New York, had maintained an open-door policy for years; yet the explosions came to C.C.N.Y. Ditto, the argument that the most distinguished professors on many campuses are too often inaccessible.

The time has come to relate the problem of the universities to a larger problem. Increasingly, we are going to discover that manifestations of that problem are not confined to the university.

The world today is a prime arena of anarchy and terror. We cannot live indefinitely in that kind of arena without having it affect our institutions. Freedom cannot exist for very long in a dominant condition of anarchy.

Man and his society are in a constant condition of interaction. At a time when nations can vaporize civilization, the individual takes on the temper of the total organism of which he is a part. He doesn't have to react on the level of conscious decision; he can reflect an environment that no longer fully comprehends the fragility and uniqueness of human life.



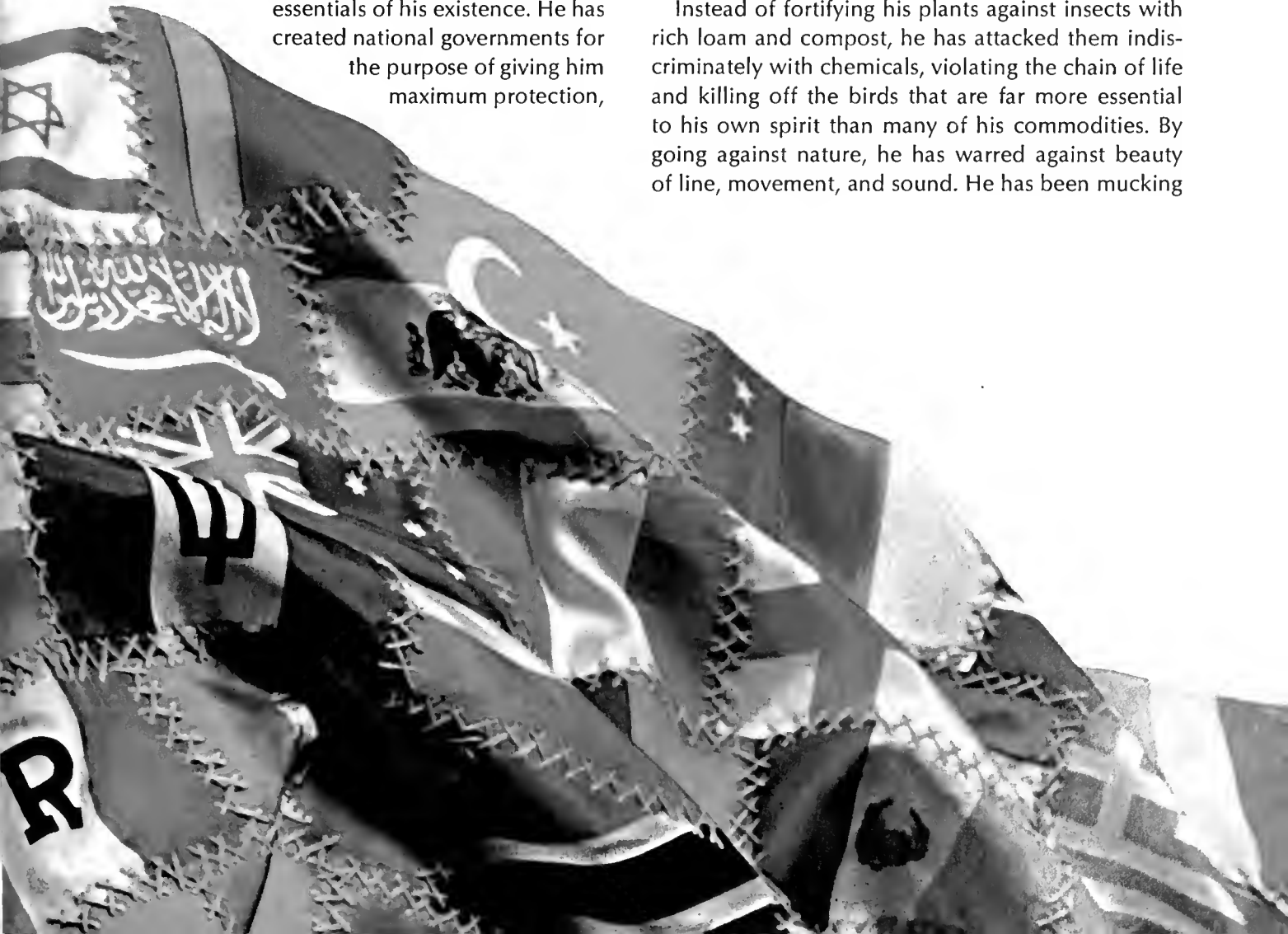
The elements of insecurity, anarchy, terror, and the irrational affect the human subconscious. Things happen in our lives that represent the dominant environment in which we live, and they register deeply on the subconscious. They don't necessarily have to filter through to the conscious. Just in the process of being alive, a human being knows whether the atmosphere in which he lives enables him to grow.

Something in the nature of being human requires a certain atmosphere for creative and responsible growth: and that atmosphere today is being impaired. What is happening is that the nation-state as an institution is able no longer to give man the kind of assurance to which he is entitled just in the act of being alive. Man's world is slipping away from him. His habits, his thoughts, his actions run counter to the essentials of his existence. He has created national governments for the purpose of giving him maximum protection,

but he has no way of protecting himself against the governments. In the act of contending with one another, the governments have become instruments of race suicide and world holocaust.

Most of what man does is irrelevant to his main problems; his ingenuity has been applied to everything except the need to make his planet safe for human habitation. He has cut into his natural environment with large slashes. His sources of food are being sealed over by the tar and cement of his cities and highways. Next to destructive force, he produces nothing in greater volume than his garbage. He has made his sky an open sewer and his rivers and lakes a poisonous brew. He has pumped his foul wastes into the seas and has stared balefully at billions of floating dead fish.

Instead of fortifying his plants against insects with rich loam and compost, he has attacked them indiscriminately with chemicals, violating the chain of life and killing off the birds that are far more essential to his own spirit than many of his commodities. By going against nature, he has warred against beauty of line, movement, and sound. He has been mucking





up his own planet, but has the arrogance to go searching for life elsewhere in the universe.

These facts register on the subconscious. Our young people whose keen sensitivities have not yet become calloused by living have a purer and more immediate response than we do to our environment. Since the environment is irrational, the human response to it is equally irrational.

The core of the problem is historical and philosophical. It involves not just the campus, but almost every aspect of our national life. The stark and ultimate fact is that the concept of natural law is not a workable reality in a nuclear age.

Natural law is one of the oldest ideas in the political and philosophical evolution of man. The idea is uncomplicated: Man acquires basic rights just in the act of being born. Governments cannot ignore or obliterate these rights, which have to do with justice, protection, personal dignity, and which are felt by conscience even when they are not in codes. The Magna Carta, the English Bill of Rights, the French Declaration of the Rights of Man, and the U.S. Bill of Rights are attempts to give legal reality to natural law. The moral of Sophocles' *Antigone* was that the law of kings is subordinate to a higher justice based on sensitivity and common sense. Aristotle, Cicero, St. Thomas Aquinas, Sir Edward Coke, Hugo Grotius, John Locke, John Stuart Mill, John Milton, and Thomas Jefferson are only a few names in the long procession of thinkers who recognized the existence of natural rights and the natural obligations of governments with respect to them.

The major obligation of national governments, as John Locke saw it, was to respect and protect the lives, properties, and culture of their peoples. This was a major aspect of the social contract. But this contract is now beyond the means of any government to fulfill. For no state today can protect its people.

At a time when the fingertip of a desperate man can activate a whole switchboard of annihilation, and when defense is represented by retaliatory holocaust, the historical social contract between



man and the state has ceased to exist. For the world has been catapulted into an open and exposed single arena. The national governments are incapable of safeguarding the people inside that arena.

The mood of violence, irrationality, and insecurity is therefore not peculiar to our campuses or to the United States of America.

Throughout the entire world people are caught up in convulsive change. The old historical rhythms are hardly recognizable. Issues that formerly took a century or more to come to a boil are in constant eruption. Everything is being bunched up — time, space, nations, people, issues. And everything has a fuse attached to it.

We are at the end of the age of purely national or even regional problems. Combustibles for setting the globe afire exist everywhere — whether in the interior of Africa or the lowlands of Asia or the seedbed of Western civilization in the Mediterranean.

The habits of nations, always variable, have become starkly irrational. Nothing made by nations today is in a greater abundance than destructive force. Nations have in reserve the equivalent of 30,000 pounds of TNT for every man, woman and child in the world. They do not have in reserve 30,000 pounds of food or medicines or clothes or books for every person in the world.

Just a single hydrogen bomb now contains more explosive power than all the bombs dropped from the air during the Second World War put together. Thousands of such bombs are now ready for instant use. Day by day the mountain of weapons grows fatter and higher. Even if only one-fourth of these weapons were detonated, the planet could be poisoned and pulverized beyond the ability of man to cleanse or repair.

The idea of protecting American cities against missile attack seems logical and incontestable until it is recognized that the ABM system would result in less security, not more. For there is an obvious and inevitable consequence of the ABM. And this is the development of an expensive decoy missile system and the

packaging of greater destructive megatonnage in the missile warheads. An aggressor nation can readily afford to saturate a target with 10 or more decoys to one armed missile, activating the defense and causing it to expend most of its explosive payloads on unarmed attackers. Radar devices have no way of discriminating between decoys and destroyers. Moreover, it takes only one penetrating armed missile to destroy a city, creating a hurricane of fire that can rage over hundreds of miles.

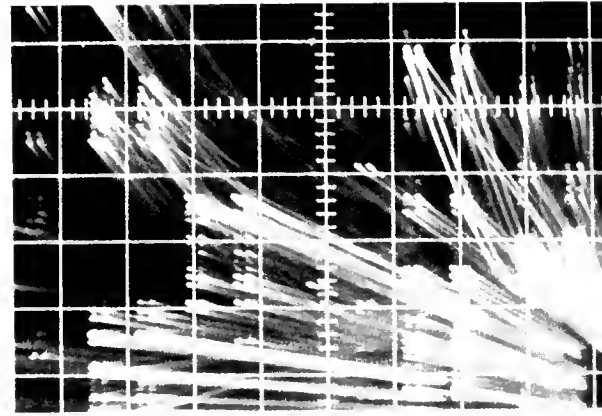
The question is being debated whether the United States ought to devise a system to defend against Chinese missiles or against Russian missiles. What the discussion overlooks is that if an attack should occur, there would be no way of determining whether the missiles come from China or the Soviet Union or any other nation.

This monstrous danger is now producing precisely the wrong response. We seek to confront the danger by enlarging it and igniting it instead of recognizing that there is now a totally new condition on earth calling for a new emphasis on world controls and world approaches. The old reflexes of absolute national sovereignty are inconsistent with either peace or progress. The present context is one in which the foreign policies of individual nations have right of way over the ability of the United Nations to deal with the tensions or conflicts produced by national policies. Therefore, the United Nations must be brought to full strength — in procedures, powers, membership. For the world requires a better mechanism than it now has for preventing conflict or for dealing with it whenever and wherever it arises.

The United Nations will never be a cure-all. But at least it should be able to act with a reasonable degree of effectiveness in behalf of the common interests of the world's peoples, a function that no single nation is equipped either to define or discharge by itself. The extent to which the United Nations can be transformed into an effective source of world law will be the measure of security and sanity for the United States — and everyone else. □

# TECHNOLOGY IN TRENTON

The invisible seven-eighths



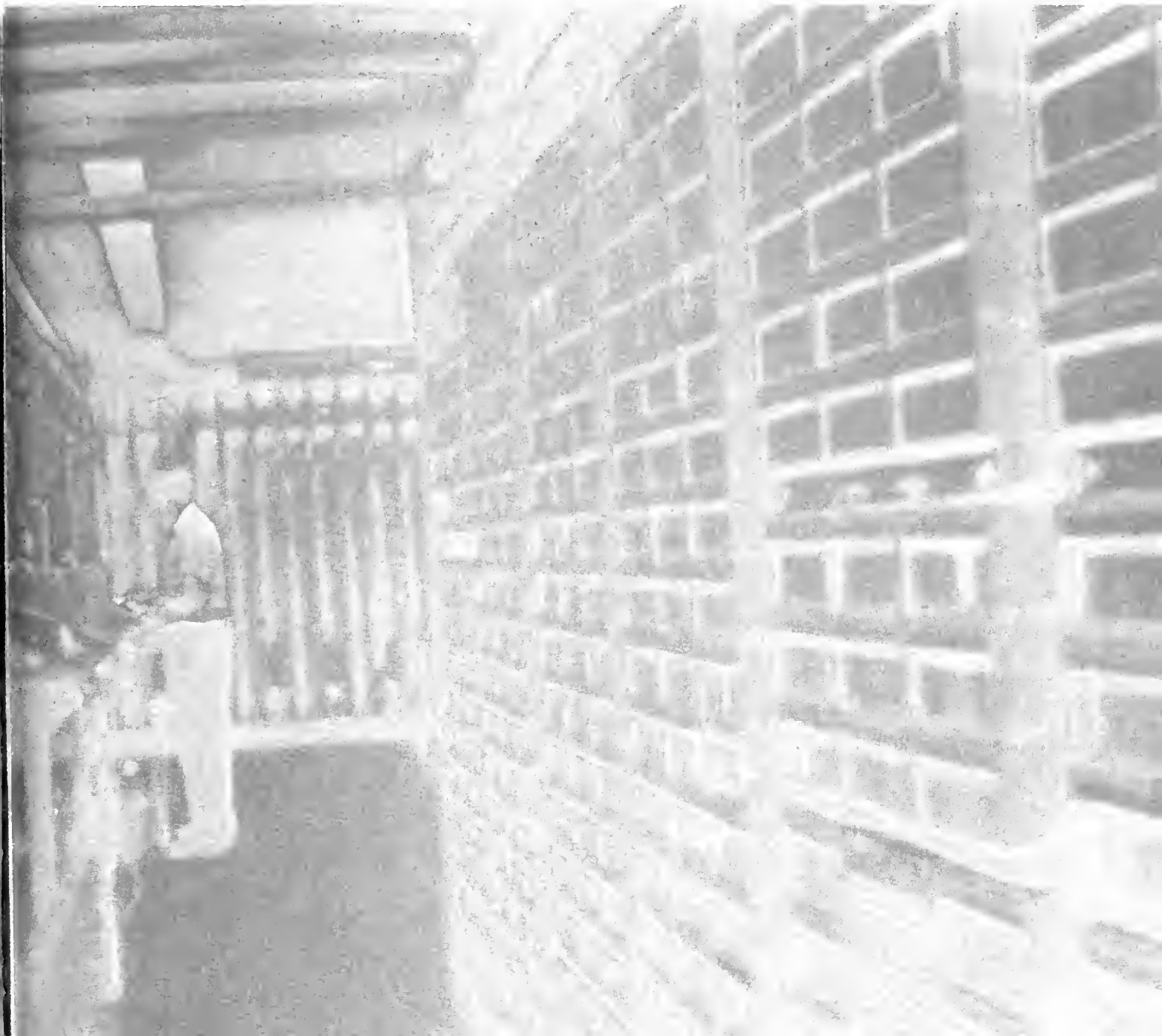
Telephone service, like an efficient housewife, is generally taken for granted. The functions of an ordinary phone call are fairly basic. To talk with someone, you dial the number of another phone. Or your phone rings when someone calls you.

Tomorrow, you will dial only a few digits to reach a frequently called number; the equipment will dial the rest. If you are visiting someplace, your calls will be automatically transferred. If you dial a busy number, your call will go through automatically as soon as the line is free.

These versatile wonders, and more, are performed by equipment behind the scenes — the seven-eighths of the

iceberg you never see. Called ESS, for Electronic Switching System, this array of complex components, silent and invisible at the end of your phone line, is gradually spreading the shape of tomorrow's telephone service across the face of the land.

New technology breeds its own new images. In Trenton, N.J., some far-out photographs of a recent ESS installation symbolize a future that is now not far out at all. This colorful general view behind the scenes is accented by a closeup of an oscilloscope screen showing the patterns of calls flowing through the new office, made visible by the silent tracings of electron beams. □



# SCHOOLS AND BUSIN





# WORK TOGETHER...

## BUT NOT OFTEN

by **Martin Mayer**

Among some educators and businessmen, there is a new focus on business management for the business of education. But productive partnerships are rare, according to one authority.

In most American cities, and in nearly all the suburbs, the largest payroll, bar none, is that for Board of Education activities. And there is an increasing suspicion throughout the country that we are not getting value commensurate with the very high sums of money we spend on the schools.

Every business has a major stake in the efficiency and effectiveness of the local schools. Education being financed mostly from real property taxes, the owners of commercial property are large involuntary contributors to the school budget. Local business, of course, must rely on the local schools to produce competent job applicants. Most important of all —

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*Mr. Mayer is a noted nonfictionist. His credits in the field of education include numerous articles and three books: The Schools; Where, When and Why: Social Studies in American Schools; and The Teachers Strike, New York 1968.*

and perhaps most endangered by what is happening in public attitudes toward urban schools — business needs civilization, civic government that works and advances the general welfare. Such government can be achieved in a democracy (as Thomas Jefferson pointed out) only through universal education.

On balance, businessmen have supported the public schools. They serve on Boards of Education, join committees to win voters for millage campaigns and bond issues, form advisory councils for vocational programs. In recent years, however, more and more businessmen have come to feel that the crisis in education requires much more help than they have been giving. The first — but not the only — focus is on the business management of the business of education.

When Richardson Dilworth became chairman of the Philadelphia Board of Education in 1965, he appointed several volunteer citizen “task forces,” one of them on school budgeting and accounting, headed by Donald Rappaport of Price, Waterhouse & Co. Rappaport found that the Philadelphia schools’ budget seemed to reflect the relative strengths of staff members rather than any conscious educational purpose: “We had a fantastic man in music,” Rappaport says, “so we had three hundred organs in our schools — but we didn’t have slide rules for the math students.” These disparities were hidden in a “line budget,” which showed so much for purchasing instructional supplies and so much for paying teachers, but did not show the purposes for which the money was used.

Rappaport felt that standard business budgeting procedures could not be imported into school systems, if only because the employee incentive struc-

tures were so different: “I can get the young fellows in our office to turn to,” he says “because they know they’ll get promoted. You can’t promise that in the school system.” He turned instead to the twenty-year-old recommendations of the Hoover Commission which studied the federal civil service, and he designed a “program budget” on the Hoover model. Instead of a single line for junior high school teachers, for example, the new Philadelphia budget shows separate lines for social studies teachers, math teachers, science teachers, English teachers, etc. “One board member said to me,” Rappaport recalls, “I’ve been on the board ten years, and I never knew we were spending more money on English than on math.”

Rappaport’s model budget for Philadelphia has been exported to dozens of other city school systems, especially in California, but he is not sure how far these other systems have actually *used* it. He cautions “against reports and plans as opposed to execution. When we first went over to school headquarters, we found a box full of reports from management consultants — good reports, many of them, but nothing done about them.” The significant element in the Philadelphia story, he feels, may be that Dilworth not only commissioned a study but that he then imported a team from Price, Waterhouse to put the new budget into effect. Rappaport himself “acted as deputy superintendent for administration, to get the system installed.”

In Philadelphia, the initiative to bring in business came from the new head of the lay board; in New Haven, it came from a new superintendent of schools, John Santini. He had been chosen to head the New Haven schools on the basis of his success in running

a non-graded school elsewhere, and when he arrived in New Haven he couldn't find out what was going on in the school system he was supposed to lead. (Older hands sympathize: "It's murky out there," says Carl J. Dolce, who was until recently superintendent in New Orleans. "You never know how many unoccupied classrooms you have until you send your own man out to the buildings to count them.") Santini, as the new boy in town, was invited to address New Haven's Chamber of Commerce, and he told its members that before he could hope to accomplish anything else he had to do something about how the schools were run — and he needed their help. William Wallace of the Winchester Division of Olin Mathiesen called Santini aside, and the two of them agreed to have Mayor Richard Lee make a formal request for Olin's help to the school system.

### **Administrators, not managers**

Wallace was and is convinced that one of the major weaknesses of urban education is simply misorganization. "Nobody in the school system," he says, "has been trained in management, in thinking ahead about what ought to happen and then organizing to make it happen. They use the word 'administration' rather than the word 'management.' They don't pay management's kind of attention to their personnel problems. I don't mean to say they don't work at it, sweat over it, bleed on it—they do. But they don't *manage* it."

Olin Mathiesen detached to the New Haven schools, full time for three months, one of the company's most able development analysts. In September, 1967, having interviewed everybody and read every-

thing in an astonishing non-stop burst of work, the analyst handed over a set of 45 specific recommendations and "the guts of an organization manual — in concrete, what they ought to do and ought to have." ("If you don't present the details," he explains, "you fit Ann Landers' definition of a management consultant: 'a man who borrows your watch to tell you what time it is.'")

The new organization charts eliminated some people's jobs and added new jobs, among them an assistant superintendent for facilities, a personnel development coordinator, and a planning and research director with a research assistant, "because planning is the first step in the management cycle." The New Haven Board of Education juggled this steaming potato for almost a year (the recommendations were not even published by the board until August, 1968), and then asked Olin to lend the man again, this time to supervise the day-to-day work of reorganization.

Now, however, Olin said NO. As Wallace puts it, "If they were serious about installing and maintaining this program, they'd find someone internal to do it."

The Southern New England Telephone Co. then picked up the year's slack in relations between the New Haven schools and the business community. Three employees—a clerical office specialist, an urban affairs expert and a systems designer — were loaned to the school system by SNET, supposedly on a part-time basis. Their first step was to organize a weekend seminar for 18 senior staffers at the New Haven schools, to show them how modern personnel management attempts to increase workers' involvement with and interest in their jobs. Of significance to SNET President Alfred Van Sinderen at this meeting was

his discovery that, although they were all on a relatively senior level, several of the participants from the school system had never even met each other.

Representatives of SNET, Olin, Marlin Firearms, Union New Haven Trust Co., First New Haven National Bank, and Second National Bank, in cooperation with the Chamber of Commerce, organized an "Education Action Committee" (educators and businessmen) to work in the schools, with separate subcommittees for business arts, computers, guidance, industrial arts, science, and journalism. One program, called Project SEED, will send businessmen with math backgrounds as volunteer teachers to elementary schools, to help the beleaguered schoolteacher handle the subject in which she herself always did worst. Other businessmen are trying to help redesign the 9th grade science curriculum. One of the SNET representatives, Richard Arnold, has also worked informally "to get teachers and school administrators and businessmen to meet socially, one-to-one."

Though sponsorship of experimental public school programs by private foundations has become commonplace, business generally has not been asked to make charitable contributions to school budgets. Of the estimated \$330 million which business gave for education in 1968, well over \$300 million went to colleges and universities. Contributions for one special purpose, however, have been sought and gratefully received: to help school systems pay the costs of campaigns for higher taxes and new bond issues. The New Orleans schools were especially happy about a donated professional public opinion survey. "We had always been told," said Superintendent Dolce, "that people resented teacher salary demands

and thought teachers were paid too much. The survey told us that the one thing people *would* support was better salaries for teachers, so we fought the election on that issue and won it overwhelmingly."

By far the most common form of business involvement with school systems, of course, is in the area of vocational training, where the cooperating businesses expect to employ the graduates of the program as soon as they leave school. Most of the efforts of the Northern California Industry-Education Council, the first and still almost the only organization of its kind, have been devoted to improving public attitudes toward vocational training. "We have to do something," says Ivy Lee, director of the Council, "to get rid of the notion that all mankind is divided into two groups — the college-directed, who are good, and the non-college-directed, who are bad."

### **School and employers: two different worlds**

The last few years have also seen a great growth of "work-study" or "work-experience" programs, which employ students part time in local business and usually grant them academic credit for what they learn on the job. Such programs are obviously beneficial to both sides at a time of nearly full employment: to the companies, they offer recruits, and to the schools they offer students with more reason than most to get their work done and stay out of trouble. But the work-study programs mostly assume that the schools and the employing firms occupy two different worlds, each of which does its own kind of training; indeed, some of the best of these programs — the Pacific Telephone and Telegraph Company is a leader — are car-



ried on under the slogan "Bridging the Gap."

In early 1968, General Electric and the Cincinnati schools (where a GE executive is a member of the Board of Education) closed the gap entirely at one point by bringing the two kinds of training together. GE needed repairmen for its appliances; Cincinnati needed an especially attractive program for a new technical high school zoned citywide, which was having difficulty finding students. There was a small-appliance repair course in the school, but it was, says curriculum director Ralph E. Schauck, "hardware oriented — you'd have 25 small irons, 25 toasters and so forth, and teach pupils to identify problems in them. You can't stay current that way, and the students know it, so the program doesn't draw."

Meanwhile, General Electric had developed in its Schenectady factories an "in-house" training program emphasizing a "diagnostic approach" to repair, and using programmed instruction to teach the necessary elements of electricity. Cincinnati was not interested in so purely commercial a course, and GE gave the school system a grant, about \$17,500, to round out the company's material with similar programmed material in basic math, law, business practice and the like. When all the wrinkles are out of both halves of the program, around the end of this year, GE expects to offer a year's worth of full vocational course work to school systems all over the country.

This sort of cooperation is not easy to achieve. School systems are inevitably more political than business is, and cannot place so much weight on pure efficiency: the Olin organizational design for New Haven, for example, stressed "spans of control" and central management at a time when pressure groups

were calling most loudly for "decentralization" of decision-making authority in the schools. Outputs from school systems are much harder to measure than factory production runs or store sales: the program budget for Philadelphia, as its designer admits, tells little more than the old line budget about how much *education* is being bought for the money. Moreover, as the current difficulties of the Defense Department indicate, expenditure is less easily controlled in a program budget than in a line budget. The Philadelphia schools under their new budget seem to have acquired a habit of spending some of next year's revenues this year, which threatens the financial stability of the system in the 1970-71 academic year, if not sooner.

Not infrequently, one still finds superintendents of schools who will say that consultants from the business world "never tell us anything we don't already know," and businessmen who announce that "our schools are in trouble because our educationists are incompetent." Even among those who are better disposed toward working together, the schoolmen often become discouraged when the businessmen cannot provide miracles or money, and the businessmen often fade away at their first insight into the profound difficulties that face today's urban schools.

A few moderately successful joint ventures too easily give the impression that a great deal is happening around the country, though in fact significant partnership between business and the schools is still almost as uncommon as a robin in winter. But both sides have seen a need for something to be done, and a number of men are looking now for something they can do. □

# No Bargains in This Basement

by Evelyn Lauter

"Now that she's married," her father said, "can we move back to an apartment in town?"

"Absolutely not," I said. "There wouldn't be enough room for all those presents."

Since that dazzler of a day in June, when we found ourselves fresh out of brides, this house is like a mad department store. The spun aluminum trays and plated flatware, remnants of our budget wedding all those years ago, still are on the main floor. Below stairs, stashed away as firmly as a parent's notion of how things ought to be, is the loveliest loot this side of Hammacher Schlemmer, aging like vintage wine against the day when the bride and groom light somewhere beyond a college pad.

When Robin's engagement announcement appeared, sounding like a leaf out of Lovejoy's college catalog, no one asked what her David does for a living. They wanted to know how much longer he still would be in school. No matter. Robin stayed in college long enough to snag a teaching certificate. She will pay the rent (till he becomes a doctor or, contrary to the best laid plans, a father).

First off we sped to the bridal bureau of the best department store

where they handed us a checklist for preferences in the area of anticipated loot. Under this sly system the gift givers have only to pick up the phone, tell the bride's name, and confide how much they wish to spend. The answer is ready-made. The bureau, in cahoots with the bride, will engineer 12 place settings of her bald sterling with the rapier knives. It will see that she gets that Danish coffee pot — the one that weighs five pounds with nothing in it.

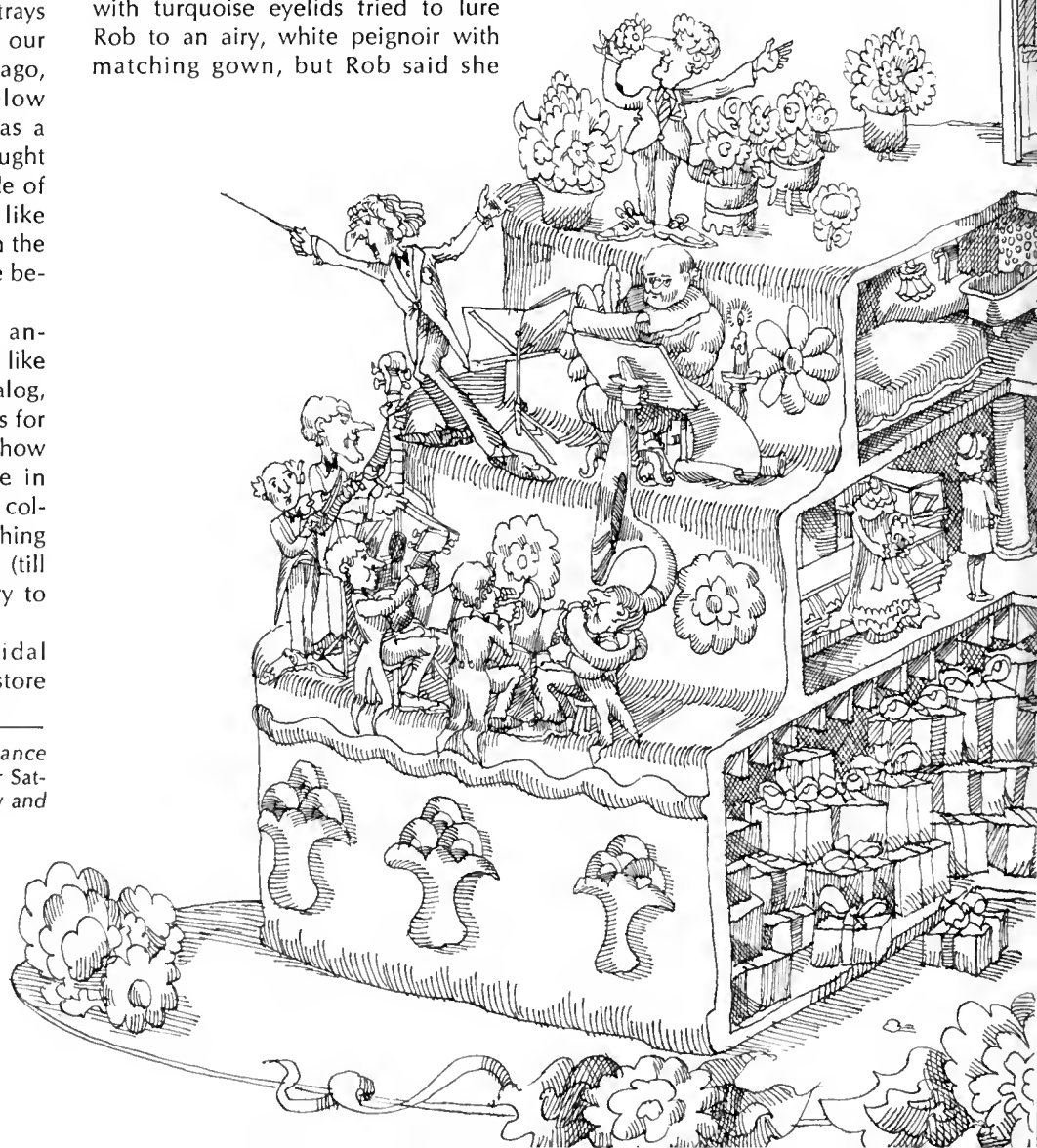
Robin latched on to the earth-tone linens — mold green towels and dust brown place mats. The whole effect is very existentialist.

We made it to the lingerie department, then, where a worn lady clerk with turquoise eyelids tried to lure Rob to an airy, white peignoir with matching gown, but Rob said she

wouldn't need this kind of trappings in a double sleeping bag in the Tetons.

Now a battalion of fringe benefitters, who pave the way to the altar while they pave their pockets, too, descended upon us. A photographer's assistant with an oily voice called up to invite us to a sample showing. This is staged in a gold and white bridal studio with piano-top portraits of brides who look like Vanessa Redgrave, wearing slipper satin gowns with mantillas of Alencon lace handed down by predepression grandmothers.

Exposure to enough of these is as morale-building as a nose job for the plainest candidate and nearly as expensive. Soon Robin began to look



Mrs. Lauter, a Deerfield, Ill., free-lance writer and housewife, has written for Saturday Review, Coronet, Family Weekly and a number of other magazines.

and act like the samples and, before the afternoon was over, both of us decided to hell with the budget and what father would say. We ordered three dewy portraits matted on white moire, one for us, one for her in-laws, one for the young pair. Before I could get out of there, I had signed up for the Moroccan leather album of candid to be made before, during and after

the ceremony, showing Robin's father all grim and gumpy, me looking as if none of the eyebag creams ever would help again, and Uncle Charlie stoned as expected. All are in natural color, preserving forever the horrendous dress Aunt Agnes wore and her incompatible shoes.

Presently the mailman showed up with a creamy envelope addressed in Spencerian script, and carrying an engraved invitation to inspect invitations. Well, Robin said she knew just what she wanted — a shaded Roman type face, straight and plain, no mousy tailed squiggles for her. The engraver offered to address the invitations as part of the deal. He delegated this job to a wiry little man in a cloistered cell who writes in a spidery hand he learned as a boy in Mainz. So we wound up with the squiggles and mousy tails anyway. (This kind of calligraphy is guaranteed to confuse the mailman clear out of his mind; he would rather deliver letters from little boys at camp any time.)

Robin soon found herself papered into a corner with monogrammed notes (though she always does her correspondence on an Olivetti) and engraved informals which she is using now to tell her starving peers that she and David can make it over for pizza.

Biggest boll weevil in the budget was the florist who said he would coordinate his decorations with the bridal party color scheme. Even though I once was president of the garden club, even though I once won first place for a Ma Perkins rose, this reedy fellow with the Liberty scarf at his throat had me completely cowed. How could I question the importance of Bells of Ireland or the "understated glory of ranunculus" when I'd never heard of either one? By the time he'd flashed

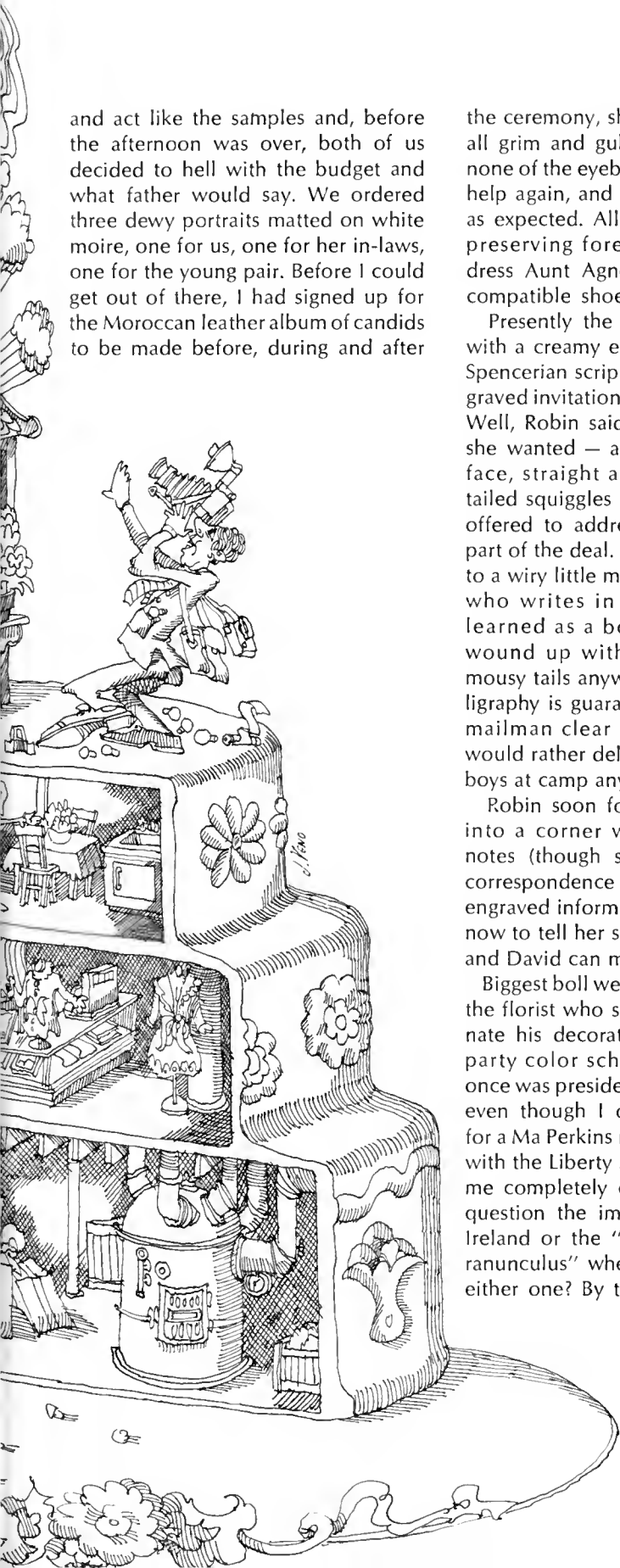
his wrists around a couple of dozen times I had signed the contract giving him permission to turn the reception area into an aromatic joss house. (Small comfort that David — or was it his father — was responsible for six skimpy boutonnieres, a couple of corsages and Robin's spill of stephanotis.)

The orchestra leader, next on our list, fancies himself a poor man's Meyer Davis, until billing time, anyway. He stood there, tippy-toed, explaining his part of the show. There must be music to cut the cake by. Robin said, "How about Mack the Knife?" But he didn't think she was funny. Then a tune for the newlyweds' first dance, something from their first date, perhaps. They had to have "Up, Up and Away." He grudgingly said okay, though he was a "Sound of Music" type himself.

After it was all over we held out for a couple of months before our first visit to the love nest in the Married Students' dorm. This, it turned out, was a living room with converted corners — one a bedroom with dungeon bath, too dark to see if the carefully chosen towels were mold-green or just plain moldy; one a kitchen with an under-sink refrigerator too small to store a chicken wing. The last corner was said to be a closet.

Thus we came, bringing glad tidings from the wedding gifts at home. We drank espresso from sick, blue plastic cups on a card table clothed in cellophane. Then we went home again to sit with the loot.

Sometimes when I pass the stacked-up hoard in the basement, I feel like saying, "Patience. Some day you'll see the main floor; some day you'll make the scene." For now, the stuff in its bride-white boxes and we, in our infinite wisdom, are learning to wait. □



$$T = T_0 (R - D_0 - \delta Y_1)$$

$$N_1 = T_0 \sum_{j=0}^{\infty} (D_{0j} - D_{Bj})$$

$$R_1 = pY_1 + T_1 + D_{B1} + T_0 (D_{T1} - D_B)$$

$$D_{T1} = Y_1$$

$$X_1 = X_{(1-)} - D_{B(1-)}; Y_1 = X_1 - N_1$$

New organizations are emerging in the corporate world to help managers cope with complexity and make decisions scientifically. Management science, says the author, points to a Golden Age in problem-solving.

# Gray flannel scientists helping managers decide

by H.M. Boettinger

John Kettle, "resident futurist" of the Canadian Broadcasting Corp., reports on a meeting with several teenagers from a local high school in his book *Year 2000*. He asked them, "What will you do in the year 2000 when you are 45 or 50?" One youngster answered: "I think we are going to lose free choice, because it's so complicated now that if anyone makes a mistake, it will put us all back." Had Mr. Kettle interviewed instead a group of managers, churchmen, civil servants, or educators, he might get more elegant prose but probably the same substance—if he asked them what life was like now.

But many lofty intellects now see the present as another Golden Age. They know that Elizabethan England, Renaissance Italy, the French Enlightenment, Revolutionary America, Pericles' Greece and Augustan Rome were dangerous and unsettled times. They also know that men of action and intellect successfully invented new ways to cope with the challenges that flowed from the view that "everything is so complicated now." New ideas or rearrangements in human affairs get their big chance during such times,

and set off social chain reactions which breed both potential chaos and extraordinary creativity.

Such is happening now in one vital area of modern life — the activities we lump under a label called "management." New tools to bring order and creativity out of a complicated world are increasingly being used primarily in the corporate world. These tools are being combined into new departments or specialized staffs of corporations and are called "management science" organizations.

While most people associate the practice of management with the commercial or corporate world, it involves any organization which (1) carries on its tasks by division of labor, (2) arranges the relations among its members in a hierarchical structure, and (3) requires decisions to be made on marshalling and deploying human and physical resources to achieve its goals.

Thus, management is pervasive in any society—and

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*Mr. Boettinger is an assistant comptroller at AT&T and heads the company's Management Sciences Division, established last year.*

especially in 20th century America. Also, most of us have a feeling that we could accurately decide that some activity we interact with is either “well managed” or “badly managed”—though we might have a great deal of trouble telling someone how we arrived at the judgment in a way that would satisfy him.

Yet, most managers, being human, want to improve the things in their charge. Almost all the events affecting them tend to worsen their operations if not countered in some way. So they attempt to improve the organization of human beings’ effort in carrying out a task by intervening with management, i.e., thought and energy. Great managers have known how to do this since Alexander the Great. But each year since his time it has become more difficult as societies have grown more complex.

**W**e have in management today all the ingredients necessary for a Golden Age. (Golden Ages are marvelous periods to contemplate from a tranquil study, but they are also hells to live through.) Some historians of business characterize its previous epochs as the Ages of Conquerors, Despots, Commerce, and Organization, with the present phase turning into the Age of Innovation.

Throughout the history of management, its practitioners have seen their field as an *art*, based on a technology of *crafts*. Their task was to select, reject, arrange, and make a good design from all the components available to them. (This is still what an artist does.) Science came to business only at the turn of the century in a few industries, and has been carried on since then almost entirely in the physical sciences.

The narrow alliance between managers and the physical sciences has produced strains on both. One old-time, veteran steel works manager was heard to mutter after a session with a research man, “This goddam chemistry is ruining the steel business!” It’s easy to sympathize with him, since the art of the blacksmith lasted about 3,000 years before being replaced by a rolling mill operator. The blacksmith’s great knowledge of metallurgy was the highest that art alone could achieve, and the metallurgical scien-

tist was allowed on the premises only after art and craft hit their points of diminishing return. Management learned to leap forward by falling back on fundamental research and inquiry — investing in knowledge and techniques to turn knowledge into technology and commercial development.

The study of a complex situation involving humans and their tools is equivalent to an investigation of a managerial process. Managers began to use the framework of scientific method in analyzing this process, and brought a new viewpoint to human activity.

In the current film “Oliver,” there is a scene where Fagin engages in similar analysis. His song, titled “Re-viewing the Situation,” is an example of how to look at a problem (whether to marry or not) from all kinds of angles before making a judgment. He brings in logic, emotion, common sense, history, and economics to enhance his understanding before he actually decides.

This is precisely what the military operations research teams did during World War II in their assignments to come up with new ways of managing systems like antisubmarine warfare, radar, aircraft defense, schemes for the invasion of Europe, use of new weapons, and many more. Their success in bringing together men who were competent in several scientific fields to attack problems as a team suggested that the idea be expanded to the larger management areas of business and government. These are, of course, more complicated than military problems, but while making it more difficult, the exploding complexity also made it more imperative to try. The last line of Fagin’s song is, “I think I’d better think it out again.” When a manager arrives at the same mood, then he is ready for management science.

**I**n the last few years more and more businesses have set up groups of people with a wide range of practical and academic skills in the physical, social, and behavioral sciences, and mathematics, whose job is to interact with managers experienced in the operations of their business. Operations research has been augmented by economics, control

theory, probability, statistics, computers, econometrics, psychology, opinion and market research, cost-benefit analysis, and other disciplines, and has been transformed to the field now known as the management sciences.

As science, it is in about the same state as thermodynamics was in 1830. Many great steam engines were working on a bewildering variety of tasks. They were helping to produce the Industrial Revolution, yet no one really understood in a scientific sense what was going on as the huffing-and-puffing monsters carried out the day's work. Science here began as an observational and phenomenological activity, developed hypotheses about the relationships among all the factors involved, tested those hypotheses by mathematical deduction and experiment, combined them into grand intellectual systems called theories (with their attendant laws and rules), and used the insights produced to make practical suggestions on how to build better engines. The work of men like Kelvin, Planck, Einstein, Bohr, and Rutherford built on this more humble foundation. Management scientists realize that their work *is* in its early stage and currently have aims more akin to the early pioneers than to intellectual giants like Einstein.

The entire justification of management science is to help a manager make a good decision — or avoid a bad one. Its practitioners have a role similar to intelligence officers in that they search for all kinds of relevant information, analyze it with all the tools in the intellectuals' workshops, and then pattern it in ways most helpful for decision-making.

The management scientist is *not* a decision-maker or policy-setter himself. He works, instead, by bringing specialized skills (rooted in all the academic disciplines, arts, or crafts) and a thoroughly objective way of looking at problems to the specific tasks faced by the manager. He tries to find the important factors in a situation, to specify the relations among them with some precision, and to place quantitative measures on their importance. He is also good at handling problems where many things are changing — all at the

same time — and where classical scientific methods meet the hurly-burly of human affairs.

Unlike those of the pure scientists, the criteria of excellence in management science is *not* applause from fellow practitioners, but, instead, the extent to which it helped the manager make a good decision, or influenced him to avoid a bad one by giving him better insight and understanding.

**S**tafford Beer, one of the highpriests of this new faith, defines management science as “. . . the attack of modern science on complex problems arising in the direction and management of large systems of men, machines, materials and money in industry, business, government and defense. Its distinctive approach is to develop a scientific model of the system, incorporating measurements of factors such as chance and risk, with which to predict and compare the outcomes of alternative decisions, strategies or controls. The purpose is to help management determine its policy and actions scientifically.” Others would broaden his categories to include any organization at all and not confine its application merely to those mentioned — important as they are.

Experts in all kinds of traditional disciplines are being attracted to this work. They work in the border marches where high theory interacts with human affairs. This kind of mixture requires men who are neither pure scientists nor pure managers, yet, as William H. McNeill points out in his *Rise of the West*, such border marches are the crucial places to watch for the beginnings of evolutionary changes in all areas of human life.

Management looks on every problem as unique—and it is. But William James discerned two types of minds, those who look for differences and those who look for similarities. To the manager, no one ever faced his *particular* problem before — the people are different, the place is different, the business is different, ad infinitum. The management scientist, though, looks for *patterns of similarity* to problems of that *type* which have been successfully attacked in the past, or which may be attacked with one of the

generalized tools in his kit. What are some of these tools? Russell Ackoff, who heads the management sciences faculty at the University of Pennsylvania's Wharton School, says that to a management scientist, every management problem fits one or more of eight forms.

An *inventory problem*, he says, is characterized by reserves of men, material, money, or any asset which can be deployed as a reserve. An inventory problem is solved by optimizing certain things. Saks Fifth Avenue has a different inventory policy from Robert Hall because they want to optimize different things.

**A**n enormous amount of material is devoted to mathematical solutions of inventory problems, and the management scientist is aware of all the solution techniques.

*Allocation problems*, a second category, are those which have a certain resource which can be used in many ways. The obvious resource is the budget and it is distributed to certain departments. To the management scientist, that's the same problem as allocating the crude oil coming into a refinery. The crude oil can be refined in an infinite number of ways — from floor wax to jet fuel in various proportions. The management scientist can tie together, through linear programming and other systems, the profits of various outputs with the elasticities of demand in response to price changes and work out a scheme that will give the maximum profitability of an oil refinery.

A third category of problems — *queuing* — occurs when a great number of sources line up to try to get at a facility. People converging on elevators in a lobby rush hour or customers pushing supermarket carts past the checkout counter are examples. To the management scientist, every one of those problems is similar and he has a whole range of solutions for the best way for the most people to get through.

*Sequencing problems* are situations where we have to do things in a certain order. This is characterized by the conditions that we can't do this thing until this other thing is done. In complex projects, the sequence keeps shifting constantly. Therefore, man-

agement scientists use computers to develop constantly changing schedules, like PERT or Critical Path Methods.

Managers usually don't call *routing problems* by this name, but most managers do these kinds of things all the time. A routing problem arises when someone or something is to be sent to a number of points in a minimum aggregate distance in a minimum aggregate time.

There are 3<sup>1/2</sup> million ways of connecting 11 points. And as with most routing problems, there is no analytical solution to reveal the best way of connecting them. But computers can be programmed to show a kind of low point or minimum, which eliminates much of the human hunch so often used to erroneously solve routing problems.

*Replacement problems*, a sixth category, are those which involve finding a minimum for the sum of two types of cost — capital charges and operating expenses. Should a hotel replace all light bulbs as soon as one fails, or should each bulb which fails be replaced? In the one extreme, the bulb cost is low, but the labor cost is high. In the other, the unit labor cost of replacement is very low, but the bulb cost is high. Obviously, an organization would not want to use the same policy on mercury vapor lamps on a highway in the search for minimum cost.

*Competition problems* are those which deal with probabilities of response. In other words, an organization's proper action is contingent on the action taken by someone else. Gaming theory comes into play here. Management scientists can play competition problems out in simulations and often can quantify the effects of various decisions.

*Search problems*, the eighth category, include all accounting systems, as well as surveys, samples and quality control. In this type of situation, the primary aim is to get a certain amount of information of a specified reliability at the minimum cost.

Since organizations cannot carry out experiments on the real institutions of society and its people, management scientists construct "models" of the process



being studied. These are like maps — they should include everything important, but no detail which is irrelevant to the decision. The models are usually expressed in the form of equations or as computer programs and allow the manager to ask a series of “What if . . . ?” questions, and get back quickly the consequences which flow from the relations and logic which he has told the model constructor are operating in the process. This interaction allows the manager to make his judgment with far better knowledge of possible consequences.

One example of the power of mathematical models comes from the management sciences organization at AT&T. A man with two Ph.D 's, in physics and mathematics, was asked to develop a model to analyze the effects of accelerated depreciation. This was needed to predict the effects when many different values of all the factors involved were assumed.

He produced a completely generalized analysis, which applies to every business and every possible circumstance. One unexpected conclusion derived was the fact that rate or price increases will always be required at one-half the average life of the plant if the benefits for the early tax reductions are used immediately rather than spread over the life of the plant. This was surprising to many experienced people who believed that growth would always postpone this day of judgment. Such insight is invaluable for those faced with strategic decisions and long-term consequences.

**T**he actual development of a managerial model is an exhilarating, creative act and takes place through intense dialogue between managers and management scientist. The scientist hammers out the form, the manager tests each formulation and modifies it by applying his own experience and concerns. It is an *art* which unites the craft and lore of the manager with the skills of the management scientist to create an insight-producing design from which both can learn and understand.

Theodore Levitt, in a *Harvard Business Review* article (May-June 1969) encapsulates the reasons un-

derlying the *demand* for management science:

“But today, as never before, businessmen live in a world of fast change and new environments. Decisions of great magnitude must be made at an increasing rate and under conditions of considerable uncertainty. The guidelines of the past may not fit the future.

“The danger is obvious. We must learn from the past in order to make any progress at all. Yet as we learn from and progress beyond the past, we run the risk of employing obsolete dogmas for new times. The issue is not whether knowledge and know-how are transferable. It is whether they are applicable.

“This means that now, even more than in the past, the essential managerial skill is not a good memory for principles, as is so often the case in law and medicine, but the ability to determine what the problem really is. It is the ability to do that which distinguishes the chief executive from the janitor. Understanding is more important than dogma.”

**m**anagement scientists are furnishing the potential *supply* — using modern methods built on the secure and tested foundation of research techniques from traditional science. Like all research, it concerns itself with the formulation of hypotheses to explain phenomena (in this case, management options, objectives, behavior, and constraints) and then ruthlessly tests these to see if they are robust enough to withstand their application to the real world. When one of them does meet this test, the world will see an authentic innovation.

After all, decision is the fine line which separates the dreamy world of aspiration from the harsh land of human and physical reality. If the promise of management science can be realized, excursions across that line should become a little safer. With brains, work, and some luck we can then disappoint the high school youngster's fears about his future freedom, for we *will* be able to handle more complicated affairs and still let him have lots of choice — perhaps even more than his parents have now.

Few activities today have such chances. □

# BELL reports

## Special Equipment Helps Handicapped

Today, virtually any handicapped person with access to the switched network can communicate with the help of a telephone instrument or related equipment. Now available are about 30 items of standard equipment either designed specifically for the handicapped or especially applicable to their needs, plus numerous modifications or "special assemblies."

These items range from low-frequency bells and electronic tone ringers for the hard of hearing, to telephones with coded vibration touch signals for the deaf-blind, to lightweight headsets and a variety of hands free arrangements for those with loss of motion.

A detailed assessment of the handicapped users' present and future telephone needs is a continuing Bell System project. Among many items presently in the research or developmental stage are:

- a modified electronic larynx with more than one volume, to replace the older single-volume model;
- a system for the deaf whereby any Touch-Tone® telephone set would serve as the sending instrument and a typewriter as the receiver;
- a special public telephone for wheelchair customers in hospitals, nursing homes, etc.

## Restructured Rate Schedule on Trial

A restructured rate schedule for interstate long distance calls, designed to pass on the economies of Direct Distance Dialing to the customer while reflecting the higher costs of providing operator service, is now on trial in Charlotte, N.C., and several adjacent communities.

The new rates — lowest in Bell System history — feature an initial charge period of one minute for customer-dialed calls, lower rates for most direct customer-dialed calls, generally higher rates for operator-handled calls, and two basic time periods—day and night — instead of the current four.

Based on present calling patterns, the new rates are not expected to produce any net change in overall telephone company revenues.

The new schedule is designed to accommodate changing customer needs and foster increased usage of the Bell System's nationwide switching network. It is being introduced on a trial basis in order to measure its impact on the network and to determine possible shifts in customer calling habits. Other cities will participate in later phases of the trial.

## Phone Network Uses 'Traffic Cops'

Electronic translators, functioning 10 to 25 percent faster than their electro-mechanical predecessors, are now directing the flow of long distance calls through some of the 1,850 toll switching centers in the Bell System's communications network.

The translators act as fast-thinking "traffic cops" by policing the movement of the continually increasing number of long distance calls.

A translator system converts the customer-dialed digits into a destina-



*By trimming a mere ounce and a half from a standard telephone receiver (right), the Bell System has developed a smaller, improved unit (left) which will eventually save more than two hundred tons of cobalt, copper, nickel, and molybdenum per year. The new receiver will eventually be used on most Bell System telephone sets.*

tion, scans the communications network highways for signs of traffic congestion, and guides the call along the best available path.

The new system is flexible enough to cope with a variety of situations. For example, in an emergency, the system could block calls going to specific cities, switching centers or areas covered by area codes and keep only a few lines open to relieve congestion.

Designed and developed by Bell Telephone Laboratories, the translators are manufactured and installed for the Bell System by Western Electric.

## State Government Gets Phonepower

The Washington State Legislature and the Pacific Northwest Bell Telephone Company have developed the most

sophisticated communications system of any state legislature in the country.

Each of the state's 49 senators and 99 representatives has a Trimline telephone at his desk on the floor of the Senate or House of Representatives. These telephones give the lawmakers direct and immediate access to their secretaries and their offices.

Additional phones in the offices of the senators and representatives allow them to dial directly to any point in the U.S., and a statewide telephone system gives them the ability to call any of the other state agencies or any telephone in the State of Washington on a direct dial basis.

In addition to the telephones, there are 16 data processing terminals which provide a legislator with access to the state's computer center. By pushing a few buttons on one of the consoles, he can learn the status or background of a bill or ask about any state law previously enacted. In a matter of seconds, the answer appears on a small video screen on the console.

To complete the communications picture, a room has been set aside at the Capitol with facilities for telephone conference calls.



A microscopic bridge of gold designed at Bell Telephone Laboratories is part of a new thin film technology that has reduced entire electronic circuits to the size of a postage stamp. Dwarfed by the eye of a needle, this crossover bridge, just 7/10,000-inch high, eliminates need for insulation where conductors must cross.

### Subway Speed Limit: 6,800 MPH??

Engineers at Western Electric's Sandia Laboratories in Albuquerque, New Mexico, are studying a magnetic suspension system that would permit rocket sleds weighing three tons to reach speeds of 6,800 miles per hour—about 2,000 faster than sleds now go.

The sled, used in testing components for the Atomic Energy Commission, could conceivably be developed on a large scale for a high-speed mass transportation system. The concept is

unique in that the faster the speed, the more efficient it becomes. Other mass transportation designs, such as the air cushion vehicle, run into problems at higher speeds.

Sandia is studying the magnetic suspension system as a possible means of eliminating problems which beset conventional rocket sleds when they slide along rails at speeds exceeding 3,400 miles per hour. Sandia's sled is suspended by opposing magnetic forces and sped through an airless copper and aluminum lined tunnel.

### Telling It Like It Is *Excerpts from recent talks by Bell System officers*

**“ . . . in the years ahead** we shall be more and more in the business of providing data communications services. While customers today have many options to use their own equipment connected to our lines, this does not mean that our activity will be limited to providing the lines.”

**“Inflation** can well generate, not desirable economic growth, but undue, unwanted, and unhealthy swings in the economy. For it distorts business decisions. It encourages mistiming of effort and misallocation of resources. And it can — in addition — bring to the peril point our position in international trade and the balance of payments problem.”

*H. I. Romnes, Chairman*

**“Certainly** in the Business community there is an increasing awareness of the fact that the continued vitality of private enterprise depends on the health of the communities in which it operates — and a readiness to act on that awareness.”

**“A man must have** the chance to take some risks, to try something different,

to make a few mistakes. Particularly with so many factors to consider simultaneously, it is important to have experienced and to have ventured.”

*Ben S. Gilmer, President*

**“I hope and trust** that our young people will not charge blindly at the barriers of institutional indifference, burning and smashing and tearing down the good along with the bad. Instead, I hope that they will conserve their zeal, become a constructive part of the institutions they feel are failing them and earn the right to change them from within.”

**“Society has** never been better equipped, in a material way, to achieve its purposes and goals, and yet it has never been more divided and confused over objectives and priorities. For almost every generation before this one, the situation has been the reverse of today's — there was little difference of opinion over our objectives. This, I think, is at least one explanation of the breakdown in communication between the young and the old.”

*John D. deButts, Vice Chairman*

here was a time when every court had its official fool. Few people realize the true function of this court jester. It is true that he was meant to be entertaining. It is true that he was a channel for controlled government leaks. It is true that he was also a channel for controlled leaks from the barons to the king. It is true that he was an agent provocateur to flush out rebellion. It is true that he served as a sensitive sounding post for the king to become aware of the mutterings in his realm. But these were all trivial functions compared to his most important information processing function. And that was a function which even the most sophisticated modern computer installation cannot provide.

Ideas are the lifeblood of business. Lateral thinking liberates the mind from repetitive patterns of conventional thought.



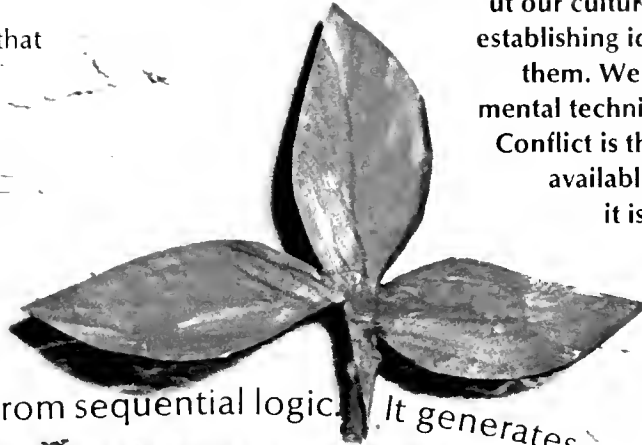
Rosa Oberoski

Ideas have always lived longer than people, but today people live longer than ideas. The progress of technology and especially communication has so speeded things up that instead of ideas being changed gradually between generations they may have to be changed within a generation.

*Edward de Bono, M.D., D.Phil., Ph.D., works on systems behavior in the Department of Investigative Medicine at the University of Cambridge in England. His book, New Think, has been published in the United States.*

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But our culture is only concerned with establishing ideas and communicating them. We have not developed any mental techniques for changing ideas. Conflict is the only practical method available for changing ideas and it is inefficient and wasteful even from a pure information point of view, let alone a social one.



...olves using information differently from sequential logic. It generates new ideas.



# THINKING SIDEWAYS

by Edward de Bono

**S**ome time ago the Production Engineering Research Association in England decided to investigate the angle on an ordinary steel drill. To its surprise, the association found that the angle was far from maximal in terms of overheating and wastage. It seems that the angle had been decided by a clergyman in the 19th century and never been queried since.

**I**n 1941 J. W. Cambell published calculations which showed that a rocket would have to weigh a million tons to carry a one-pound payload to the moon.

**S**ummer suits are often made of such a smooth material that the trousers tend to slide off clothes hangers. I once put this problem to a lecture hall of engineering students at London's Imperial College (the equivalent of M.I.T.). They produced a number of answers, all of which fell into one category. They completely missed what is probably the simplest answer. How would you tackle the problem?

**I**n my experimental work I have been appalled by the lack of creativity in people with technical outlook and training. I recently asked the readers of a major scientific journal to suggest how they would redesign one feature of the human body. The result was feeble—but not surprising. I had posed the same problem to a variety of groups beforehand and each time the result was equally feeble. Everyone seems to be very satisfied with things as they are—unless they simply cannot think of any possible improvement. Practically all the adult suggestions were duplicated by a group of seven-year-old schoolchildren.

**T**he beautiful blonde flew from London to Paris every week. The excise men were sure that she was smuggling something. Every week they examined her luggage very carefully and searched her handbag most thoroughly. But they never found anything. In the end they said to her: "We know you must be smuggling something. For our own peace of mind we must know what it is. We won't prosecute you. Please tell us." "Why, of course," said the blonde sweetly, "I am just smuggling handbags."

**W**eeds grow readily. Weeds are very difficult to get rid of. A heavy growth of weeds makes it difficult to grow other more useful plants. What is fogweed?

**E**ducation has always placed an exclusive emphasis on vertical thinking. Few educationalists can even conceive that vertical thinking is an incomplete method of using information. Nor are they to blame, for vertical thinking has always been exalted as the only possible way to think. It is only now under the surprising impetus of top computer scientists that doubts are beginning to be cast on this concept.

**A** gland is a small, specialized part of the body that can exert a stimulating influence on the rest of the body quite out of proportion to the amount of nourishment it requires. What is a "de Bono gland?"

**F**rom an information processing point of view, humor is far more important than reason. As an indication of the information processing system in the mind, humor is far more revealing than reason, which is a cheap property easily reproducible by machine.

**I** am always being asked to talk or write about “creativity” or even to use it to some purpose. But I do not like the word and I do not like the concept.

There is an aura of special gift about “creativity.” On the head of a creative person sits an envied halo. “Creativity” is a matter of brilliant shooting stars. As long as one surrounds creativity with this sort of precious mystique, I think there is very little chance of doing anything useful about it.

“Creativity” is the description of a result which could have been achieved in any number of different ways. It is far more useful to talk about the actual process of information handling than about the result. A process can be used deliberately to bring about those instances of unpredictable effectiveness which are called “creativity.” A result can only be marvelled at. Instead of “creativity” as a result, I prefer the term “unpredictable effectiveness.” Instead of “creativity” as a process, I prefer to use lateral thinking, which is an operational term. You cannot be “creative” unless you create, but you can use lateral thinking whether it gives you a result at any particular time. What is the process of lateral thinking?

**L**ateral thinking is a way of handling information that is fundamentally different from vertical thinking. What is vertical thinking?

**Y**ou are leaving early in the morning on a long journey. Your wife is asleep and you do not want to wake her by putting on the light. You know there are 11 separate socks in the drawer, six of them are red and five of them are blue—or it may be the other way round. How many socks would you have to pack to be sure of getting two of the same color?

**E**fforts to develop thinking techniques have always concentrated on the second stage of the thinking process (logic and mathematics). The first stage has been neglected. We have no tools for dealing with the first stage.

**I**t is very curious that most people give the answer seven to the sock-selecting problem. Since there might be six of one color, it is felt that at least seven socks must be selected to be sure of having one of each color. One of each color? But that was not the problem. The problem was to be sure of having two of one color and for that to happen three socks are sufficient no matter how many socks there might be in the drawer. It is curious how the natural patterning of the situation produces an exactly opposite problem.

**T**he natural patterning of a situation is what gives rise to ideas, concepts, points of view, and approaches to a problem. It is this natural patterning of a situation that constitutes the first stage of thinking. And by natural patterning is meant the self-organization of information in the self-maximizing memory system that is mind. Call it perception if you like. At the end of this first stage of thinking the information is already parcelled up into packages ready to be handled by the efficient second-stage processes (logic and mathematics) that we have developed. It is in the first stage that the perceptual platform is built and it is from this perceptual platform that the second-stage processes are used.

**A**ll the engineering students who tackled the trouser-hanging problem concentrated on improvements in the hanger: special clasps, hinged hangers, corrugated grips, etc. None of them paid any attention to the trousers

or the way they were put onto the hanger. And yet the simplest way of all to solve the problem is to hang the trousers so that instead of both legs going over the bar from the same side each leg goes over from a different side. Thus the legs have to slide over each other in order for the trousers to slip off. The trousers do not slip off. But no amount of attention to the hanger itself would lead to this answer. If the perceptual platform is wrong, then efficiency later on will not put it right.

**reason for without a repatterning process adaptive behavior is impossible. Reason itself is an abstraction (almost fogweed) which in operational terms is of paltry significance.**

**Insight, like humor, is a very real, but haphazard process which is apparently beyond useful control. Lateral thinking is concerned with deliberately increasing the chances of concept restructuring—of insight.**

**T**he calculation that showed it would require a million-ton rocket to land a one-pound payload on the moon was correct in itself but the starting assumption was wrong. Excellence in second-stage techniques is no substitute for developing first-stage thinking methods.

**T**he natural patterning of situations produces concepts and ideas that have a natural validity and even a temporary usefulness. But the very existence of these concepts can be terribly obstructive. Such concepts can capture available information and make it impossible to use that information in a different and more useful way. "Fogweed" is a convenient term for such concepts. They grow readily and are sturdy. The more soil you add the more readily they grow. But they obscure the situation.

**C**onflict is incomplete as a method for updating ideas. The most efficient method would be concept restructuring. This method is demanded by the system and yet we have done nothing to develop mental techniques for bringing it about more easily. Insight and humor are both restructuring phenomena. As an indication of a restructuring or repatterning process, humor is of more significance than

**V**ertical thinking is like building a tower. Each new layer goes on what is there already. Vertical thinking is the traditional, Aristotelian idiom of information handling. Vertical thinking includes mathematics, logic, and other second-stage information-processing techniques. In vertical thinking, we advance progressively through a series of steps, each of which arises directly from the preceding step. Above all, we are not allowed to be wrong at any stage. Vertical thinking deals only with what is relevant. Vertical thinking is a selective but not a generative process.

**Y**ou cannot build a tower in a different place by building the same tower higher. Lateral thinking is concerned with building a tower in a different place—with restructuring concepts, not with developing them. Lateral thinking is generative, not selective. In lateral thinking, information is used in a fundamentally different way from vertical thinking. Information is used provocatively to dislocate the pattern and allow it to reform as a different pattern. In lateral thinking, we use information in an unreasonable manner to bring about the emergence of new patterns. In lateral thinking, we realize the arbitrariness of any information arrangement and deliberately seek to generate alternative configurations. We think sideways rather than straight ahead.



**T**he thief must have been one of the villagers. But which one? There was no way of telling. So the headman caused a special magic bell to be placed in a darkened hut through which the villagers were made to pass one at a time. Each person was to lay his hands on the magic bell. When the thief laid his hands on the bell it would ring out.

The villagers filed through. All was silent, nothing happened. Then the headman pounced on one of the villagers and declared him a thief. He explained that the magic bell was coated with soot and that the thief was the only villager not to have soot on his hands.

**V**ertical thinking processes are all second-stage thinking techniques. Nor can we apply them to process the perceptual platform of the first stage, for we would only have to stand on another platform to do that. To process the perceptual platform we must use restructuring techniques. It is not a matter of deciding what is right or wrong or best but a matter of generating alternative structurings.

**T**he aim of both lateral and vertical thinking is effectiveness. Lateral thinking is not a matter of open-ended, wishy-washy creativity. Because the mind behaves as a self-maximizing memory system, any arrangement of information tends to be less than the best possible arrangement since the sequence of arrival of information plays so important a part in pattern formation. Lateral thinking is an attempt to reduce this gap by means of restructuring procedures.

**I**n vertical thinking you must inch forward to a solution being right at every point. In lateral thinking you move freely by any means whatsoever. Once you have reached a point, the usefulness of that point cannot be shown by the soundness of the path by which it has been reached. But the new position may show an immediate usefulness in its own right: it may manifestly work, it may provide a new starting point which makes solution possible, it may be found to fit a context or even create its own context. Finally, you may be able to look back from the new position and construct a sound, logical pathway to support it. It cannot possibly matter from which end the pathway is constructed if it is indeed sound.

**C**hange occurs so fast that the future can no longer be regarded as a reasonable extension of the past. History is no longer a scaffolding but a cage. The expert is no longer the man with stores but the man with vision. To be able to look ahead, we must develop discontinuity tools which allow us to restructure concepts so that we can look further than is allowed by current concepts.

**A** court jester's most important function was as a concept restructuring device. It was not so much a matter of throwing in irrelevant random stimuli, but also of putting things in different ways—of thinking laterally instead of vertically. Because his official function was entertainment, the court jester was always motivated to think laterally. Though the king would probably never accept the jester's ideas as such, they could still have a useful restructuring effect. Since the jester was not pursuing some structured interest, his lateral value would be high.

**T**he importance of a gland is out of all proportion to its needs. The “de Bono gland” is a device for putting the court-jester function into large organizations. The resources devoted to the gland would be minute but, provided the communication system (as in a gland) was effective, the stimulating function of the gland would be great. A small group of people would be employed as concept disorganizers in fixed or rotating tenure. Without needing to justify their proposals, their job would be to consider that any particular way of doing things was always less than the best one— if not downright stupid.

**T**here are three basic types of problems. The first type requires for its solution further information or better information-handling techniques. The second type of problem requires for its solution no new information, but a rearrangement of information that is already available. The third type of problem is the problem of “no problem.” This is the most difficult problem of all, for it happens when one is blocked by adequacy. With this type of problem, there is no obstruction point at which to focus problem-solving effort. One has to rely on concept restructuring—or periodic reassessment. How many other items are there like the steel drill examined by the Production Engineering Research Association?

**S**ome practical points can be suggested to temper the exclusive arrogance of vertical thinking:

1. The realization that lateral thinking is fundamentally different from vertical thinking, that it is a concept restructuring method.
2. The realization that any particular conceptualization is a prison as soon as it starts being useful, that it is arbitrary and not absolute, that very often problems are actually created by particular conceptualizations.
3. The realization that in thinking one may have to be wrong at the generative stage, that the need to be right all the time is the biggest bar to new ideas.
4. The realization that information can be used in a provocative and catalytic manner.
5. Acquire some personal skill in lateral thinking both as an attitude and also as formal technique. Make use of such skill in others by selection or by training. Set up a “de Bono gland.”

**I**f the many formalized techniques of “creativity,” some are fashionable, some are quite effective. But too much emphasis on such techniques tends to detract from the basic nature of lateral thinking, which is more than a parcel of gimmicks. Lateral thinking is a fundamental way of using information and it is made necessary by the self-organizing characteristics of the mind.

"Know what I'd do if I had a kid like that?" asked an ample, garrulous man standing next to us on a recent evening commute. His disaffection was directed at a heavily maned young man standing between cars in a Confederate army jacket and rimless spectacles.

"What would you do?" we asked, pretending not to know what the man would do. "I'd hog-tie that kid and shave his head to the bone. Then I'd douse him in a barrel of lye. Then I'd tell him to go get a job and if he couldn't find one, to keep right on going."

"Why would you do that?" we asked, pretending not to know why he would do that. "Why!" the man shouted, incredulously, fixing us with the sort of squint he'd give Ho Chi Minh, Norman Mailer or Dr. Spock, should he ever catch them on his train. Then, with a laugh toward our fellow standees and a nod of his head toward us, he said, "What is he, one of those weirdo professors?"

On a flight into JFK the plane circled for an hour and 24 minutes as other aircraft landed and unloaded so we could make a safe approach. Pressed into a decrepit limousine with a full complement of riders, we left the airport and edged onto an expressway where, being roughly 6 p.m. on a weekday, miles of cars were halted dead in the road.

To no one in particular, one man said, "Great to be back to reality." A simple, jocular bid for popularity or perhaps even fleeting leadership among one's temporary colleagues. It didn't work.

### Too Far To Walk

A long, intense fellow sitting next to him said, with feeling, "If you don't like it, get out and walk!" The first man said he didn't like it at all, but home was some 40 miles distant, and being one among 10,000 or so stalled automobiles at cocktail time was, to him, a less than pleasant position to be in. "I'm tired of guys like you complaining about how bad everything is," said the second man, whom we later learned was with an oil company. "If you'd seen what I've seen around the world, you'd be damn proud we can afford all these cars."

The first man, only partially cowed, mumbled something about his being even more patriotic than the man who

was so proud of the cars because he, the first man, wanted to further improve the country by ridding it of problems such as the one we were part of at the moment. But the second man cut him short. "I don't need a lecture from you," he said. The man who liked traffic jams being nearly twice the size of the man who didn't, that ended that.

At a dinner party the conversation crackled over the priority items—Portnoy's Complaint, the price of real estate, then settled, as it does, on black people. A man at one end of the table who works for a publishing enterprise said he knew some pretty good guys at work who were black. A commercial artist sitting toward the center of the table, who was black, said he did too. A young man at the other end who had made a pile as an investment banker in his family's bank, said he'd always had the greatest admiration for Colored People.

### An Early Appointment

He talked frequently, he said, with his Colored housekeeper, about all the things Colored People are said to desire these days—Colored People curricula in colleges, Colored Peoples' infatuation with suburbia, the quest of Colored People for non-menial jobs. "Colored People," said the prosperous young banker, citing his housekeeper as authority, "don't want any of these things."

A discussion ensued around who would object and who wouldn't if a quiet, clean, polite, rich, educated, black professional man and his small family wanted to buy the house next door. After 20 minutes the banker's jowls appeared inflamed and he started to stammer. In the nick of time he recalled an early morning appointment, yanked his wife's chair from beneath her so swiftly she almost cartwheeled into a nearby lamp, and led her out of the front door without finishing his coffee.

The man on the train, the man in the limousine and the man who came to dinner were each endowed with strong devotion to the social status quo. More than mere devotion, their intensity was augmented with an unwillingness to accept another's style, ideas or experience on issues that were clearly Outside The Office. These were men whose minds, at least on unfamiliar, complex social and environ-

mental subjects, were comfortably made up. At the office, each may represent the leading edge in his industry—virtual astronauts of commerce, carving exciting new conglomerates out of weary corporate heirlooms; burgeoning internationally; exploring the ocean and space simultaneously and buying into everything in between. In the office.

### Rear Guard

But outside the office they and others in other segments of society represent an attitude—a minority attitude, perhaps—of rear guard reluctance.

Should the attack against the traditional cornerstones of life as we know it continue—and one has reason to suspect the offensive has but begun—it will not be just because of the notoriety of that grand alliance, the military-industrial complex. It will not be just because of the alleged inflexibility of some college deans. It will not be just because of the draft or other specific questions of public policy.

The attack will be continued at least in part because of the attitude of reluctance, scattered though this attitude may be, in government, business, the universities, and other institutions—reluctance to get physically or even philosophically involved outside the office.

Countless private and public organizations and individuals in them have worked long and well toward the probability that things can be better, outside one's own familiar confines. Among business organizations, the Bell System, for one, has been no corporate slouch in such critical areas as employing the once unemployable, and in helping to revitalize inner cities.

That notwithstanding, the reputation of mainstream organizations as conscientious contributors outside the office will be lessened if an attitude of apathy, however narrowly-shared, persists. Business and industry have long since demonstrated their worth as effective institutions in the best, nation-building, GNP-expanding sense. Now it is necessary for more people of business, together with more in the professions, in politics, in religion, education and other established endeavors to become less aghast and more involved, outside. Better understanding and broader abilities are needed, now, to manage a constructive transition into these new times. THH



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September/October 1969

Karl Marx  
vs.  
American Business:  
Round 2

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# BELL

telephone magazine



## The Chester Principle

“What Chester Makes Makes Chester” is a sign along the tracks of the Penn-Central on the New York-to-Washington run. It is a big, electric sign with a simple, old-fashioned message. But the statement, for all its brevity and brag, says something about Chester, Pa., and Chesterites—if that’s who they are—that we find pleasing.

We don’t know, from the sign, just what Chester makes, or how well. But we ride on, knowing that Chester is proud of what it does, and certain that there is a basis for the pride. Any town that makes something which in turn makes it, and is so anxious to proclaim that phenomenon to even the swift passerby, can’t be all bad. Maybe even a nice place to live. At least to visit.

The Chester sign shows little élan. It’s corny. Yet it is the very incongruity of this bold boast, in the context of our sophisticated age, that makes Chester’s more than just another big, bright billboard along a railroad track. In working, watching, reading, traveling, participating, an observer becomes suspicious that enthusiasm for one’s product or productivity is becoming passé. Indeed, the hottest evidence of hard-core enthusiasm around nowadays is the reverse-productivity vigor of youngsters who gather together to denounce and dismantle the very structures which, in an earlier day, their forebears constructed with an equal zeal and determination.

This seemed the case, at least, until July 20, 1969, when men walked on the moon.

The internationally cohesive qualities of the Apollo feat are legend: how it brought feisty nations together for a few quick minutes to applaud as Mr. Armstrong stepped off the LM. That

it required the most spectacular adventure in human history to distract the world from its usual preoccupation with neighborly distrust does not make that brief bond among men any less significant. Most of mankind did, for awhile, rivet its admiration on a single, bold effort by men and their machines.

There were, as always, exceptions. Red China’s millions, for example, remained ignorant of the event. No mention was made there in any media prior to, during or after the Apollo flight.

If the moon’s exploration acted as an adhesive agent internationally, it also served to join the emotions of those in this country who like things as they are — or as they were — with those who would have things otherwise. Attacked by many as a usurper in our order of national priorities, the moon shot, once underway, was more compelling than even our countless conflicts between parent and adolescent, taxpayer and bureaucrat, hippie and sheriff, student and administrator, soldier and card burner, black man and white.

It felt good to think that most people in most places were pulling together instead of apart as the LM dropped to Tranquility Base. It felt good to think that men, whatever their hue, age, god, nationality or environment, felt empathy and pride in the same incredible accomplishment.

The landing of Apollo 11 gained new respect for this nation among its fellow nations. More importantly, the effort gave us new pride in ourselves at a time when we sorely needed it. During the last few years we’ve become known abroad more for our part in Vietnam and for assassinating national leaders than for much else. Now we’re again known for something else, something better. What Chester makes makes Chester.

Having successfully applied the Chester principle to space, we should now proceed concurrently with equally imaginative programs to upgrade life on earth. Existing cities need to be creatively restored. Whole new ones need to be built, out where there’s room to move and breath. Necessary natural resources demand protection against self-serving exploiters and polluters. Blight and ignorance and their by-products of crime and disease in rural as well as urban America cry for a confrontation through education, training, and good jobs.

Not that we should choose butter over space. But is it not conceivable that in our increasingly robust economy, we might, instead of guns and butter, have space and butter in abundant amounts with enough left over for defense? It is essentially a rearranging of national needs, which now show defense (or offense, whichever the reader prefers) well in the lead, with space a distant second, and domestic issues so far behind one suspects it of having stumbled and fallen at the starting gate.

The spirit of Chester will work as well in the states as in space. It has worked here, piecemeal but exceedingly well for the most part, for over 300 years, when we were a simpler and less flammable society. Almost everything is on hand for a major, coordinated effort at home: the funds, the human talent, the technological apparatus. All that is really missing is the will.

Considering that reaching and walking on the moon is a cinch compared with the more difficult, more dramatic and more patriotic job begging to be managed at home, one wonders why we don’t get cracking. To a people who excel at doing the impossible, the complexity of our earthly problems should provide all the impetus we need.

THH



# BELL

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# Karl Marx vs. American Business: Round 2

"The universities have had it. Big business is next." With enthusiastic war cries such as these, radical student groups have announced their intention of turning their energies — and their tactics — onto the U.S. "business establishment." Given the Marxist thrust of the New Left movement, it was inevitable that radical student attention would come ultimately to rest on business. What is surprising is that it has taken so long. But apparently, confrontation time is finally here.

Unhappily, it looks as if business will be caught as badly off guard as the colleges and universities. To everyone's surprise, the radical student attack against the colleges was more vehement, more widely supported by other students and more successful than anticipated. Now, the surprise may be repeated. Most businessmen assume that the New Left's turgidly ideological denunciations of "the system" have little relevance to them, and while they are concerned about the impact of the student revolt on the universities, they also assume that the student unrest is not transferable from campus to business.

While these assumptions are largely correct, they are also misleading. The typical radical student's understanding of business *is* ill-informed and distorted by odd ideological premises, and business as an institution *is* less vulnerable than the rigidified academic world. But these facts are beside the point. The real threat to business does not come from the most radical students but from the more moderate ones. Business does not have the same vulnerabilities as the colleges, but it has others which make it just as susceptible to attack. The tactics that worked against the colleges are not transferable to business, but new tactics are now being evolved.

Our research indicates that in the present agitated state of public opinion, many of the preconditions

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*Mr. Yankelovich heads Daniel Yankelovich, Inc., the largest independent attitude research firm in the nation. Educated at Harvard and the Sorbonne, he also is Adjunct-Professor of Psychology at New York University, lecturer at Tufts Medical School, and co-chairman at Columbia University of the Seminar on Basic and Applied Social Research.*



exist for creating a new era of antibusiness feeling led by reform-minded students. That the American spirit is troubled today, perhaps as never before, cannot be doubted. The country is polarized and sharply divided by Vietnam, the race issue, student unrest, taxes, the impact of inflation, and an unsettling spiritual malaise. Blame for our troubles shifts erratically back and forth from one group to another. The military, blacks, students, the Democratic Party, the Dow Chemical Co. and others all have had their turn. And the end is not yet in sight. At this moment, the political pendulum has swung toward the right. But it can easily swing back in the other direction, especially when it becomes clear, as it must, that a "law and order" emphasis unaccompanied by positive solutions will further aggravate social problems that have already reached crisis proportions.

In today's unstable social climate, how business responds to what may seem like the provocations of unwashed kids can have far-reaching consequences. If business is well prepared, if it understands the true nature of the challenge, and if it reacts constructively, then a confrontation with students can have a beneficial and healing effect on the country. But if business misinterprets the student rebellion and finds itself, as did so many university administrators, vacillating between overreaction and underreaction, then the results will be bad—bad for business, bad for the students, and bad for the country.

### Not a Tiny Minority

Few subjects have received as much attention in the past few years as the campus rebellion. It is almost impossible to watch television or to pick up a magazine or newspaper without being exposed to student riots, student protests, student demands. Yet, despite the massive coverage, what is happening remains badly misunderstood.

We are misled by preconceptions which prevent us from interpreting what we see correctly. One is the mistaken belief that campus disturbances are caused by a "tiny minority of radicals and malcontents." Such

a view is obviously comforting since it implies that the great majority of young people share our values and that the mischief is caused by a few troublemakers who could easily be dealt with if college administrators "had more backbone." At best, this is a misleading half-truth. Our recent study of American youth for CBS News (*Profile of a Generation*) revealed that fewer than three percent of all college students can be classified as revolutionary in the sense of seeking to destroy our institutions. (I doubt if there ever was a time when our colleges did not harbor at least this percentage of irreconcilables.)

### 'Forerunners' Point to Future

What is new is not the presence of a small group of radicals, but the mushrooming growth of a much larger number of students who agree with the radicals' diagnosis of what is wrong with America, even though they do not endorse their tactics. We estimate this larger supportive group at a whopping two out of five college students. In other words, there are at least *three* on-campus groups — the revolutionaries (three percent), the students who share many of their beliefs (41 percent), and the practical-minded, more conventional majority (56 percent).

We have named the middle group the "Forerunner" segment of college students, implying that they point a future direction for the society. They are young men and women who come mainly from affluent middle-class families, the first depression-free generation. Unlike past generations, they do not seek the traditional benefits of a college education—earning more money, having a better career and enjoying a high status in the society. These goodies they take for granted, and hence minimize. Rather, they are searching for something far more intangible; they want to change society rather than make out well within the existing system. As of now, they believe in draft resistance and civil disobedience. They are against the Vietnam war, against the military, against the police, against restriction on marijuana and conventional sex morality, and against other forms of

restraints. They believe that something fundamental is wrong with American society, and they enthusiastically support radical reform of our most cherished institutions. (Later in this article I will summarize the positive side of their new value system.) There is some evidence that this group, which is now several million strong, is increasing in number, creating an even wider chasm between themselves and the mass of the American public.

### What Business Should Expect

The business community should be grateful that few of the conditions which led to successful campus rebellions are present in a business setting. Students disrupted the campus because they were able to mobilize the support of the large Forerunner group. The revolutionary students by themselves did not have the necessary clout. While a small and determined group of students can create momentary havoc, they can easily be squelched if they fail to win the sympathy of the other students.

It should be remembered that the main target of the revolutionaries' efforts on campus was rarely the administration or the faculty or the trustees. It has always been other students, notably the Forerunner group. Forcing the administration's hand by means of intolerable pressures (like seizing buildings and publishing secret files), the revolutionaries goaded the administration into calling the police or committing other acts of repression. Such actions "radicalized" the more moderate Forerunner group and effectively paralyzed the college administration. For while it is possible to discipline a tiny minority, it can destroy a college to come down too heavily on what is often a majority of students, especially in the Ivy League colleges.

### Tactics Are Effective

In the current campus climate heated up by Vietnam and by years of neglect of student-related issues, tactics such as these have proven remarkably effective. College administrators are readily put in unten-

able positions where they find themselves in greater agreement with students' complaints than they care to acknowledge. It is a well-known fact, as the eminent political scientist Seymour Martin Lipset has pointed out, that successful revolutions arise when those in authority are half-hearted and divided in their loyalties. When authority is not strong and self-confident, it rarely finds firm ground on which to stand. College administrators have not yet recovered from the student onslaught and are still groping to find appropriate policies for the future.

Virtually none of the same conditions for successful disruption exist in the student-business relationship. The Forerunner group cannot easily be mobilized for noncampus activities, except perhaps in the political arena (as in their support of Gene McCarthy). Although many students are prejudiced against business and have a distorted image of its power, authority and motives, they do not have the same specific grievances against business as against their colleges. Businesses are not as divided within themselves as are the universities. Nor can self-confidence of business leaders be easily shaken by student polemics. Moreover, the country feels a passionately antistudent mood and will not tolerate disruptive tactics outside of the campus. In short, the classic SDS tactics will not make much headway against business because the conditions on which their success is predicated are absent.

But business should not, on this account, lull itself into a sense of false security. For students are rapidly evolving new strategies which promise to be just as effective as the old ones.

We must keep in mind that the New Left owes its major intellectual debt to its own version of Marxism. Not that students have actually read Karl Marx or applied his thinking rigorously: many New Leftists are antiintellectual, preferring to get their intellectual sustenance secondhand. From the writings of Marcuse and others, filtered down through pamphlets, articles and speeches, the New Left has inherited a number of premises with a Marxian flavor. The prem-

ises include (1) the belief that economic motives dominate other people and institutions (but not themselves); (2) a sensitivity to the importance of power; (3) an analysis of society in terms of social class; (4) a belief in the unresponsiveness of our institutions except to economic and power influences; (5) the view that our society concentrates its power and resources in profit-making institutions, thereby deflecting them from purposes which do not maximize profits; (6) the belief that large-scale social and economic inequities are inevitable in a capitalist society even under conditions of affluence; and (7) the belief in the inevitable exploitation of the average person by the capitalist system.

### Facts Easily Swept Aside

As applied by some of the more radical student groups such as the Progressive Labor Party, these beliefs take on a ludicrous “Chinese” flavor with little appeal to other students. But here, again, it is not the revolutionary fringe of the student population that has to be reckoned with but the massive Fore-runner group whose Marxism is often tempered by pragmatism and common sense. In their hands, and those of their professorial mentors, the analysis of business and society is far more subtle and the Marxian premises less gross. It is in the nature of any *a priori* theory that it sensitizes those who hold it to certain aspects of the world and renders them insensitive to others. Theories like this are most easily applied by people who do not know intimately and at firsthand the complex reality of the world they describe. Hence it is simple for those who have no direct knowledge of business to sweep away facts that contradict their theory.

I have emphasized the neo-Marxian elements in the New Left approach — the emphasis on the illegitimate use of profit, power, social class, and the exploitation of the have-nots by the haves — because these are the conceptual tools out of which a new and powerful condemnation of the business community is to be fashioned for the second time in this

century. Intellectually, we can demonstrate that a Marxian analysis of contemporary American business is too simplistic, too lopsided, and irrelevant to the actual operations of the American economy. But the battle is not to be fought on intellectual grounds. It is to be pursued at an emotional level whose intensity will, I believe, surprise most participants.

### The Case Against Business

The case will be made that American business is virtually all-powerful, both on the domestic front and in the world at large, and that in using its power to maximize its profits and retain its position of preeminence, it keeps black people from sharing in the economic well-being of the country; it keeps low income people, both black and white, caught in a trap where they are either squeezed by inflation or by job insecurity; it keeps urgent domestic problems from being solved by supporting the concentration of wealth in the “military-industrial” complex; it keeps alive an outmoded policy of containment and economic imperialism to protect its business interests; and it keeps the various ethnic minorities in a subservient role to a WASP social and economic aristocracy. Such a view, in one version or another, will be used to mobilize, unify and give focus to the discontent of various unhappy groups.

We must understand that there are many groups in this country to whom such an explanation, in one or another version, will have a powerful appeal. There is the black community, which feels that it is not making fast enough progress or getting its share of economic benefits, education, good housing, and fair treatment. There is, and this will surprise many business executives, a great pool of discontent bubbling up among *non-college* youth. Many of these young people, deprived of the benefits of a college education, brim over with resentment and hostility. Much of their anger is formless and unfocused, but it can readily be channeled, if an articulate and determined leadership hits upon the right appeals.

There are also large numbers of liberal Democrats

in the country who are deeply disturbed over our current domestic priorities. As these priorities become increasingly identified with a Republican administration, and are linked in the public mind with business, the present disarray in the ranks of the liberal Democrats can vanish overnight—especially if, out of the miasmal mist of politics, there should appear, once again, the favorite target of the Roosevelt era, big business.

Finally, there are the various ethnic minorities which make up so large a part of our body politic and which once formed the backbone of the Roosevelt coalition. Should the present inflation become even more severe, or should a recession be created in the process of curbing inflation, business can easily become the goat.

Those who believe that a recurrence of the old animus against big business is implausible should be sobered by some of our recent survey findings. College students are not alone in their conviction that “business is overly concerned with profits and not with public responsibilities.” Ninety-four percent of all college students endorse this view strongly or partially, but so do 92 percent of non-college youth, 79 percent of the parents of college students and 84 percent of the parents of non-college youth. In other words, the view that business is too profit-minded is spread throughout the society and is felt just as keenly by non-college youth and their parents as by the college community. There is, even today, a readiness on the part of the public to hold business suspect because of its preoccupation with profits.

### New Focus Needed

In times of stress, people gravitate toward the most readily identifiable target, and business is clearly identified with huge problems which have begun to reek with the stench of failure. First and foremost is our failure to arrest the vicious cycle of decay and decline in our great cities. At the present time, business is enjoying a false honeymoon in its relation to the urban crisis, a love fest that will not last for long.

The Federal government, the mayors of cities, the black community, and opinion leaders have all called upon the business community to become more deeply involved in the urban problem. And, business has responded well to this plea, finally recognizing the urgency of the plight of the cities and its own stake in redeeming the cities from further decline. Many of our greatest business entities have entered Urban Coalitions, participated in the NAB’s Jobs program and have launched pilot and experimental programs on hard-core unemployment training.

In its relation to the urban crisis, however, business is making one huge mistake which may return to haunt it in the future. It is becoming identified with a problem for whose solution it takes no real responsibility. There is a great difference between making a contribution and solving a problem.

The \$10 I send to the Heart Fund is a useful contribution, but I do not take responsibility for curing heart disease. The present level of business involvement in the cities, with a few notable exceptions, merely scratches the surface. Unless new formulas are found for reconciling business’ responsibilities to its stockholders and its customers with its new-found social responsibilities, the present pilot programs which represent the average business’ contribution to the urban crisis are not going to expand into the kind of full-scale effort required to stem further deterioration.

At the present time, no one, neither business nor the Federal government, nor local and state governments, are taking *responsibility* for the cities’ problems. It is not, of course, the *fault* of the business community that adequate resources are not being used to arrest the decline of the inner city. But when, in the near future, the urban crisis becomes so intolerable that it replaces Vietnam, inflation, and student unrest as the major focus of domestic concern, business is likely to be blamed for not solving the problem rather than praised for making an earnest and well-meaning though inadequate contribution.

In brief, then, we can expect a new student attack

on business, built around an updated version of the classic Marxian analysis of capitalism and emphasizing the theme that business first monopolizes the power in our society and then misuses it. We can expect such an analysis to “explain” the reasons for many of the problems that now beset this country. We can further expect that large segments of the population who would not ordinarily be influenced by such “explanations” will be moved by them under the emotional duress of frustration and in the effort to fix the blame for their problems. Under the impetus of such a movement, a new antibusiness coalition can be shaped which will present business with the most potent challenge it has faced since the 1930s. □

*Mr. Yankelovich will discuss his views on how business can respond to the challenges of young people in an article in the November/December issue of Bell Telephone Magazine.*



# Looking Ahead



The stylized bell in the circle across the page and the colorful truck below give a thumbnail preview of what is to come for visible parts of the Bell System plant such as cars, trucks, public phones and business offices. Crisp blue and yellow stripes will mark the new design for vehicles, separating the white heat-reflecting top from a grey-green bottom. The revised Bell seal will be used with simple, easier-to-read lettering to identify the various Bell companies and

will appear on stationery and phone bills.

Because of the nationwide size of the task, the cut-over to the new designs and symbols will be gradual, with most changes taking place over a five-year period. Some items must undergo more experiment; some field testing is needed; economic decisions, as distinct from design decisions, must be made. But the paint shops and sign makers already have started to transform the Bell System's face. □



*Intense heat forms an eerie pattern as silicon slices pass through an oxidation furnace before being made into transistors at Western Electric's Allentown, Pa., Works.*



## Why One Manufacturer Excels

A recently published, comprehensive performance study examined Western Electric Co., manufacturing and supply unit of the Bell System.

The study was made as part of a continuing program by AT&T to assure that Western Electric is meeting the needs of Bell Telephone companies for high-quality products at reasonable prices. In addition, Western Electric wanted an independent and objective appraisal of its performance for internal management purposes and to furnish to regulatory agencies.

The study was made by McKinsey & Co., internationally-recognized management consultants. Its clients have included 110 of the 300 largest U.S. corporations, 33 major international companies, and 22 major United Kingdom companies.

To gain insight into the study, which took 2½ years and included activities accounting for 97 percent of all Western Electric employees engaged in Bell System work, *Bell Telephone Magazine* interviewed the man in charge of the study, Phillip S. Babb, a senior partner in McKinsey & Co. Mr. Babb has had more than 25 years of consulting experience with large manufacturing enterprises.

**Mr. Babb, what were McKinsey & Co.'s general impressions about Western Electric before the study was begun?**

We knew that Western Electric is a very large company with more than 170,000 employees at over 60 locations in the United States, and that its sales volume is practically the same as U.S. Steel. Also, the product line is large and complex, with a wide variety



of technological requirements including many of the most advanced.

I have to admit that in approaching this study we shared what is perhaps the view of some people that Western Electric, as the supplier to the Bell System, had a rather cozy niche in which it could relax and be comfortable. But the results of the study were quite at variance with our initial preconceptions.

*How long did it take before you began to see things were not the way you had imagined them?*

It took about six months. We visited many plants and viewed their operations in considerable depth, and during this time the evidence piled up to the point where we began to accept the fact that this company was really running better than most companies. The results reported in your study are so favorable that one wonders whether Western Electric really is that good.

Yes, such a reaction is natural—but just look at the record. How else can you interpret the hard facts of steady improvement in cost, quality and service performance over time, and the attitude of the hundreds of management people we saw? We met many men at the middle level who were

*Phillip S. Babb*



more broad-gauged managers than many works managers in manufacturing operations outside.

Why is this? Much of it may be explained by the fact that many companies have manufacturing as only one of several functional departments. They also have R&D, engineering, finance, marketing, and so on. Marketing in many instances will be dominant, even in a company manufacturing industrial goods.

This is not necessarily bad. But what often happens is that the more able and aggressive managers choose the more glamorous functions that appear to offer quicker paths to the top. In Western Electric, your whole mission is manufacturing and the people who enter can go the whole distance on their performance in meeting your goals of cost, quality and service.

Your report has been published by AT&T and is being made available to people who are interested in its findings. Do you expect that many companies will attempt to apply to their businesses the Western Electric management methods and organization you describe in your study?

I understand a number of companies have requested copies for their management people. Careful study of the report will undoubtedly prove valuable to them. However, these management processes and points of view take a lot of consistent effort and time to develop.

But the aspect of the public release of the report that is interesting to us is that the study is being put in the public domain. What you're really doing is putting Western Electric in a position where it must continue to do an outstanding job.

What, briefly, are the conclusions McKinsey & Co. reached in the study?

We found that Western Electric's operating results since 1950 provide convincing evidence that the com-

*Touch-Tone® Trimline® sets are one of the many types of phones manufactured at the company's Indianapolis Works.*



*Several acres of completed cable at the new Phoenix Plant are being readied for distribution to telephone companies throughout the nation.*



pany has been very efficiently managed. Western Electric has consistently reduced the cost of most activities while maintaining high quality and service despite the continual pressure of rising labor rates and prices of purchased material. We also found that Western Electric's performance is largely the result of an unusually effective management control system—one that has helped to create considerable internal competition aimed at steady improvement of results. And we found that the company's affiliation with the Bell System has also permitted the System to achieve economies and service advantages that would not otherwise have been possible. How do you explain the effectiveness of Western Electric management?

Much of the reason the company does as well as it does is its preoccupation with four areas—cost, quality, service, and management of people—

from the worker level right up to the president of the company. If you are able to focus every level of management's attention on standards of performance that are difficult to obtain but are obtainable, and then follow up on them regularly, you can get remarkable results. This actually brings all aspects of the managerial process to bear on the achievement of these objectives with maximum effectiveness. Will you discuss what you found in each of the four areas you mentioned? Suppose we begin with the management of people.

The company for the most part has done an unusual and consistent job in the people area.

Almost all of us need fairly clear objectives and some targets against which we will be measured to make us do more than an ordinary job. We also must have faith that these targets are obtainable and reasonable. We

found this reflected, for example, in Western Electric's excellent wage incentive system.

Western Electric has also done a good deal of work in establishing goals for managers, and our discussions with members of management indicate that they generally accept that the objectives and measurements that are used are fair. This faith is reinforced by the promotions, transfers and special assignments that are given to people who have consistently demonstrated good performance.

You can have the best system in the world but if you're not consistent in its application, it falls on its face because people become cynical and pay no attention. Based on our experience with a number of other companies, we think the consistency of follow-up and review in Western Electric is unusual and I think this has a great deal to do with the effectiveness of its

*Integrated circuits are magnified hundreds of times at the Allentown Works to check quality.*



managers and the results they achieve. They become disciplined in the best sense of the word to do the job they are supposed to do. This disciplined dedication is an unusual quality. I think a lot of companies would give their right arms to have it within their own managements.

You mentioned the competitive spirit that seems to pervade Western Electric personnel. Isn't this an important factor in any well-managed company?

Yes, of course it is. But in one way Western Electric is quite different from many other companies. In many companies, and I have seen a lot of them, the development of managers through the competitive route is a pretty rugged experience. You see men go in and out pretty fast. This is not the case in Western Electric.

You succeed in making good managers of a much larger proportion of your material than most companies do because you have a good deal more depth, regularity and consistency in the use of objectives, standards, measurement, feedback, review and change.

We have talked this over among our partners and we agree that the managerial mores of Western Electric in terms of real dedication to the solution of managerial problems and securing results, and a pretty broad-based faith in the integrity of the reward system are the closest things to theory in action we have seen. Other companies do well here, too, but the fact that Western Electric ranks among the leading companies in this area is beyond question.

Cost was another factor you concentrated on in the study. What did you find here?

The information we gathered on costs of individual product lines and in total are hard facts that are verifiable in any desired depth. They show a remarkable performance which I think

is best summarized by the fact that from 1950 to 1967 wages increased 101 percent and materials increased 34 percent; yet during the same period, Western Electric's costs decreased 12 percent.

A second broad external measure, and I think it's one of the best measures to use, is the Bureau of Labor Statistics Durable Manufactures Price Index, which since 1950 rose 52 percent, whereas Western Electric's total price index dropped 10 percent. We also found about the same difference when we compared Western Electric's prices for apparatus and equipment with the Bureau of Labor Statistics price index for the electrical equipment industry.

A third comparison which is even more striking is Western Electric's cable manufacturing performance. In spite of the tremendous impact that the cost of copper has on cable manufacturing costs, Western Electric's prices rose only 14 percent. Other producers' prices rose 96 percent.

Some people have charged over the years that Western Electric has definite cost advantages because of the large scale of its operations as part of the Bell System. How important is this in the company's efficiency as compared to other manufacturers?

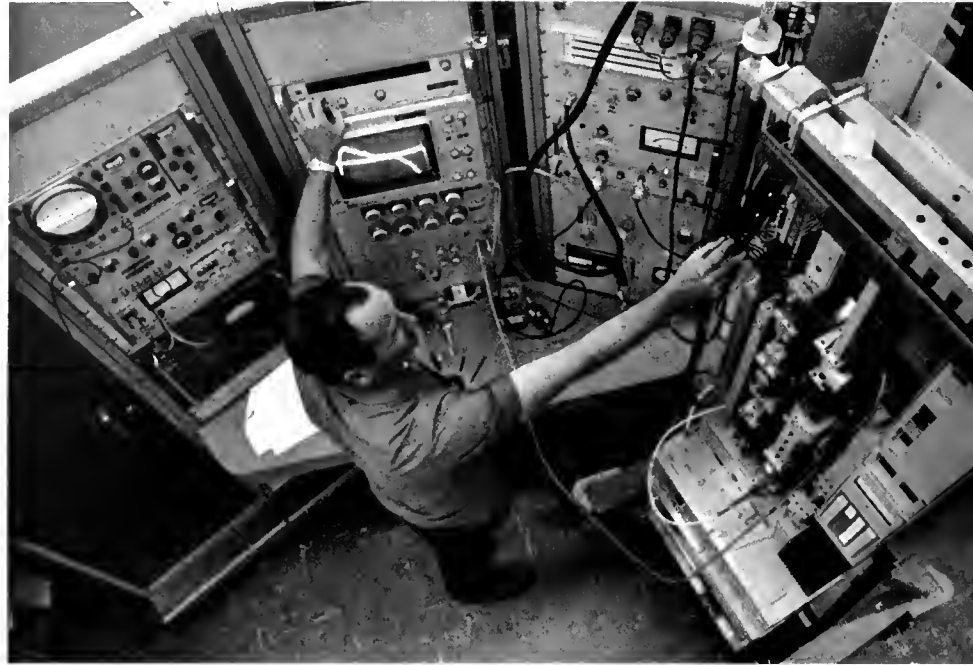
I think it is very important. Because of the scale of Western Electric's operations you have a very significant advantage over most of your potential alternate sources of supply. However, we should not overlook the fact that it takes an aggressive, cost-conscious management to search out and apply the labor-saving machine applications, purchasing and other economies that higher volume may make feasible. But, as we concluded, the differences are too large to be explained in terms of Western Electric's volume alone.

For example, our report showed that at year end 1966, Western Electric tele-

*An important part of every Electronic Switching System is the memory unit. This one is being assembled at the Hawthorne Works in Chicago.*



*Testing is a critical step in the manufacture of microwave radio systems for the nation's communications network.*



phone set prices were 47 percent below the lowest outside supplier's price. To determine the effect of volume, we asked plant management at the Indianapolis Works, which makes most Western Electric telephone sets, to design the most efficient factory they could to produce a quantity of telephone instruments equal to that of their largest potential competitor. The plant was to produce about 1,300,000 sets—about one-sixth the Indianapolis plant's present telephone set output.

We reviewed the process, tooling, floor space and equipment investment assumed in the study. It turned out that with all the costs and markup considered, even at this lower volume, Western Electric would still be able to produce a telephone set at a price 25 percent below the lowest price of the outside manufacturer's comparable set. In other words, scale accounted for only half of the difference between Western Electric's price and the lowest priced competitor.

One other reason for the extraordinary cost performance of Western Electric is the vital role manufacturing engineering plays, which is greater than in most companies. As you know, Bell Telephone Laboratories product design groups are located at Western Electric's major manufacturing plants. Thus, early in the design process Western Electric manufacturing engineers and Bell Labs development engineers can sit together, talk together, and interact in terms of the design's producibility, quality standards, and cost. This is one of the significant advantages of Bell's integrated system.

Another powerful cost avoidance tool working for you is the company's Princeton Research Center. This center anticipates future product designs of Bell Laboratories and works at or beyond the current frontiers of manufacturing technology to develop materials, processes, and equipment which make possible giant steps in Western Electric's product perform-

ance, quality, and cost.

The other necessary part of winning the battle over cost is your unusually effective cost-reduction program, which strives to lower manufacturing costs by improved methods after the design has been turned over to Western Electric for production.

**Quality was a third factor you concentrated on in the study. What did you find here?**

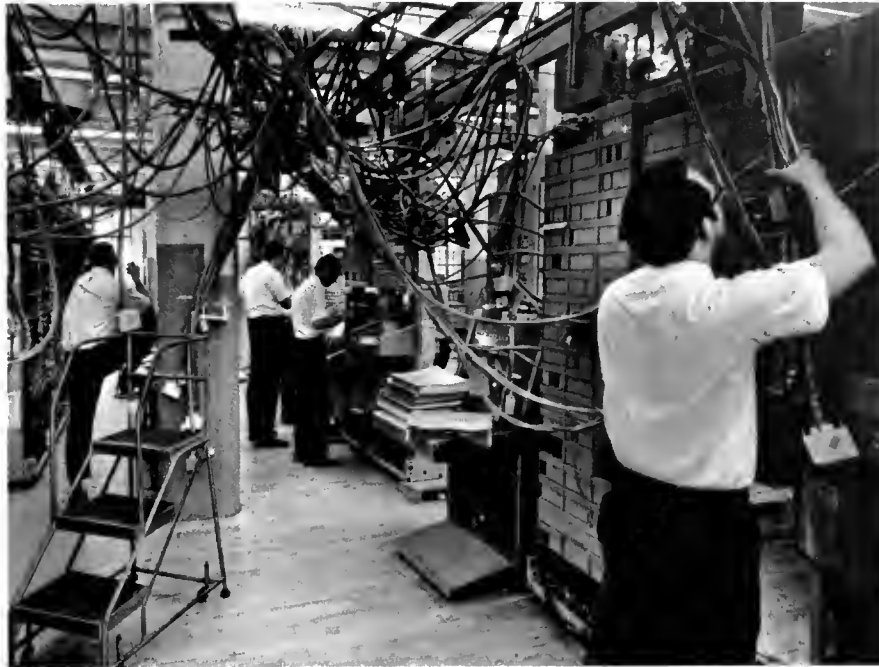
The specifications for the quality of Western Electric's products are not set by Western Electric but by Bell Laboratories, and I think sometimes this fact may not be fully appreciated. Our study of Western Electric's quality trends since 1947 shows that the company has met Bell Laboratories' high standards consistently.

During our many visits to Western Electric plants, we were somewhat surprised to find that the need to meet Bell Laboratories' high quality standards is accepted as one of the facts of life. This is somewhat in contrast to

truded sheath of  
cable is observed  
being cooled  
ter at the  
ore Works.



A maze of cable is needed  
to test advanced Electronic  
Switching Systems being  
developed at the Indian Hill  
Laboratories at Naperville, Ill.



our normal experience where manufacturing is saying if "they" would only loosen the quality specifications, "we" could reduce the cost.

How stringent are Western Electric's quality standards as compared to other companies you have studied?

They range from being comparable to considerably tighter. Because of the tremendous number of components and interconnections in the communications network, the quality of the telephone equipment must be high to minimize the probability of service failures and to keep maintenance costs as low as possible. For example, we were surprised to find some of these quality standards expressed in failures per billion hours of operation. A billion hours amounts to some 114,000 years, and that's quite a bit of time.

A fourth factor you studied in Western Electric's performance was service to its customers—mainly the Bell companies throughout the country. How is Western Electric's service?

Western is doing a service job that would put it among the top 10 percent of major comparable companies. This doesn't mean that Western Electric never has a missed date on a specific order. All companies do. In the overall, however, Western Electric provides unusually fine service.

Western Electric's service has to be viewed in terms of the needs of the total Bell System. The company has to be prepared to meet these needs in relatively short lead times even though demand for equipment fluctuates with the same wide amplitude as almost any capital goods company.

The lead times, established to meet the service requirements of AT&T and the operating telephone companies, are invariably much shorter than the time actually required to manufacture the product. So Western Electric must begin manufacturing based on forecasts of requirements rather than on hard orders from the telephone companies, which may differ widely.

Western Electric managers have, however, shown themselves to be very capable in adapting and finding ways to improve production planning and inventory control to accommodate shorter lead times and wide variations in demand.

What about the future, Mr. Babb? What do you see?

I think the integrated structure of the Bell System provides unique opportunities to improve the planning and coordination of telephone company supply. Your ability to act as a system, to cross corporate lines, and to freely exchange information, will permit you jointly to exploit fully new advances in computer technology and make use of common data banks in such key areas as production planning, inventory control and distribution logistics. This will result in shorter lead times, reduced costs, and lower system investment in inventory and plant, which means lower cost and better service for the public. □

# THE MOST RADICAL LOT OF

by Art Hoppe

Our Congressional investigators have bared still another insidious plot—this by the long-haired revolutionaries of the Students for a Democratic Society.

These fiery-eyed young radicals, Congress has learned, have been ordered to disguise themselves as red-blooded American youths, infiltrate our great corporations and topple our free enterprise system by boring from the inside.

Actually, pioneer efforts in this direction have already been made by the SDS. At hand is a report to SDS headquarters from one of the first infiltrators, Grandville (Che) Grommet, a former student of animal husbandry at Pocatello State College. The text:

As per instructions from the Leon Trotsky Post No. 1432 of the SDS, I purchased a two-button, lounge model brown suit and made the supreme sacrifice for The Cause (receipt for shave and haircut attached). Answering an ad for a management trainee, I presented myself to the personnel manager of Erstwhile & Ne'er, Inc.

"What are your goals, your hopes, your dreams, Grommet?" he asks.

"Man," I say, propping my feet on his desk, "I want to overthrow this whole lousy, stinking system."

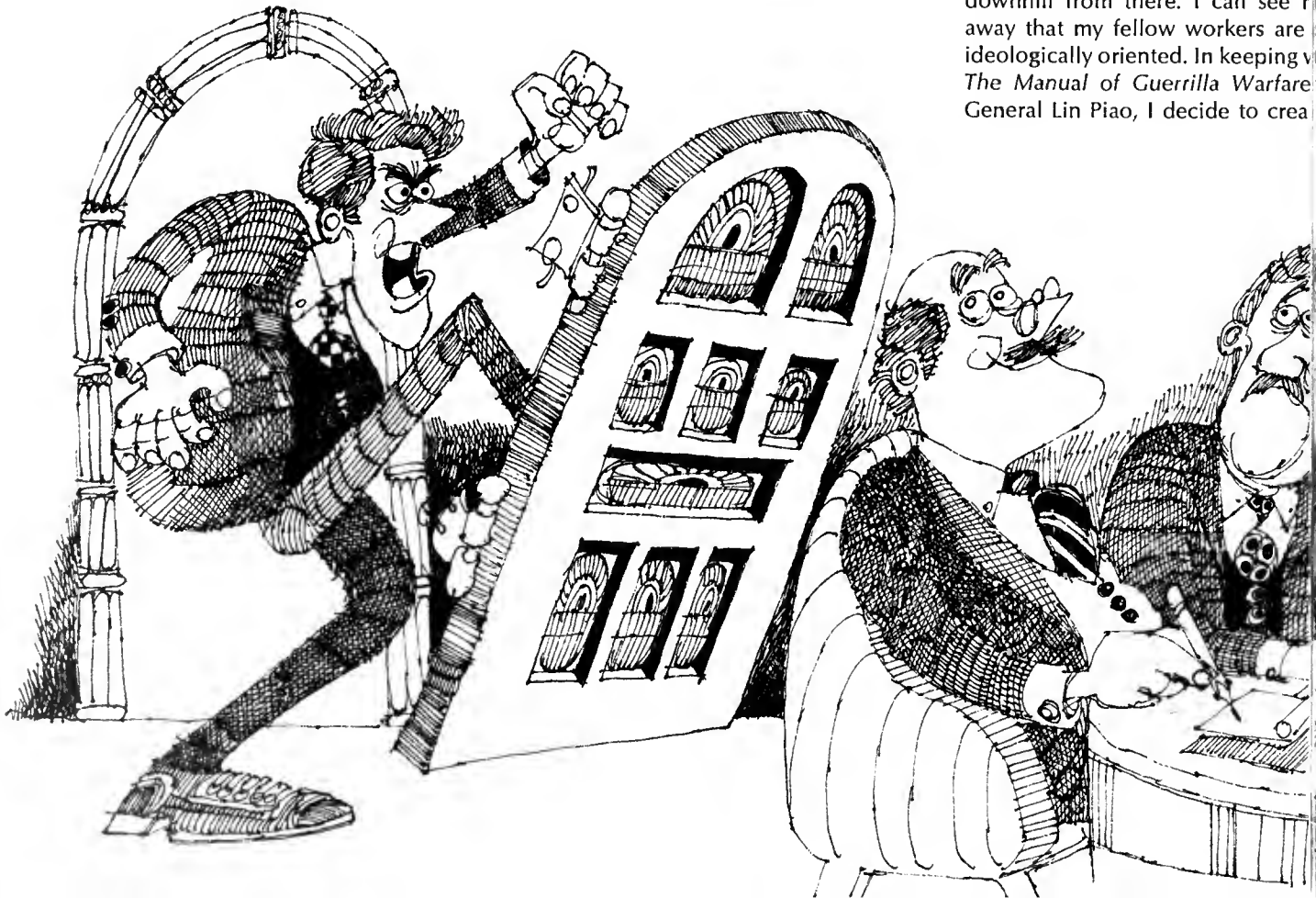
"Here at Erstwhile & Ne'er," he says, "we are looking for bright young men with fresh, new ideas. You're hired."

Well, they put me in Market Street, which is a big office on the 16th Floor with maybe a hundred desks. As soon as I walk in I look around for a crowd to harangue and there it is, over the water cooler. I sidle up, slip a little red *Quotations of Chairman Mao Tse-tung* out of my vest pocket and begin indoctrinating them.

"He who would cultivate the wheat, first he must embrace the porcupine."

"Boy, talk about embracing," says one young man, "have you caught a new dish in Accounting?"

The conversation kind of goes downhill from there. I can see right away that my fellow workers are ideologically oriented. In keeping with *The Manual of Guerrilla Warfare* by General Lin Piao, I decide to crea-



it of activism among the indige-  
s population on the basis of the  
ific issues which affect their life  
es. Before you know it, I am lead-  
a bitter fight for better quality  
er towels in the men's room. I fol-  
this up with a crusade for an extra  
e minutes on the morning coffee  
k. And I culminate with a march  
Payroll to demand that paychecks  
ssued Fridays instead of Mondays.  
oon, I am a marked man. It comes  
o surprise when the head of Mar-  
ng, Mr. Grumwalder, calls me into  
office. I fling open the door with  
e and defiance. "All power to the  
k-typists!" I say, holding high my  
ched fist.

Here at Erstwhile & Ne'er," he says,  
are looking for bright young men  
o evidence corporate leadership  
ity. You're promoted."

o they make me assistant deputy  
cutive secretary for marketing with  
t salary increase of \$12.83 a week  
stock options. Naturally, my fel-

low workers think I've sold them out.  
I catch a group by the water cooler.  
"Death to the bosses!" I whisper.  
"Honest, Mr. Grommet," one says ner-  
vously, "we weren't wasting company  
time. We were discussing the Murd-  
rach account." And they all scurry  
back to their desks.

It looks hopeless. There's one last  
chance: a confrontation. I will take  
over the Board of Directors room and  
stage a sit-in. They will call the pigs.  
I will yell, "Pigs off premises!" The  
pigs will bust my head in. The sight of  
my blood will radicalize the apathetic  
masses. It is a small sacrifice to pay  
for The Cause.

So I kick in the door of the Board  
Room. All heads swivel in my direc-  
tion. Hands on hips, legs akimbo, I  
shout the immortal words of the esti-  
mable Fidel Castro: "Up against the  
wall, you mothers!"

There is a moment of stunned  
silence. All heads turn expectantly to  
the Chairman of the Board. He drums  
his pencil on the table, frowning. Sud-  
denly, his eyebrows raise and he  
breaks out a beaming smile.

"By George," he says, thumping the  
table, "I think he's got it!"

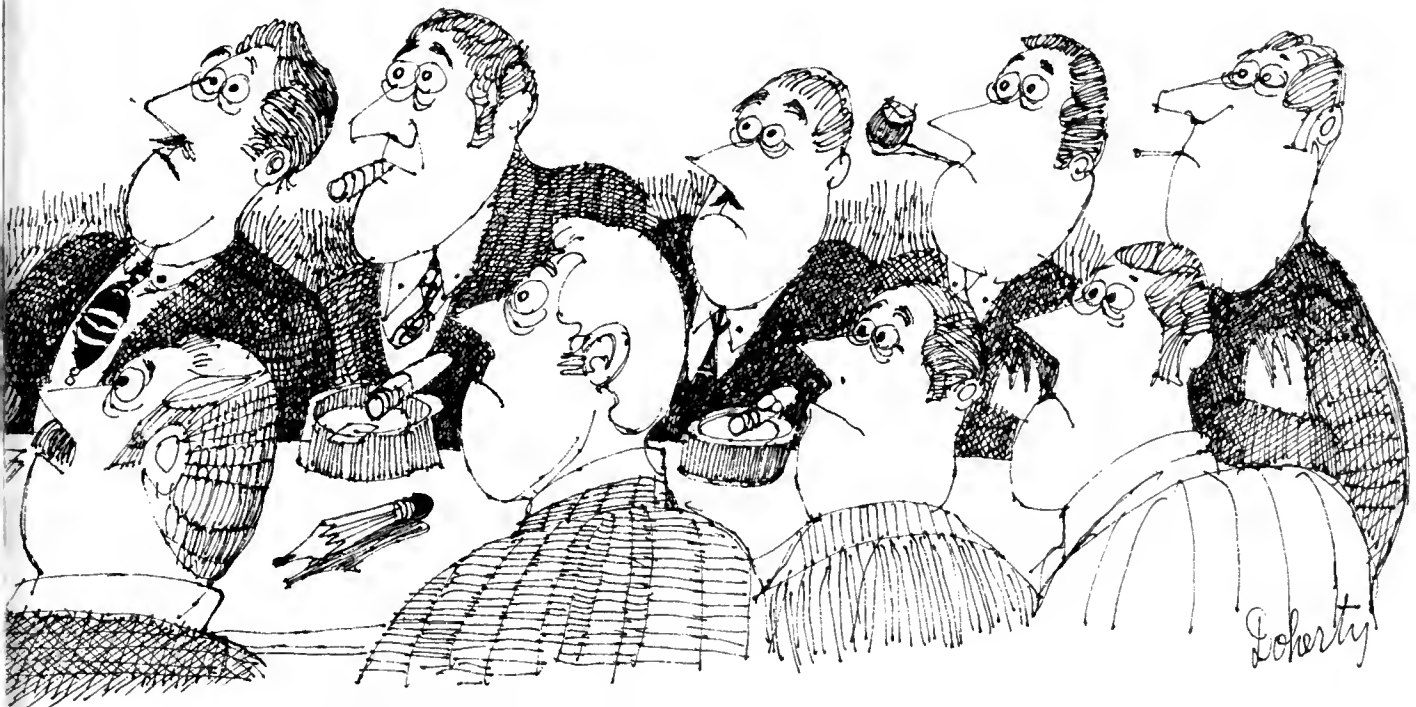
Immediately, I am surrounded by  
directors, all clapping me on the back  
and shaking my hand. It seems they've  
been sitting there for six hours, trying  
to think up a high-impact slogan for  
an advertising campaign in Parents'  
Magazine to introduce our new Wall-  
to-Wall Floor Wax.

So now I'm vice president of Erst-  
while & Ne'er in charge of revitalized  
concepts. By faithfully applying the  
principles of Chairman Mao Tse-tung  
and Che Guevara to modern business  
practices, I've managed to increase  
corporate profits 3.2 percent in the  
first quarter of this fiscal year. I con-  
sider this a victory of sorts and you  
can count on me to continue boring  
from within as long as our earnings  
hold steady.

But, frankly, I feel the SDS should  
give consideration in the future to  
infiltrating organizations more ame-  
nable to overthrowal through radical-  
ization. What about the FBI?

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Mr. Hoppe is a columnist with the San  
Francisco Chronicle. His column is syndi-  
cated by the Chronicle Features Syndicate  
in over 100 newspapers.



Urban living is becoming intolerable.  
The solution: a system of dispersed  
cities, controlled in size, surrounded  
by miles of open land, and  
distinctively different  
from conventional urban centers.

by **Athelstan Spilhaus**

There are too many people on earth, the United States not excepted. Significant as that may be, however, more critical is the fact that the numbers of people are increasing faster than we can provide the human services which people need to remain human.

The mandate is clear. We must restrict the increase of population worldwide, and we must provide a better way of living for the present and future populations. Presently we are doing neither. We merely whittle timidly at the edges of an expanding entanglement that grows more serious each year.

Restricting population growth is not the theme of this discussion. I submit, nevertheless, that the words of biologist Garrett Hardin merit consideration: "To couple the concept of freedom to breed, with the belief that everyone born has an equal right to the commons, is to lock the world into a tragic course of action."

Former Secretary of the Interior Stewart Udall phrased it this way: "We have learned neither how

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*A noted meteorologist, oceanographer and urbanist, Dr. Spilhaus formerly served as President of The Franklin Institute, Philadelphia; Dean of the Institute of Technology, University of Minnesota; and Director of Research, New York University. He is now president of Aqua International Corporation.*

SO  
THAT  
MAN  
MIGHT  
LIVE  
BETTER





to grow, nor at what pace, and *that* is our failing and our future trouble."

While sociologists, biologists, and theologians discuss the control of population growth, the search for a better way of living continues. The crux of this problem is the city.

The urban dilemma is an American problem and a worldwide problem. At its root is the fact that too many people drift into too few cities or their immediate environs. Consequently, 70 percent of all Americans now live on one percent of the land.

**U**rban renewal too frequently encourages such movement. Two- or three-story slum buildings are torn down, and sterile, high-rise, so-called low-cost housing brings more people into the center of the metropolis. Such a quandary can be rationally explained: Our system seldom rewards long-range planning and experimentation in government; the reward to a public servant is continuation in office; incumbency is usually based upon ability to find a quick fix that shows instant benefits.

Countries vary in their material resources and in the degree of development of these resources. But every country has human resources in excess of its ability to use them fully. Therefore we should concentrate on "people services" in a new culture, recognizing that we are all in the service of others, without servility.

I dream of a city where the dwelling units are simple and adequate but the services in education, sanitation, health, recreation, and all forms of culture are outstanding. To achieve this in realistic dimensions, I am convinced that we need, as a corrective, the development of a system of dispersed cities of controlled size, differing in many respects from conventional cities, and surrounded by ample areas of open land. Present "model city," "satellite city," and

"new town" projects do not fulfill all of these criteria.

The cities I have in mind would be "planned"—carefully planned before construction to reasonably assure that the people services effectively intermesh with adequate physical facilities and essential governmental procedure in an atmosphere of flexibility. This would be feasible because the critical factor of population size would be known rather than unknown.

Needless to say, the first planned cities would have to be dedicated to experiment before a "grand system" of dispersed cities could be fully conceived. The proposed Minnesota Experimental City (MXC) would be a prototype.

MXC is a cooperative venture of the business and industrial community, the Federal government, and the State of Minnesota and its university. The subject of serious discussion and planning since 1967, it will be a complete city of some 250,000 people outside the commuting range of existing cities. It will also be a huge urban laboratory effecting actions which are necessary to alter the social, economic, and physical environment to achieve otherwise unattainable ends over a relatively brief period — about 10 years. Construction is expected to begin in 1973.

The potential gains of a grand system of dispersed cities are great enough to justify huge calculated experimental risks. It is mystifying that we reserve great risks and toleration of great mistakes for wars.

**P**eople like to live in cities. Dispersal, as I see it, does not mean that the whole United States would become a single sprawling suburb on the order of a Los Angeles. Dispersal refers to cities big enough to offer the advantages of city living yet small enough not to be subject to unplanned overgrowth.

The city is a system. It requires synergism. Each of the interlocking services affects each of the others. It is unwise to study the status of education without

considering the ramifications of housing, transportation, communication, labor, welfare, etc. For example, institutions such as schools and churches could probably share facilities with much greater efficiency of operation than either can now muster separately. If noise and filth are eliminated from factories, zoning becomes unnecessary, and transportation needs change because people aren't as apt to move to another part of town. Better communications change patterns of travel, medical care, and education. Clearly, we cannot continue to experiment in bits because each new technology affects other technologies.

It is obvious that the planning, construction, populating and managing of a dispersed city system that is highly suitable for industry, commerce, and human occupation will require leadership, imagination, and enthusiasm of scientists, industrialists, and educators alike. We must be prepared to discard convention and to experiment with new and radical ideas.

**I**t is also obvious that the project cannot be accomplished through any attempt to rebuild a present city, regardless of its size or location; for, without exception, our cities are bound by tradition, outmoded building codes, restrictive legislation, and the consequences of unplanned, unhealthy growth.

The urgency of such an ambitious and large-scale experiment is readily evident. Even if a newly conceived city accommodating a quarter of a million people were built in every one of the 50 states within the next three years, these cities would barely absorb the predicted increase of population in the United States during that time and would do nothing to alleviate the problems of overgrowth in existing cities.

An experimental planned city such as the Minnesota project will constitute an immense study not only in new technologies but in new social concepts and even morality. For instance, it should help to

measure the degree to which we would be willing to give up security of ownership in favor of part or shared ownership that would lead to something better. How much beyond the compromised ownership of condominiums or time-bought automobiles are people willing to go?

Government? There is increasing evidence that the ballooning maze of physical and social complexities in our cities is undermining the theory that advocates the spreading of authority. Federal standards and controls are established to resolve the conflict. In new experimentation, an attempt at management of the city-hotel-corporation type is worthy of consideration. Many public services might be contracted to private businesses on a performance basis. Population balance can be achieved through careful selection of the type of industries participating and the commercial operations established.

Consider also the possibilities for significant innovations in transportation, waste management, housing and construction, and communications.

**N**ow in the process of design are systems that can move people motorless, driverless, and noiseless in semiprivate pods, computer-controlled so that passengers travel from where they are to where they want to go without stopping. The various systems have a common denominator: they are driven by a propulsion system built into a track. Eliminating the automobile in cities by means of a modern transport system of this kind would do away with the need for freeways and traffic control. It would lessen smog, save lives, and free valuable space.

In a city of controlled size, two miles square, one could reach the edge of the city walking on the trafficless ground level in 15 minutes or less. More importantly, using 400-miles-per-hour underground tube transit systems presently in design, one could go from

the center of one city to the center of its neighbor in the same acceptable commuting time of 15 minutes. Thus, mobility, not only within a city but between cities, is a vital part of the concept since it would multiply the choices offered to any individual in any of the different cities.

The high-speed network between dispersed cities would also provide access to long distance airports serving several of the cities from an open land area. Vertical takeoff and landing craft, for short distance flights, would use terminals inside the city.

The ultimate solution to the population problem for a closed-system earth is to use, reuse and recycle wastes. One step is to control waste at the source to avoid mixing and dispersing. Another is the re-design of many systems so that less waste is produced. For example, a sterile pneumatic system for delivering food might reduce the vast quantities of wrapping paper and containers now required.

**U**tility tunnels, hydraulic conveyors, or unitized trains might carry many solid wastes as well as liquid and gaseous wastes to processing plants. Reduction of bulk and suitable packaging of wastes would allow deadheading trains and trucks to take them away from the city to open areas where they could be processed and stored or reused, perhaps to build ski slopes, arenas, or other recreation facilities. Wastes not immediately reused could be sorted and stored in "mountains" to be mined when reuse becomes economically desirable.

In water-rich areas, water can be used first for drinking and then reused at least twice, for cooling and then for recreation. But, if experimental cities are to show the way for cities in arid areas, complete recycling of part of the water must be attempted.

Large industries dedicated to pollution control are springing up, and while complete recycling might

not be possible to achieve for most wastes immediately, that objective should remain in all planning.

Between now and the year 2000, we shall need to build a family unit for two and one-half people every 27 seconds. This will simply accommodate the increase in population and does not take into account the razing of substandard units. It means mass production of buildings on an assembly line basis, perhaps in the vein of Moshe Safdie's mass producible, privacy-respecting, and aesthetically pleasing Habitat at Canada's Expo 67.

**S**imple construction is an essential in mass-produced housing. In an experimental city, materials could be brought up from the city substructure inside the growing building itself so that growth could take place without clogging the surroundings. Easy dismantling is also important. As needs change, buildings would be taken apart and the materials moved back into the substructure to be stored and reused later.

The city's infrastructure might contain all the services: power, communication, water, gas, pneumatic tubes for parcel delivery, express tunnels for police and other emergency vehicles, fume sewers, conveyor mechanisms. For most of these services new technologies already exist, but they haven't been tried as a system.

For information transfer in densely populated communities the "wired city" approach may be preferable to a radiation system. Perhaps radiation should be reserved for needs—such as communication to and from moving vehicles—that wires cannot fulfill.

In a city with a suitably wired or piped substructure, a large spectrum of sight and sound terminal devices would be applicable. Telephones or typewriter consoles can already tie into computer services of schools, hospitals, libraries, stores, and banks. Advances being made today in cable circuits and in

waveguide, satellite and laser transmission could also be put to good use.

The communications system in a planned city would provide access from any point to large high-speed computers for purposes of city management on the basis of real information, crime prevention through video monitors, and advanced social experimentation through up-to-the-minute data banks. Such an advanced system would furnish an ideal laboratory for determining how to insure privacy of computer use while realizing maximum computer benefits to society.

And what about the cost for an experimental city of 250,000 inhabitants? If we take 2.5 people as an average family unit and \$20,000 as the average cost per unit, we arrive at \$2 billion. But the city would be planned from scratch with large substructures housing equipment for city services, and it would involve extensive experimentation. Thus we double the first figure and arrive at a guess of \$4 billion.

However, not all these costs constitute an additional burden on the national economy. New housing and businesses will be built in any case, somewhere.

**C**ertainly the plan must prove attractive to industries if they are to participate and bear part of the cost. Some construction cost could legitimately be funded by FHA mortgage. Part of the experimentation and research would be met by the private sector. Imaginative American industry needs a place, a city laboratory, in which to try out new technologies of waste management, communication, transportation, and construction. This laboratory would also serve those in business who are showing greater concern for urban social problems.

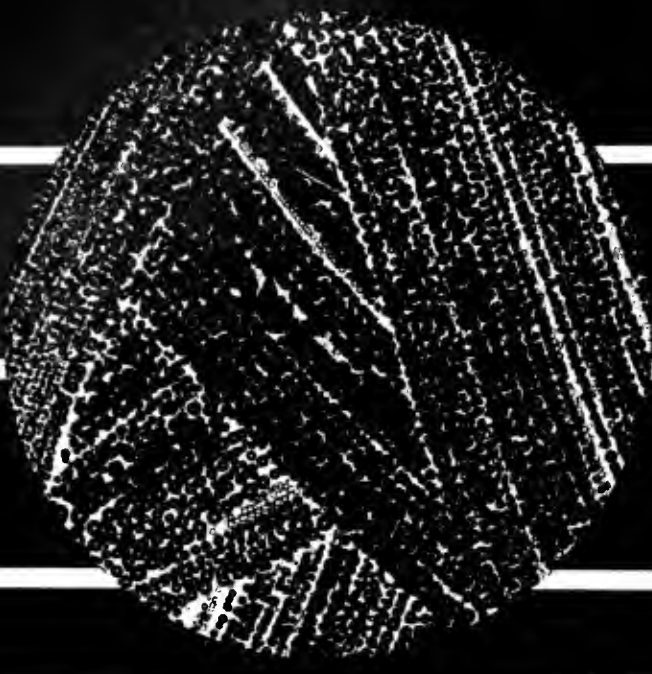
If these ideas are subject to charges of impracticality, consider the possible consequences of failure to innovate on a scale broader than any we've known.

Look ahead, for instance, and suppose that the world population, if we do little about population control, reaches 15 billion by A.D. 2069. And let us assume that our technology permits us to build cities on any solid land, from Antarctica to the tropics, from desert to rain forest. The area of all the continents is about 2.3 billion acres. Thus, if we built cities of controlled size, dispersed throughout the world, there would be 60,000 cities of a quarter of a million people each, and each city would be surrounded by 40,000 acres, or 64 square miles, of open land. The alternative of allowing the present big cities to grow unplanned or to accelerate their growth through so-called urban renewal would mean that vast tracts of the earth's surface would be uninhabited and the urban complexes would be intolerable.

**T**here is no magic in the number 250,000 as a desirable population level for a planned city. Perhaps a half million would better provide the choices people want, or cities of different sizes may be needed. But size must be controlled and cities must be kept within a small area, with clearly defined bounds, so that they would remain surrounded by open land.

These ideas are not totally new, but they have been treated with little sense of urgency. There are new insights, new technologies, new inventions, and there are resources. What has been lacking so far, in the words of Economist Barbara Ward, "is the unifying vision of the whole urban order as a proper field of coordinated inquiry and action."

We have witnessed how commitment and imagination of the best in government and the best in industry can work as a team to achieve, within a few years, almost incredible accomplishments in outer space. To provide a better environment for people on earth can we not explore space on this planet with similar commitment and imagination and with the involvement of people in a grand national experiment? □



In the thirty years during which I have been lecturing and writing on space and its exploration by man, I have seen the subject pass through two of the three phases which any novel or revolutionary idea has to undergo. These may be summed up as follows: 1: It's utter nonsense. 2: It's possible, but it's not worth doing. 3: I said it was a good idea all the time.

We are through phase one, we are thrashing about in the middle of phase two, and I hope to accelerate the transition into phase three.

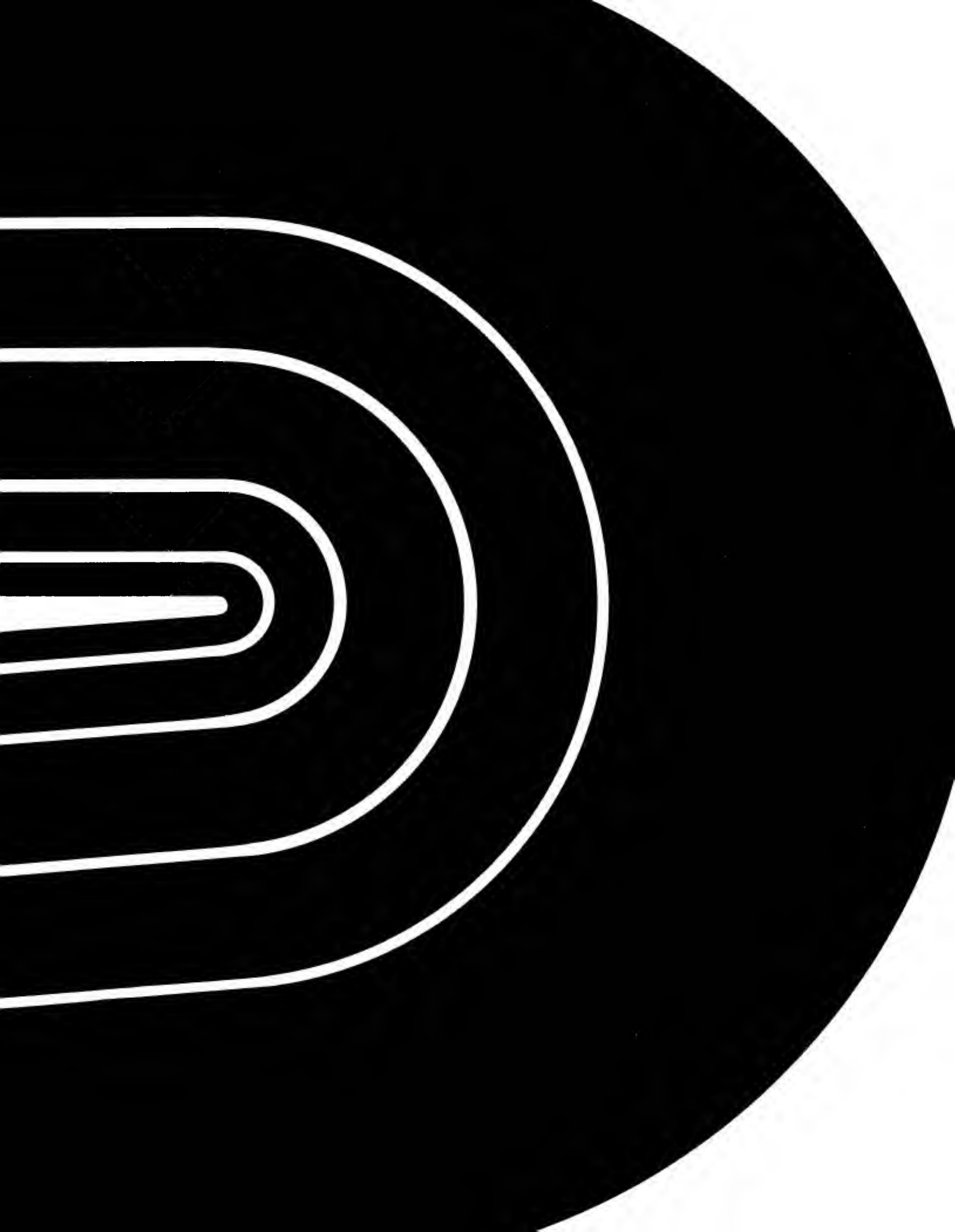
I consider acceleration essential, because today there are many critics of the space program who regard it as a kind of technological Olympics. They say, in essence, why shouldn't all that money be

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*Mr. Clarke, explorer of new ideas in space, oceanography and many other fields, is author of numerous books and articles, and co-author of the film 2001: A Space Odyssey.*

# Spinoff from Space by Arthur C. Clarke

The space program is not all far-out science. Some very tangible benefits are being realized here on earth from man's effort to reach the planet



spent here on earth, on housing or schools or hospitals? There is some truth in these arguments, which makes them difficult to answer glibly.

History, far from being glib, provides an apposite lesson for those who refuse to see any value in leaving the problems of earth to explore the space around it. There was plenty to do in Europe when Columbus left it to embark on a voyage which most people then considered as foolhardy and needless as contemporary skeptics consider a voyage to Mars. There is *still* plenty to do in Europe. But the opening up of the new world did more to revive the stagnant European culture and economy than any internal action could possibly have done.

In that sense, at least, Columbus was just in time. I believe that our reaching into space, as he reached across the Atlantic, is just in time. I cannot prove this; it is an act of faith. But I welcome the so-called space-race, despite its high cost in money and human effort, for if we weren't racing — if we had nothing to push against in the form of our Russian counterparts — we wouldn't be moving fast enough. We may be doing the right things for the wrong reasons, but the fact that they are the right things I believe can be proved.

A relatively new word in our vocabulary — spinoff — describes the benefits that accrue, sometimes unexpectedly, to everyday life from a purely scientific undertaking such as the space program. These spinoff benefits today are quite unpredictable, and are not so much in the form of hardware, marvelous though that is, as they are in the realm of knowledge and capability. The learning of things we will have to know to cross our last frontier can also contribute to improving the human condition on earth.

Such improvements are essentially materialistic, else I imagine they would not qualify as improvements. A conspicuous example among the multitudinous space hardware now circling the earth can be

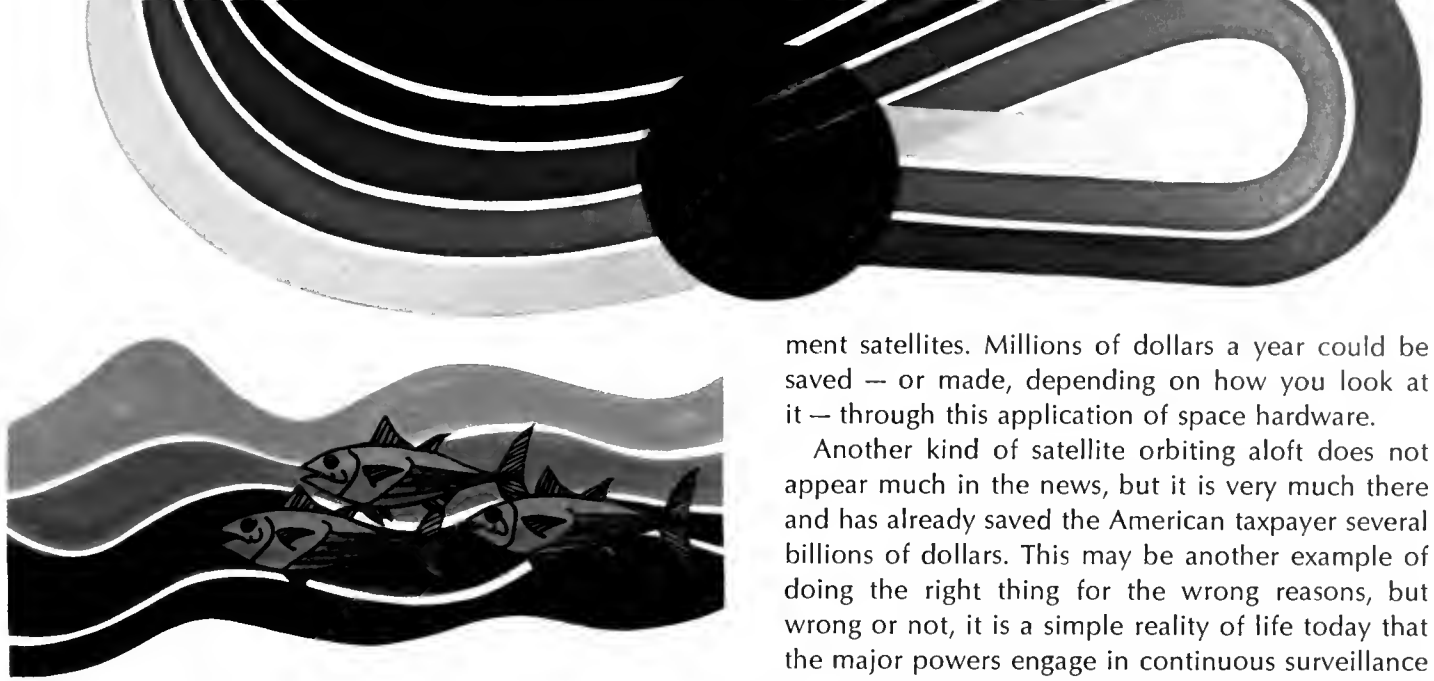
found in the meteorological satellites. In the comparatively short time they have been in orbit, they have practically revolutionized the science of weather forecasting. Weathermen can now receive current photographs of cloud formations and movements over large portions of the earth, taken from *above* all the weather — photographs that provide them with knowledge they have always wished for but have never before had any way of obtaining.

Accurate weather forecasting, both immediate and long-range, is of immense importance not only to such obvious beneficiaries as farmers the world over, but to the general populace as well. In Ceylon, for example, where I live, life literally depends on the monsoon. As of now, no one can predict when it will break and deliver the water so essential to our crops. Sometimes nature doesn't deliver on time, and starvation hits whole areas. Forecasting the monsoon's arrival accurately is going to be of vast economic importance to half the human race.

A more dramatic use of meteorological satellites has been in observing and tracking hurricanes. About 30 years ago a string of hurricanes which hit the Gulf States took about a thousand lives. This past summer, a similar storm roared up the Gulf of Mexico, but it was tracked every inch of the way in satellite photographs — which gave enough warning of the storm's approach to prevent worse loss of life than occurred.

Although it is now impossible for the United States to be taken unaware by hurricanes, that unfortunately is not true elsewhere as yet. The cyclone that swept across the Bay of Bengal about three years ago caught a whole fishing fleet at sea and drowned a thousand fishermen. It even whipped a train off the causeway between India and Ceylon, dumping train and passengers into the sea. That cyclone had been photographed by the weather satellite Tiros, but no warning network existed where it was then needed most.





When ground facilities around the world match the capability of the globe-circling satellites, such disasters may be prevented, or at least mitigated.

Closely allied to the meteorological satellites are the environment satellites, which study and report on all types of ground resources. These, equipped with special cameras and sensing instruments, are beginning to tell us far more about the planet's surface than even the best aerial surveys were able to show us. For example, some photographs reveal all types of air and water pollution, and can even detect areas of ocean fertility. Fishermen studying these satellite pictures can actually see where they're likely to find fish, and where the water has been polluted by land runoff, a potential destroyer of marine life.

One of the most important parameters of the ocean is its temperature. The Gulf Stream is familiar to everyone, but not everyone knows that its stream of relatively warm water often forms a thermal barrier to fish: they will swim within a few yards of it and follow it, but will not cross it. The enormous economic importance of that fact was demonstrated a few years ago when the Iceland fisheries were threatened with ruin because they couldn't find the fish where they were supposed to be. The United States contributed an airplane equipped with infrared sensors, which successfully located the wandering Gulf Stream by detecting its heat. The fish had followed the stream, and the trawlers followed the fish. What was done then with an airplane can be done so much more effectively, and on a global scale, with environ-

ment satellites. Millions of dollars a year could be saved — or made, depending on how you look at it — through this application of space hardware.

Another kind of satellite orbiting aloft does not appear much in the news, but it is very much there and has already saved the American taxpayer several billions of dollars. This may be another example of doing the right thing for the wrong reasons, but wrong or not, it is a simple reality of life today that the major powers engage in continuous surveillance of each other by means of reconnaissance satellites. Before the advent of these orbiting eyes in the sky, we had only the ill-fated U-2 plane, and the conviction that a serious "missile gap" existed between this country and Russia. Former President Johnson remarked off the record that the reconnaissance satellites revealed the true extent of Russian missile development, showing it to be much less than was formerly supposed. Consequently, the planned ICBM force in this country was cut back to a level deemed adequate for security in the light of our new knowledge, and the taxpayer was saved literally billions of dollars in the process.

By far the most familiar item of hardware in the space program is the communications satellite. The general public, inured to an accelerating barrage of technical marvels, takes for granted the fact that it can flick on the TV set and watch Olympic games relayed live from Tokyo or Mexico City without ever considering for a moment the real marvels that make this possible. Although I have been credited with first suggesting communications satellites as early as 1945, I am impressed by the sheer sophistication of the equipment it has taken just to enable us to reach the point where we are now in real-time global communications.

But present accomplishment is only a foretaste of what is to come. I believe that before the end of this century, we can have enough communications chan-

nels through satellites to enable the whole human race to pair itself off and carry on simultaneous conversations, perhaps a billion at one time. Will we really need such fantastic capability? I think we will, if not for human conversation, then certainly for channels linking computers, which are becoming more talkative than their human creators.

I believe that some of the consequences of the communications satellite may be as profound — perhaps more profound — than those resulting from the invention of the telephone itself. For eventually, it will do away with much physical transportation. The world of the future will communicate, it will not commute. I think that is how we will solve some problems of the cities, how we will eliminate the traffic jams — not by covering the world with concrete, but simply by doing away with much of the traffic.

There have been many studies of possible uses for “education” satellites. In an area like Brazil, for example, we can provide 12 channels of color TV to every school in the country. The cost of the satellite and ground equipment would work out to about one dollar per pupil per year. As I see it, the question is not, can the poorer countries afford communications satellites, but, can they afford any alternative?

The social, cultural and even linguistic consequences of such direct broadcast satellites would be immeasurable. Imagine what would happen if one country were to establish a global system with just three transmitters in orbit, broadcasting directly; actually only two would reach about 95 percent of the human race. In the course of one generation, the language of that network would become the language of all mankind. This is not a matter of conquest or imposition of ideas; it is simply a matter of exposure and absorption.

I believe that the ultimate impact of communications satellites will be much like that of the railroad and the electric telegraph in building and unifying



the sprawling new United States. What we are seeing now, a hundred years later, is the repetition of this situation on a global scale. Instead of the railroad and the telegraph, we now have the jet plane and the communications satellite. Ultimately the result will be parallel in unifying all people.

Perhaps critics of the space program might concede some of these spinoff benefits. But what of manned space flight? What can man voyaging through space, exploring other worlds, bring back to help improve the human condition here at home? A simple and immediate need for man in space is to help unmanned satellites in trouble. A couple of years ago, for example, this country launched its first orbiting astronomical observatory, which cost over \$50 million. High above the murk and haze of our atmosphere, it could have revealed the stars as they can never be seen on earth. It went into a perfect orbit — then its battery died. It is still up there, a beautiful, useless piece of hardware. And a man with a screwdriver might have fixed it could he have reached it. Another unmanned observatory, functioning perfectly, has now joined the dead one, but that kind of experience is both disheartening and expensive.

Not every “bird” sent aloft slips flawlessly into its intended orbit. Several communications satellites have gone astray and so cannot function as they are



designed to. If we could send up manned rendezvous vehicles, the errant satellites could be nudged into the right orbit. It seems clear to me that the real exploitation of space cannot come about until we have manned observatories, workshops and laboratories orbiting the earth, with crews rotating on regular shifts. In another decade we will have permanent stations in space, manned by teams equipped to replace worn-out components or expendables in the satellites, which will be the workhorses of the future. The capability to do this is being developed automatically as a by-product of the Apollo program.

In fact, we would have had to develop the Apollo equipment needed to take men to the moon, even if the moon wasn't there at all. We would have to develop all the hardware, with the single exception of the lunar landing module, just to get into near space with substantial payloads to exploit the possibilities of orbiting satellites.

### The Queen Elizabeth for three

Until we have a fundamentally new type of launch vehicle, however, the exploitation of space on any practical scale is not going to be economically feasible. The economics of space travel today are absurd. We must build a Saturn V rocket, driven by chemical combustion, 360 feet high and weighing 3,000 tons, just to take a small payload containing three men to the moon. This is like building the *Queen Elizabeth* to carry three passengers across the Atlantic and

then sinking her after the maiden voyage.

On the other hand, space travel is not going to be fantastically expensive. Actually, the energy requirements to take one man the quarter million miles to our natural satellite are surprisingly low. If you ran your car continuously for 24 hours, it would do enough work to carry you to the moon. Electrically, it would take about 1,000 kilowatt hours of energy for the same trip. Just in terms of energy, the basic cost to take one man to the moon is \$10. Today it costs \$10 billion. Obviously, there is room for improvement. I do not predict that we will ever have a \$10 ticket to the moon, but the cost of this basic space voyage will come down by several orders of magnitude in the 50 years just ahead.

It is generally agreed among space experts that the key to practical space exploitation is the reusable vehicle. These can be flown up to orbit, then return to earth to be refueled and serviced, much as are today's jet airliners. Reusable vehicles can open the way to space factories where entirely new manufacturing processes can be carried out. A production plant orbiting in space can exploit two properties not available on earth: weightlessness and a limitless vacuum. Engineers can now speculate about the fantastic manufacturing processes they could develop if nothing weighed anything. And as for electronic studies, instead of putting electron tube elements in a vacuum enclosed in a glass shell, we would put the scientists in a space suit and leave the tube elements out in the open.

I'm sure that sometime in the next century we will have space hotels, like the Orbiter Hilton in the film *2001*. More importantly, we will have space hospitals, opening whole new frontiers in medical science. Preliminary studies of the effects of weightlessness on animals and human beings already have shown some interesting biological changes. Some of these are beneficial, some may be harmful, but all will contribute to our knowledge of organic processes and cell growth. Obviously, one kind of cell growth in which all of medical science is interested is the yet

unexplained and uncontrolled growth of cancer. I do not predict that we will ever find a cure for this dread malady in space, but I am certain that when such a cure is found, some of the knowledge that goes into it will have come from advances in medicine and biology resulting from the new disciplines of space medicine, developed in reaching for the moon.

The first landfall beyond the atmosphere, of course, is the moon. It is a larger world than we tend to imagine, larger than Africa, and there are many geological processes going on there which make it a more interesting and exciting place than it seemed only a few years ago. I'm sure that in 10 years there will be permanent bases on the moon, analogous to those now in the Antarctic. As soon as possible, we must locate lunar resources — water, oxygen-bearing material — so that bases there can be self-supporting. And what practical good can come of manned bases on the moon? For one thing, we will learn a tremendous amount about our own planet and the forces which formed it.

For another, we may find recorded on the moon the history of the solar system. The earth's surface has been turned over again and again hundreds of times since it was formed, so that much geological evidence of the far past has been lost. But on the moon, which has suffered little if any erosion like that on earth, digging down a few feet may take us back a billion years in time, or even farther back, to the time when the solar system was born.

Beyond that, the key to exploring the rest of the solar system itself may lie in the moon. It is 25 times easier to escape from the moon than it is from the earth, in terms of fuel or energy needed. Therefore, the moon may be literally a stepping-stone to the other planets — Mars, Venus, Jupiter, Saturn. We are lucky in having a sort of proving ground for our techniques so near at hand: only a second and a half from earth in terms of radio and only 50 hours or so in

the time it actually takes to get there.

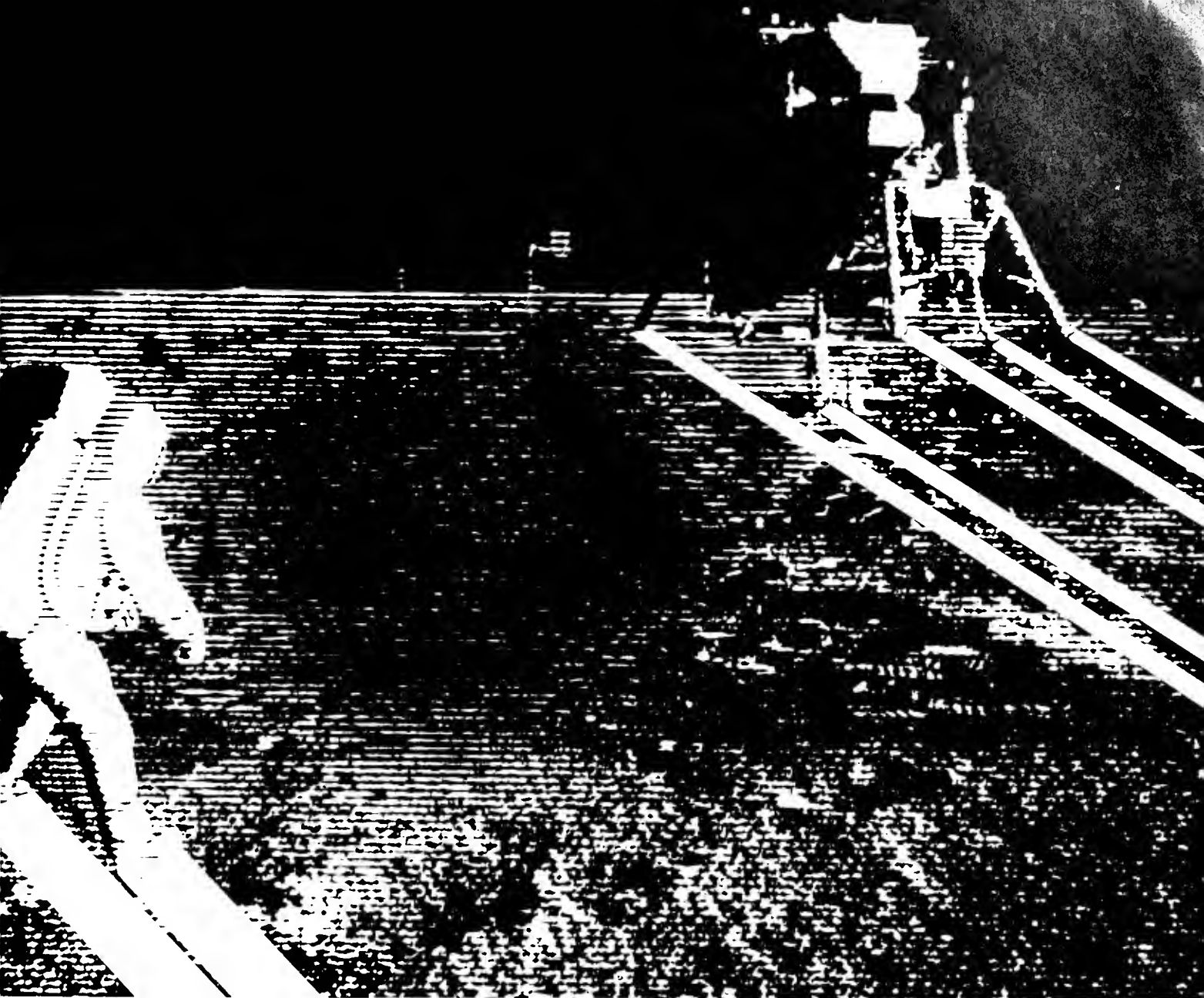
Jupiter, the colossus of the solar system, now looks as though it will be the most interesting of all the planets. Some 11 times the diameter of the earth, it has a very deep, turbulent atmosphere consisting mostly of hydrogen, methane and ammonia. Until recently, most scientists thought that a planet covered by such a lethal mixture would be of no interest to anyone but biologists. But there has been a considerable change of opinion in the last few years, for two reasons. First, because, although its outer atmosphere is very cold — as is the earth's — beneath that the planet, whatever it may consist of, is actually quite warm, perhaps as warm as earth or even warmer. Second, the Jovian atmosphere now is identical with the one in which life originated on earth about two billion years ago. There may be an immense amount of early life on Jupiter — a living chapter from the remote past of creation.

### Like Vespucci and Columbus

The beneficial by-products of such exploration may be evident only in the long run, beyond the time of anyone now living. But the study of the inception and evolution of primitive organisms may give us invaluable clues to maladies afflicting more complex organisms such as man.

The moon is only a way-station, a launch-point, for the solar system at large; and this, I believe, is the frontier of the next century. Out on the planets there is several hundred times the land area of the earth, waiting to be explored. Perhaps much of it is inaccessible or uninhabitable. The giant planets like Jupiter and Saturn may have no solid surfaces, and in any case will present an appalling challenge. But so did the voyages of Vespucci and Columbus, who really did not know exactly where they were going or what they might find when they arrived.

We, at least, will know precisely where we are going, and we are beginning to have a clearer idea of what we may find at journey's end. □



"Houston, Tranquility Base here. The Eagle has landed." New words for history. Words taken from a succession of intensely dramatic moments in mid-July 1969 when the United States sent three men to the moon.

Those words are preserved for posterity on the record accompanying this issue. The editors consider it an appropriate supplement since the Bell System, as one of countless contributors to the success of the first manned lunar landing mission, was a significant participant.

Technologies developed by Bell Telephone Laboratories, in some cases long before the space program moved into high gear, helped pave the way for America's space successes. Among them were advances in the negative feedback principle, radio astronomy, frequency modulation

with feedback, the transistor effect, the solar cell, gigantic sky-scanning antennas, and the traveling wave tube.

Since 1959 when NASA asked Western Electric and Bell Labs to head a multi-industry team assigned to engineer and build an around-the-world system of 18 tracking stations for Project Mercury, the Bell System has been a constant factor in the American space effort.

Bellcomm, a Bell System subsidiary, was organized in 1962 to serve in a systems engineering role as a part of NASA's organizational structure. It has contributed technical advice on everything from the Gemini earth-orbiting missions, to launching Saturn V, to pinpointing the best lunar landing location for Apollo 11.

And, of course, the network. A half-

million miles of Bell System circuits -- by coincidence, the rough equivalent of a round trip to the moon -- carrying every type of electrical communications, helped couple the first men on the moon with men all over the earth. These circuits stretch across the United States, involving the AT&T Long Lines Department and every Bell telephone company; and they reach around the world by way of overseas cables, satellite circuits, and high frequency radio. Special Bell System links connect Cape Kennedy, the Goddard Space Flight Center in Maryland, and the Houston Control Center.

The voices on the record are those of Astronauts Neil A. Armstrong, Edwin E. Aldrin Jr., and Michael Collins; President Nixon; and NASA officials.



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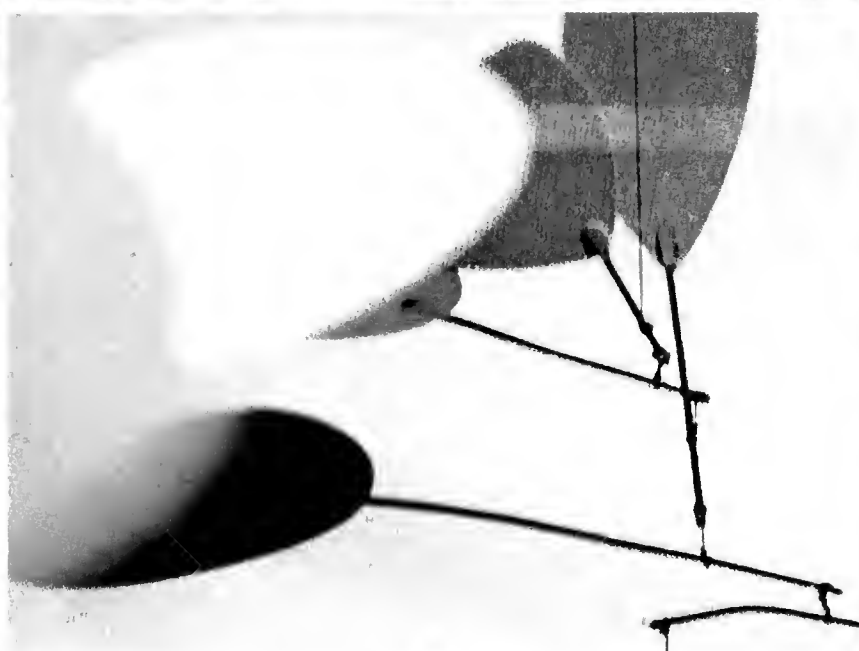
Responding to Student Ideals

Consumers

November/December 1969

# BELL

telephone magazine



# The Whole Loaf

The issue of communications service in several major metropolitan centers has, during this last year, been probed and dissected and analyzed to a fare-thee-well. The growth problems and progress of communications service are, in much of the land, intertwined with the growth problems and progress of the cities. The telephone business and the cities it serves grow and improve together. And sometimes they must, as we are wont to say these days, share a "crunch" together in order to become better than they have been.

The best human talent and technology in U.S. business are working to restore peerless communications wherever it is less than it should be. If one believes that a team of strong men and sophisticated machinery functioning with a fierce will within the free marketplace is capable of moving mountains—and there are plenty of precedents to confirm one's belief—then the restitution of dependable service is as certain as desert sunshine.

There's little zip, punch, or sex appeal in the word "service." You wouldn't pay a dime to see a movie about it, especially considering the competition and convenience of Swedish stag films that have been lately liberated from fraternal parties to be featured prominently for art's sake. An opera house or live stage production on service would compel you to demand your money back. A novel on the subject, even with an exotic title such as, say, "Naked Came The Service," would have to be published and paid for by the author himself and given gratis to his relatives, who wouldn't read it. As entertainment, the subject of service is the wrong show to back, the wrong book to write.

One reason might be its obscurity. Service to some is what you either deliver or return in tennis. Service to others is something in china, pottery, sterling, stainless or silverplate that makes dining more acceptable than if you ate without it. To many a man, service is what you were in when you were younger and thinner and your bones were less brittle. Service is also the late Canadian writer with the first name of Robert who wrote lusty ballads of the North.

But for those recipients of Bell Magazine who hold Bell System jobs, service is those jobs. The same holds for the far larger number of Bell people who don't see this journal. Public service is their *raison d'être*. It is not a by-product of a man's main duty, not an offshoot of something else deemed more urgent by upper management, not an appendage to some more critical bottom line results sheet, not a platitude to make profit-taking sound more palatable to the public or

the national government. Naïve as it may seem to some, in the Bell System service is *why we work*.

Parenthetically, service is also how we attract the best talent to our work. In the vigorously competitive market for bright, skilled and educated people, the service doctrine that guides this business is the recruiter's equivalent to a straight flush. Every upbeat business has insurance plans, pensions, savings programs, good pay and vacations. Every upbeat business must, to stay solvent. But the concept of service upon which Bell is built brings a "meaningfulness" and a positiveness to work which is lacking in much of our supercharged, opulent and yet often tedious life style. To instill this attribute among newcomers in the business, and make it known among the most thoughtful youngsters on the nation's high school and college campuses, is to ensure the future of this organization and of the service it provides.

To devote one's days to such worthwhile endeavor as communications service is to be fortunate indeed. At least that is one man's conviction, one man who a few years back quit the Bell System to sample employment out there where the incentive is merely money and they wouldn't have it any other way. To the entrepreneur whose only work goal is to grow corporately bigger and richer without the restrictions of such unbusinesslike, do-good tenets as commitment to public need, the Bell System way is dullsville. To him we lack the dynamism and derring-do of competitive big risk, big reward, free-wheeling free enterprise. Yet, to the man reared on Bell service, to suddenly work for bread alone seemed lacking in purpose; only half a loaf at best.

Fortunately, in an economy whose Gross National Product is some \$925 billion, there is sufficient room for various management motives to thrive. The economy can grant eye-popping success to the bright, aggressive fellow whose sole purpose is pursuit of the buck, and at the same time provide a niche for the financially unambitious man who wants to serve others through, say, government employ or high school teaching and cares not if he ever attains the classiest address in town.

The Bell System mode blends the best virtues of both—a private, profitable corporation with the unconventional purpose of meeting a public requisite. To be able to earn one's pay from the proceeds of providing communications service—an effort which makes life more pleasant, productive and promising for men everywhere—is satisfying stuff. Seen in such perspective, there's considerable appeal in the service idea. As a way of work and a way of life, it may be the best idea ever. THH



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# Business' Response to the New Values

by Daniel Yankelovich

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A revolution in values is incubating on college campuses, posing a critical challenge to business. A leading researcher of youth attitudes says business can respond self-confidently and sympathetically, yet without appeasement.

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In the first part of this article I stressed the negative side of the campus rebellion: how the students seized upon a secondhand and shopworn ideology which they then applied to business, a subject about which they show an almost invincible ignorance. But this is only half of the story and it is not the most important half. There is a positive side to the student protests that deserves our most careful attention.

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*Mr. Yankelovich discussed the significance of campus unrest for the business community in "Karl Marx vs. American Business: Round 2" in the September/October issue of Bell Telephone Magazine. In this article he gives his views on how business can respond to the challenges of youth.*

*Mr. Yankelovich heads Daniel Yankelovich, Inc., the largest independent attitude research firm in the nation. He draws upon studies for Fortune magazine and CBS News and other research his firm has conducted among college youth to interpret the impact of the student rebellion on business.*

The philosopher Alfred North Whitehead once observed that "great ideas often enter reality in strange guises and with disgusting alliances." His insight applies strikingly to what is happening today in our colleges, although many people will agree more quickly with the second half of Whitehead's dictum than with the first. Yet, there *is* a great idea at work buried beneath the student rhetoric. And it is worth the trouble to search for it.

Since the Depression, we have been so preoccupied with building up the economy and with achieving a better distribution of its fruits that we have rarely stopped to ask what happens when peoples' material needs are finally satisfied. After the second car and the third TV set, what does one do for an encore? If a man has achieved the American dream of "making it," i.e., a college education, a secure



position in the society and a good income, what new values does he then pursue? So small a proportion of our citizenry has actually achieved these traditional goals that the question is an idle one for most people. But it is not at all idle or meaningless to the Forerunner college students, who are, for the most part, the sons and daughters of the people who *have* made it. These young men and women are at work evolving a creative and highly adaptive post-affluent style of life.

### **Forerunner students de-emphasize careerism**

These New Values, as I shall call them, are still in a formative stage but certain themes emerge clearly among Forerunner students, particularly a stress on social responsibility and de-emphasis of personal careerism in the form of accumulating money and status. While we have often found a deep sense of social responsibility bred among the very rich and privileged such as in the Rockefeller and Kennedy families, it is new to find this same sense developed among a far larger number of young people with less privileged backgrounds. These Forerunners also place a new emphasis on the community as a whole and on insisting more vigorously than in the past that our social institutions be more responsive to the needs of those they purportedly serve.

Somewhat inconsistently with this social orientation, self-expression and self-fulfillment also enjoy a central role in their philosophy. Older people with a liberal bent often fear the dehumanizing effects of advancing technology, but the young people warmly embrace the new technology as a means for achieving humanistic goals. They are also busy working out new conceptions of religion, sexual morality, and patriotism, seeking to purge our older love-of-country of its nationalist pride and will-to-power—luxuries that mankind can ill-afford in an atomic age. It would carry us too far afield to elaborate on these themes, but perhaps these few wisps of testimony are enough to show that new values are coming into being. At the very least, new combinations of values are find-

ing a fertile breeding ground among large numbers of our younger college-bred generation.

Though the New Values go beyond youthful idealism, they have not yet worked themselves out as a coherent world view. While influenced by the war in Vietnam, the struggle of the black minority, and the assassinations of the Kennedys and Martin Luther King, they are essentially independent of current events. Such events, however, especially the war, have currently given the campus rebellion an ugly and divisive twist, turning youthful idealism to despair, changing moral yearnings into bitter anger, and transforming a longing for community into a sense of solidarity against the larger society.

Partly because of the war, a huge gap in perspective has opened up between business executives and Forerunner students in relation to our record as a nation. To most successful executives, our cup runneth over: the country is prospering as never before. Despite some unevenness, there is a broad distribution of material well-being. We are meeting our international obligations responsibly, even at the cost of a distant and divisive war. And we are mounting a serious and deliberate attack on our urgent social needs while seeking at the same time to restore the country to a less troubled state of mind.

### **New values antedate the war**

The young Forerunner students bring a far more jaundiced perspective to bear. After years of unprecedented affluence, they say, large segments of the population remain in desperate need; the black minority is still effectively shut out of the larger society; we are using our economic and military power to exploit other peoples and our own as well; our institutions have become bureaucratized and unresponsive to the needs of those they serve; we are engaged in a brutal and imperialist war; and we are preoccupied with an irrational anticommunist ideology under whose sway we are rapidly moving toward the holocaust of atomic warfare.

As long as the war continues, these extreme differ-

ences in perspective will remain sharply polarized and the premises of the Forerunner students will continue to show a personal bitterness and signs of influence by an alien ideology. But once the war is settled, the true nature of the New Values may emerge more clearly, divested of their ideological overtones. For the New Values antedate the war. They have been incubating at least since the 1950s, the period of the so-called Silent Generation. Hopefully, they can be restored to a saner and more positive level of development once the war is over.

### **Beneficiaries of affluence have different goals**

A significant finding of our research is the fact that the New Values are quintessentially represented by the children of parents who are themselves college graduates, and that conversely, such values are at least coveted by young people who have no college education in the family. The New Values, in other words, are highly correlated with several generations of college education which, in our society, usually means several generations of material comfort as well. There are many exceptions, but the statistics on this point are quite clear. Nor are the implications illogical. If we educate people to think for themselves, we should not be surprised when they do so. If we strive to achieve a high level of education and affluence, we should not be surprised when those who are its chief beneficiaries take these benefits for granted and move on to other goals.

If we incubate high ideals in our young people, we should not be surprised when they use these to shape a new philosophy. It is inherent in the social nature of man that when he satisfies one set of needs, he goes on to create others. We are a restless people, and at this problematic juncture in our history we can no longer afford to linger lovingly over our past accomplishments. The press of events forces us to move on and attend to our unsolved problems.

There is, to be sure, something invidious about young people dismissing the massive accomplishments of the past with an airy wave of the hand. We

have built a great and stable economy and we have done so at no small sacrifice. Yet, our children squirm when we tell them how we had to struggle in the Depression. When we point out that the affluence we have created is a precondition for what they want to do, they are bored. When we recount the history of the post-World War II period and our struggle to contain Stalinist expansionism, they accuse us of living in the past, of failing to recognize how the world has changed, and of failing to acknowledge the thrust of naked power in our own policies.

These discrepancies in perspective will not easily be bridged. But if the atmosphere of mistrust and alienation in which these young people have come to live can be dissipated in a post-Vietnam period, we may find the dialogue between the past and the future to be productive. For this exceptionally gifted generation of young college students is filling a vital function in our society — the process of renewal and adaptation. They are building on the past, not wallowing in it. They are putting their emphasis and their energies on unsolved problems rather than accepting these problems as the price of personal career success. They are screaming out, sometimes hysterically, the warning that we are failing to change our policies, priorities, and attitudes quickly enough to adapt to a new and very dangerous world.

### **Business needs new language and theory**

Here are a few suggestions on how the business leadership of the country might wish to respond to the challenge of the New Values.

**Avoid Ideology.** It would be fatally easy for a confrontation between students and business to degenerate into a false battle between the semantics of Marxism and capitalism. Both sets of semantics are outmoded and neither theory in its pure historical form applies to present realities. Only misunderstanding can result from such a shadow contest. We must bypass ideology and bring to bear a nondoctrinaire, problem-solving approach on each separate issue, resisting the temptation to generalize. Business needs

a new language and theory to explain itself and its social role. It also needs new types of executives at high levels in the corporation who have a bridge-building function to perform. The job of these new executives should be to understand what the students and minority groups are trying to tell us. They should understand the world of business at firsthand, and they should be capable of building a bridge between the two worlds. Business would be wise to take this new public seriously.

Hire Forerunner Students. Paradoxically, although students are preparing to attack business, at the same time a countertrend is beginning to develop, stimulated by student disappointment with the universities and government. There is something appealing to this generation of students about a disciplined, responsible, hardheaded, business approach to problems. Students have not yet worked through their ambivalence about the profit motive, but many are eager to escape from the genteel moratorium of college life we have created for them out of our own profound sentimentality about a college education. They want real responsibilities. They feel we are doing a bum job and they are confident that they can do better. We must let them try. We need their vitality and their self-confidence, even if accompanied by brashness. We need to channel their resourcefulness onto responsible projects rather than have them spend their energies in a vacuum.

It is, I think, a particularly good idea for companies who have hard-core job training and other urban programs to hire these young people to work within these programs as part of their initial experience with business. Such work will be meaningful to the young people and will attract them to business. At the same time, it will bring to bear a much-needed new commitment. Above all, it will provide the vital connecting link between youth's desire for responsibility with its practice on work that is socially useful.

Face up to the Profit-Vs.-Social-Responsibility Issue.

One positive by-product of the student challenge will be to accelerate within the business community

a debate of the utmost importance: resolving how business in the future is to reconcile its objectives of maximizing profits with its new social responsibilities. The student attack will, of course, load the dice against business, suggesting that the outcome of such a debate is foreordained. Faced with any threat to profits, however nominal, they claim that business will reject meaningful social responsibility.

The business community must not let its ideological opponents dominate this debate and monopolize the interpretation of its meaning. The issues are extraordinarily complex and are likely to lead in the future to far-reaching changes in business' relationship to society. Up to now many business executives have preferred to avoid the issue simply by denying that there is any conflict. They take the position that the long-term profitability of a business demands a greater emphasis on social responsibility, implying a wholly harmonious relationship between the two.

Undoubtedly there is merit to this argument. But our own conclusion, based on extensive study of business involvement in the urban crisis, is that once the pressure is put on business to expand from pilot and experimental programs to large-scale efforts or once there is a pinch on profits, the conflict between profits and social responsibility will show itself to be very acute indeed. Most businesses simply cannot meet the demands for new social commitments out of their charity pocketbooks or without coming into collision with stockholders. To refuse to face this fact squarely will stir up further social conflict, not reduce it. If business comes to feel that the demands on it are too great at the same time that ghetto residents see its efforts as too little and too late, we have a formula for further mistrust and failure.

Many new types of businesses and business concepts are emerging today that are capable of meeting vast public needs with complex and intangible services and systems. Some of our new computer-based businesses are becoming finely-honed, problem-solving entities, capable of assuming social problems on a public-contract basis. This pluralism in business

concepts, existing side by side with the traditional forms of business, is a healthy development and one that opens up many new possibilities for the future. Perhaps business does not have to sacrifice either its single-mindedness of purpose or its public responsibilities. But it does have to face and engage the issue rather than let the initiative pass by default into the hands of its youthful critics.

### 'Third-ear' approach suggested

In general, I am proposing that business respond sympathetically to the student rebellion. Psychoanalysts sometimes refer to "listening with the third ear," a phrase which means being attuned to the inarticulate feelings and strivings that lie hidden beneath the screen of language. If, in the light of the business executive's more extensive experience in the world, he can listen with the third ear to what the students are trying to communicate, he stands a good chance of factoring out the great idea embodied in the New Values from its strange guises and disgusting alliances.

Clearly, the students cannot accomplish this task for themselves. To illustrate: the college Forerunner group is marvelously sensitive to the needs of the few, but often obtuse and insensitive to the needs of the majority of middle-class citizens who are striving to gain the traditional benefits of our society—a good living, a good education, and a life of dignity. As a result of this insensitivity, most adults are infuriated by those students who, in effect, spit upon the values that they, the majority, cherish most dearly. If the New Values are to have a broader significance for the country than degenerating into snobbish cultism, there must be a productive encounter between them and old values. The sympathetic and intelligent business executive can help to create a synthesis between the two.

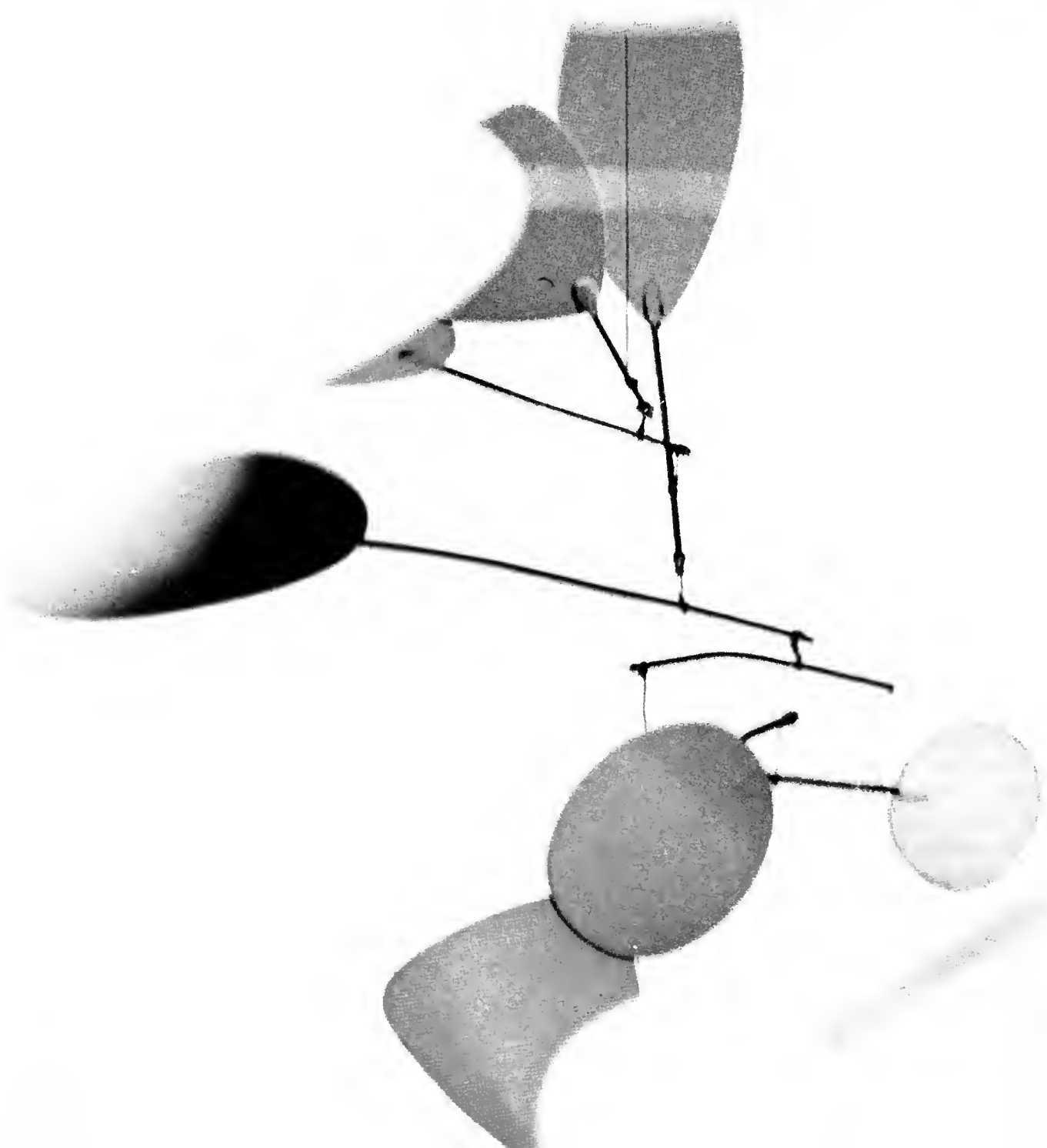
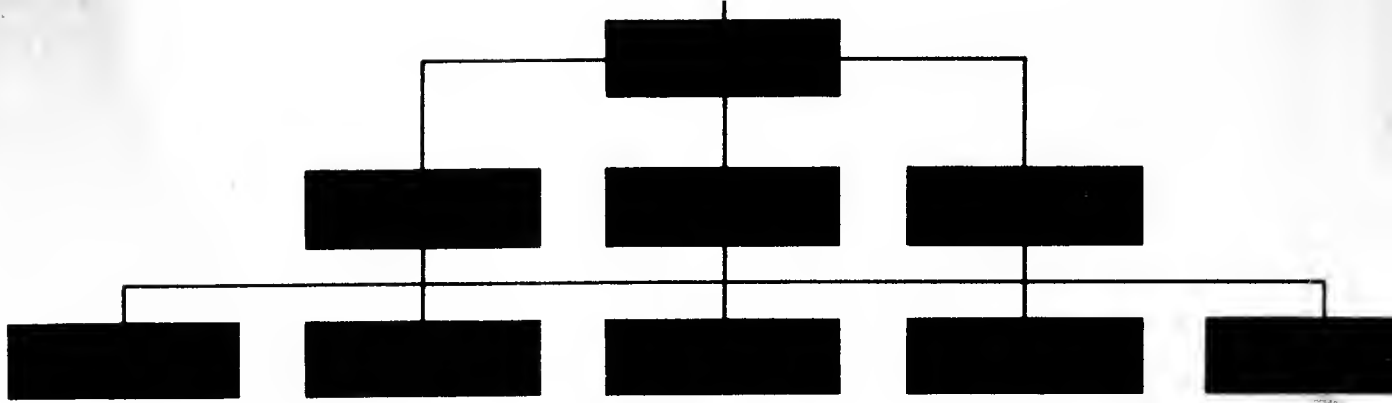
Responding sympathetically, it should be emphasized, does *not* mean appeasement. Business executives must respond self-confidently to the student challenge. This may seem like an odd point to stress, but business is easily put on the defensive by the

academic community. Business has a kind of love/hate relationship with the university. The executive often derides the academician for his lack of practicality and his self-importance. But no one has a deeper reverence, often to excess, for learning and education. The more hard-boiled the businessman, the more defensive about business and the business function he is likely to be. And the more inarticulate.

Responding sympathetically also means taking the Forerunner group's point of view seriously and engaging in debate on the substantive issues. Up to now, we have avoided the content of youth's concerns, looking instead at their motives. Some observers have interpreted their motives along Freudian lines, as a rebellion against the authority of the father. Most people have taken refuge in the "generation gap" theory with its corollary that the youngster will soon "grow out of" his foolishness. We should recognize, however, that we are not dealing with mere age differences or with a transitory phenomenon that can be explained away once we understand the motives of the young rebels. With the emergence of a large Forerunner group on our college campuses, we are confronted with a form of social change that introduces a radically new element into American life.

### Linking two segments of society

These few suggestions are offered from both a tactical and a strategic point of view. From a narrow, tactical vantage point, the business community should engage the student challenge and respond to it in a sound and constructive fashion to keep it within bounds. From a broad strategic point of view, such an approach is not a sterile and negative antistudent maneuver but a pro-student, pro-business, pro-country strategy for linking together two vital segments of our society — the gifted, articulate, and responsible Forerunner group of college students with the dedicated, concerned, and socially responsible business executive. "Only connect the prose and the passion," said E. M. Forster, the English novelist, "and both shall be exalted." □





# Conventional Company or Conglomerate

## Which Works Best?

The freewheeling tactics of conglomerates are making a strong impact on old-line organizations. Whether growing 'internally' or through merger and acquisition, both kinds of companies add excitement plus a new element of controversy to the business scene. by Bill Hennefrund

Like good theatre, the business world—particularly that large part of it called "Wall Street"—thrives on action. The days of freewheeling free enterprise may be long dead, but business excitement predictably runs high with a novel situation, an eyeball-to-eyeball confrontation, a daring solution.

The rapid growth of new types of companies generally known as "conglomerates" was bound to release satisfying juices. Unlike the old-line companies that claimed their activities were "diversified" but "related," conglomerates boasted that their activities were *unrelated* or at best tied intangibly together by "technology." Management expertise and money, they seemed to be saying, could hold together the widest assortment of enterprises imaginable.

What's more, the conglomerates seemed, or at

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*Mr. Hennefrund is an assignment writer specializing in subjects pertaining to business.*

least claimed to be, headed by a new breed of daring, aggressive managers who delighted in taking over established, sometimes much larger, companies.

Their take-over tactics led people engaged in sedentary chores to yield happily to the High Noon Syndrome. A hapless company, in 1968, was no longer "acquired"; it was "gunned down." A securities analyst, describing the hazards of assessing conglomerates for a major magazine, actually said without smiling: "You're operating in the blind, and if you get let down, you just get killed." A business publication asked: "Can Billy the Kid Ride Again?" The story was about the ordinary kind of stock market speculator that has hung around Wall Street since the Buttonwood Tree days.

The conglomerators, in this cowboy literature sense, were obviously quick on the draw with the corporate wallet (often stuffed, some claimed, with

Confederate money), ready to confront the Biggest Corporation in Town. Who could not thrill to the long-running serial starring James "Jimmy" Ling, who started with a small electrical contracting shop, acquired an airline, a sporting goods company, and a steel manufacturer? Or Charles "Charlie" Bluhdorn, who rode tall in the saddle of an auto bumper company to take over 80 companies in 11 years, including a major motion picture firm? Or the heads of at least 30 other recognized major conglomerates?

## Investors were more interested in growth than safety. Company managements frequently followed suit.

As matters have turned out, however, 1969 may go down as a critical year for the conglomerates. Lower stock prices, combined with tight money, proved to be a strong handicap to the conglomerates' take-over capabilities. Antitrust activities by government stalled several large merger attempts. On top of it all, Congress was in a mood to "do something" about conglomerates.

The relative calm on the conglomerate front has probably come in the nick of time. At long last, businessmen and investors have a chance to evaluate conglomerates in an atmosphere at least partially free from heroics and derring-do. How do conglomerates differ from the old-line conventional companies? Are they really a significant new force on the corporate scene, or are they simply a phenomenon of the long bull market?

A key distinction between conglomerates and the older companies concerns "growth." In the years following World War II, the factor of "growth" (as compared with safety) assumed immense importance for investors and, hence, for company managements.

At the same time, government antitrust activities seemed to be discouraging growth among the giants like General Electric, General Motors and U.S. Steel, particularly growth through mergers and acquisitions.

As a result, the companies sought growth by developing new products and finding new customers. For some large companies, this kind of "internal" growth has been substantial. The assets of General Electric, for example, grew from \$3.8 billion to \$5.7 billion in the four-year period of 1964-1968, without the acquisition of a single new company. Over the same period, assets of old-line U.S. Steel grew by nearly \$1 billion, despite foreign competition and without acquisitions. Standard Oil (New Jersey) tacked on \$4 billion of growth, and General Motors \$3.7 billion without substantial acquisitions. Even a relatively old "glamor" company, International Business Machines Corp., enjoyed a doubling in assets—from \$3.3 billion to \$6.7 billion—exclusively through "internal" growth.

The ability of such companies to achieve growth internally is impressive; but in comparison, the growth of conglomerates by another method was spectacular. Conglomerates sidestepped the "economic concentration" question by moving into markets that were only vaguely, if at all, related. A producer of textiles, in acquiring an auto rental business, could hardly be charged with consciously acting to curtail competition.

## Growth by acquisition was considered best because it was fastest.

Thus, International Telephone & Telegraph Co. grew by nearly \$2 billion over the four-year period in the course of acquiring a hotel business, a home construction company, a baking company, a data processing company, and about 200 other businesses. Gulf & Western was able to zoom from less than \$1 million in sales to more than \$1.5 billion largely through the acquisition of 80 companies. Teledyne, Ogden, Bangor Punta, Loew's Theatres and others chalked up spectacular growth rates through mergers and acquisitions.

Investors, looking for growth, obviously believed that growth through acquisition was the "best" kind

of growth because it was the “fastest.” In the bull market year of 1968, they were willing to pay premium prices for such growth potential. Thus they reckoned that, while a share of General Motors was worth 13 times the company’s expected earnings, Litton Industries was worth 41 times; U.S. Steel, 14 times earnings; but Loew’s Theatres, 39 times.

The high valuation, in turn, sparked even more growth by conglomerates through mergers and acquisitions. With their stock prices rocketing, they could offer an almost irresistible deal to the shareholder of a company that seemed to be out of the growth “action.” The typical bid offered an exchange of shares at a rate substantially above the normal or prevailing price of the stock in the company to be acquired. Often, other types of security issues were utilized, making it difficult for casual readers of annual reports to determine the real or potential ownership claims on the company. Particularly popular were convertible debentures (a debt issue, similar to a bond, convertible to common stock) and warrants (similar to an option to purchase common stock).

## Low price earnings ratios made some companies particularly vulnerable.

“Some of the deals have been so attractive that a company’s size was no longer the protection it had been a few years ago,” says Richard S. Nye, a leading specialist in proxy solicitation and tender strategy. “Of course, companies like American Telephone and General Motors are completely invulnerable on the basis of size alone. However, I could mention 15 companies with a market value of between \$750 million and \$2.5 billion that were very seriously concerned about a tender. A company was particularly vulnerable if its stock was selling for a low price-earnings ratio. If it was selling at a price ratio of 15, say, a company with a price-earnings ratio of 40 could obviously offer the stockholders 20 times earnings and still improve their own earnings.”

Thus, Mythical Conglomerate could easily take over much larger XYZ Corp. Assume that Mythical Conglomerate had expected earnings of \$1.60 per share and that investors, in their optimism, thought Mythical worth 40 times earnings, or \$64 per share. XYZ, on the other hand, was trading sluggishly at only 12 times expected earnings of \$1.50 per share, or about \$18. If, in addition, XYZ had no debt, had no preferred stock outstanding, and had a great deal of cash or other current assets (all signs, in the Old Days, of a Prudent Management), the company was a sitting duck for a conglomerate on the prowl.

## It seemed as if conglomerates simply could not lose, even if mergers failed.

All Mythical Conglomerate had to do was offer XYZ stockholders one share of Mythical for three shares of XYZ. On the face of it, the XYZ stockholders would be getting stock worth \$64 for \$54. If Mythical preferred to buy out XYZ for cash, the high value of its stock enabled it to borrow heavily from banks for the purpose.

What about XYZ’s management, that loyal group that included some new, bright young fellows? Mythical simply offered to increase their salaries and to pad the benefits with stock options.

On a number of occasions it seemed as if conglomerates simply could not lose, even if a merger attempt were unsuccessful. In the case of Mythical Conglomerate, the generous offer to XYZ stockholders would trigger a rise in XYZ stock. If the Department of Justice then let out the word that it took a dim view of the merger, Mythical could then dispose of the XYZ stock it had already acquired, at a tidy profit.

With a high price-earnings ratio the key to continued growth through merger and acquisition, conglomerate managements paid much attention to the daily fluctuations in their stock prices. A former vice

president of a leading West Coast conglomerate says candidly: "When I was out there, everybody on the top-management side was expected to give a lot of optimistic speeches. The idea, of course, was to do everything you could to help keep the stock up—maybe even give it a boost if you could."

For such reasons, conglomerates have come under especially heavy fire for the way in which some of them have created the illusion, rather than the substance, of growth. One of the sharper critics is G. William Miller, president of Textron (itself a leading conglomerate), who says that "at its worst, the modern-day conglomerate is a pyramiding structure built on sand, creating growth in earnings with the use of financial mirrors."

## 'Pooling of interest' is a favorite growth device.

One of the favorite growth devices used by some conglomerates is known as "pooling of interest." Mythical Conglomerate, let us assume, acquired XYZ Corp. in December 1967. When the annual report for the year was published, XYZ's annual earnings were lumped into Mythical's, creating the impression that Mythical's earnings had jumped for the whole year. (In fact, the earnings of both Mythical and XYZ may have been lower than the previous year.) Furthermore, a year-by-year summary of earnings carried in the annual report gives no indication that XYZ and other acquisitions were not part of Mythical in prior years. Without reading the footnotes, a casual reader might assume that Mythical's earnings take a wonderful leap, year after year. In 1968, the Securities and Exchange Commission warned companies that they may be in violation of securities laws if they compare one year's pooled earnings with profits that are unpooled in previous years.

Method of growth, with or without mirrors, is not the only difference between the conglomerates and the old-line companies. Often noted (and promoted

by conglomerates themselves) is the idea that they are headed by colorful, dynamic people.

Conventional companies, on the other hand, have traditionally stressed the importance of "teamwork." The "organization" has been considered more important than the individual. A chief virtue, from top to bottom, is understood to be "loyalty to the company." There is, even in this highly mobile era, surprisingly little in-and-out flow in the top management levels of the large conventional companies.

Of the 12 top officers of U.S. Steel, for example, six retired between 1964 and 1968; all were replaced by men in the next lower echelon. Upper-echelon turnover in Standard Oil (New Jersey) amounted to seven of the 16 top officers; all were replaced by long-term Jersey men. General Electric, which has had its management ranks raided repeatedly through the years, and particularly by conglomerates in recent years, continues to promote replacements "from within." Indeed, the company feels obliged (because of the raids) to point out that the present management team "has service averaging 26.2 years."

IBM has also consistently promoted from within, the few recent exceptions being additions to the company's legal staff.

## Growth-minded investors tend to attach magical qualities to the man, rather than the company.

By contrast, the executive suites of conglomerates are fitted with revolving doors. Executives failing to reach earnings objectives are let go, sometimes noisily. Sometimes their management contracts are simply bought up, or allowed to lapse. More often, successful conglomerate executives move on to positions of more responsibility in other companies.

Former Litton executives, for example, are now presidents or chairmen of Walter Kidde & Co., Hunt Foods & Industries, City Investing Co., Teledyne, and Western Union. Former IT&T executives head up Colt Industries, P. Ballantine & Sons, Turner Corp., Crouse-

Hinds Co., Whittaker Corp., Kearney-National, Keene Corp., Crucible Steel, and McCall Corp.

Since conglomerates have always stressed management expertise, it was inevitable that growth-minded investors would begin to attach magical qualities to the man, rather than the company. Fred J. Borch (General Electric), Neil McElroy (Procter & Gamble), and Gordon Metcalf (Sears, Roebuck) are considered brilliant managers, but their resignations would hardly cause a ripple in the stock market; there is confidence that GE, Sears, *et al* have competent executives behind them by the dozens—and anyway, it's the organization that counts. Now, consider Franc Ricciardi. Who had ever heard of *him*? The stock market. On the strength of a simple announcement that he and some fellow executives were leaving Litton Industries to join the Walter E. Kidde Co., Kidde stock took a sizable jump. (Ricciardi left Kidde last April. He now heads Richton International Corp.)

## To encourage innovation, conglomerates emphasize entrepreneurship rather than organization.

A comparison of conglomerates versus old-line companies also raises important differences in form. The "traditional" companies have not hesitated to experiment with management approaches over the years, but any tinkering has been within an organization that remains highly structured. The most highly-prized *objet d'art* in many a conventional company is the organization chart. Now and then, over the years, a box is moved or a solid line is turned into a dotted line. This year's favorite involves creating a new box called the "Office of the President," which shows a few vice presidents sharing the "Office of the President" with the president. But the critical decisions are still made where they have been made for decades—by the Executive Committee.

Many conglomerates (and some notable non-conglomerates) have a "free-form" organization, which gives individual managers the kind of authority and

responsibility they would have if they owned the business themselves. This emphasis on entrepreneurship as opposed to organization is claimed to encourage the innovation that is necessary for "growth."

In the usual conglomerate organization, a small headquarters staff handles financial planning, capital allocation, PR, legal, and accounting matters. The operating managers, meanwhile, are given free rein to innovate in their particular areas of expertise.

The efficient use of capital and human resources, afforded by the free form, has a "synergistic effect," the conglomerate leaders claim. They believe the combined efforts of a group of experts and the pooling of capital resources will have a greater impact on a company's growth than will the sum of individual talents or capital resources. Synergism, they contend, enables conglomerates to infuse new life into a lagging company at the lowest cost.

"All elements of the modern, multimarket organization receive direct and indirect benefits by way of synergism," says David N. Judelson, president of Gulf & Western. "The organization can provide its various acquisitions with very real assistance in the way of financial resources and the necessary managerial and technical talents. The acquisition acquires something, too — the funds and talents required to accomplish far more than it could on its own."

Judelson cites a number of acquisitions that have benefited from joining conglomerates. He points out that Gulf & Western itself acquired a small manufacturing company that had reached \$1 million in sales in 12 years of existence but could not expand further because of lack of capital. But with G & W capital and management specialties, the company is now doing \$12 million in sales. In another case, a company that had taken 45 years to reach \$18 million in sales increased sales to \$38 million in two years after joining G & W.

A substantial inquiry into synergism was made by John Kitching, a marketing development expert, while at Harvard Business School. In a study of the results of 69 acquisitions, he found that some companies

distrusted synergy to the point of completely discounting it in an acquisition. The study points out that the synergistic effect of an acquisition should be analyzed separately relative to finance, marketing, technology, and production. Its conclusion: "Synergy is most easily accomplished where financial resources are pooled, and is most difficult to achieve where production facilities are combined." A more important element, Kitching decided, is the "existence or absence of 'managers of change.'"

More recent developments must also be considered. By mid-1969, merger and acquisition activity by conglomerates was under study or attack by the Department of Justice, the Federal Trade Commission, the Federal Communications Commission, the SEC, and several House and Senate committees. The most significant step of all has been taken by Justice's antitrust division in attempting to force Ling-Temco-Vought to divest itself of Jones & Laughlin Steel Corp. The Justice Department succeeded in obtaining a court order preventing Ling from taking over operational control of the steel company, even though he now has a large majority interest. Ling has asked for a showdown on the issue.

## Large acquisitions of big conglomerates wane with stock market prices.

The authority of the Department of Justice to curb mergers and acquisitions of conglomerates is by no means clear. Richard W. McLaren, chief of the antitrust division, says, however: "I believe we can and should go after some big-company mergers of a somewhat 'purer' conglomerate nature than have thus far been ruled on by the Supreme Court. In my view, many such mergers have a dangerous potential for substantially lessening competition and unduly increasing concentration."

With stock market prices off, large acquisitions by the big conglomerates are also off. The critics say this proves what they've been saying all along — that

conglomerates cannot grow at their accustomed pace without a bull market that lifts price-earnings ratios. Conglomerators deny that this is the case. Lawrence P. Klamon, vice president of Fuqua Industries, says that "people who realize the benefits for them and for us are not going to change their minds just because of tight money."

The top managers of several leading conglomerates say that, in a period of marking time, they intend to focus on "internal" growth.

"Our whole program emphasizes internal expansion," says J. F. Bradley, Jr., vice president for finance at TRW, Inc., a conglomerate that embarked on an acquisition binge in 1968. He adds that the process of concluding a merger or acquisition is so long, it is difficult to ascribe any single cause to a fall-off in activity. Washington's antitrust actions, however, are a leading cause, in his opinion. Charles Bluhdorn, Gulf & Western chairman, says that the company's own acquisition pause will allow "more time to remedy problems inherited from some of the acquired companies."

Regardless of the outcome of the conglomerates' current difficulties, it appears that their surge has had some impact on the old-line companies. Conglomerate readiness to give bright, young middle managers the chance and the risk to handle real responsibilities has caused a number of older companies to take a second look at their advancement policies.

At the same time, government action against the conglomerates is not likely to curb significantly the urge of company managements to grow by merger and acquisitions.

The president of an Ohio steel products company probably reflected the feelings of a lot of businessmen as he spoke recently of attempts by several conglomerates to take over his own company. He was relieved, he said, that the current lull had taken off some of the pressure. But then, lapsing into familiar shoot-'em-up jargon, he added: "Now that we're out from under the gun, we might begin looking around for some good companies ourselves." □

# NOT FOR THE BRICKS BUT FOR THE PEOPLE

You have 800 New Yorkers, most of them female, and you want them to move to New Jersey. You consider the problems. You plan how to solve them. Then you try to.

The transplanting of business from city to country has become, if not common, at least frequent enough to have produced a base of experience for the industrial community. Such companies as General Foods, IBM, American Cyanamid, Allied Chemical and many others have had ample opportunity to practice the virtues of advance planning for such a move, both for physical plant and for the people who work in it.

Since advance planning has long been a way of life in the Bell System, it is scarcely surprising that AT&T's preparations for moving a small but critical part of its operations from lower Manhattan to central New Jersey started nearly three years before the event. Involved were about 800 people who handle share owner records and relations, as well as data processing. The preparations were generated by two rapidly developing aspects of the business: the burgeoning use of computers, and the complex demands of handling over three million share owner accounts.

In the 1950s, as the number of AT&T's owners rose above the million mark and soared toward the second million, the company's treasury department ran out of room for coping with the mounting flow of correspondence, stock transfers, records, debenture issues and dividend mailings inherent in the world's most widely held business. To provide the needed space, AT&T purchased a large, four-story building

a few blocks from its home base on lower Broadway. The entire share owner operation was moved to that facility in 1953.

However, in an era when computer technology is changing not only the form but also the techniques of business administration, one wall-stretching maneuver like this one rarely assures a quiet and changeless future. The nature of share owner affairs made that part of AT&T's treasury work a natural for the record-keeping capacities of the electronic workhorse. In March of 1956, the company's management began to eye the possibilities of computerizing its share owner records. Only two years later, the first computer system was installed.

Inevitably as an eight-year-old outgrowing shoes, the system slowly outgrew its quarters. The business expanded, its owners increased steadily in number toward three million, and by the mid-1960s, the need for more space was beyond any alternative. Furthermore, the Bell System by then was on the brink of implementing its own nationwide business information system, tagged with affectionate brevity as BIS. At its heart was to be the third-generation computer, with planning and direction to come from AT&T and a new division in Bell Telephone Laboratories.

Late in 1966, AT&T's management was melding its assessment of things to come with the expertise

of architects and computer designers. The parameters of the problem were rather quickly established: the requirements called for 80,000 square feet of floor space, all on one floor. The compass of decision therefore pointed out of the city, where such a requirement could not be met, to open country where it could. The Bell System owned a 92-acre tract of land in Piscataway, N.J., on the Raritan River plain, which is somewhat above the center line of the Garden State and about 35 miles southwest of New York City.

### **Parkways, Princeton and Penn Central**

The area fulfilled other requirements: it was dynamic, growing and accessible. Its flat farmlands, dotted with islands of woodland, were bordered by the Garden State Parkway and New Jersey Turnpike, with a gleaming segment of the new Interstate 287 running near the planned site. Since it was almost on a direct line between New York and Philadelphia, train transportation was available via the Penn Central in the nearby towns of Metuchen and New Brunswick. The home campus and University Heights campus of Rutgers University were in New Brunswick and Piscataway respectively; Princeton University was a half-hour's drive to the south, Newark Airport 45 minutes to the north; there were many fine residential sections in the vicinity. And the same virtues which made the Raritan River site a logical choice for AT&T also made it attractive for other industries, such as American Standard, Colgate and Chanel.

With architects actively transforming functional needs into tangible form, AT&T began a "community interface," appointing John J. Driscoll as manager, community relations. Promptly joining the Piscataway Chamber of Commerce, Mr. Driscoll commenced the twofold task of introducing the Bell System as a new neighbor, and of learning everything there was to know about the Raritan River area. Acquaintance on both sides grew through innumerable talks and meetings with community and indus-







trial groups, municipal officials and other businessmen. The environmental aspects of the move from city to country were well under way.

"Then," says Mr. Driscoll, "comes the moment of truth when you have to tell your people about it. After all, we were not simply moving computers into a new building. We were asking 800 people who were working in New York to move to the country in New Jersey. It's not far on the map, but to many of them it would look like another world."

Although such a move is far from unique in the business world, there were special aspects of the problem peculiar to the Bell System. As assistant treasurer George N. Armstrong points out, "The task was formidable. The force involved in the transfer was 85 percent female, and covered the full spectrum in ages, skills and salary levels. Unlike many other people in the Bell System and in other kinds of business, those employees were not accustomed to job transfers and associated house-hunting as a way of corporate life. On the contrary, many of the women are married and actually do not need to work, or their husbands cannot or will not change residences. Still others came from out-of-state expressly to live and work in New York. The problem was further complicated by the fact that the local labor market could and would absorb those people if they chose to remain in Fun City."

### **The priority human factors**

Highly competent employees with 15 to 20 years of service are valuable and not easily replaced; keeping as many of them as possible through the transplanting process was mandatory. With the need to move established and the technical problems in process of solution, top priority then was dealing with the human factors in the equation. But, as Mr. Armstrong says, there was no primer, company, group, agency or consulting firm that had all the answers for successfully handling a major move like this one.

"There are so many variables in such an under-

taking," he adds, "that there is no 'best' or 'right' way to do it. We had to start from scratch, making our own ground rules, deciding our own sequence of events — not for the bricks or the machines, but for the people."

Consequently, the treasury department's management launched a comprehensive employee information program, carefully designed to leave no questions unanswered. The natural human need for basic facts had to be satisfied at the outset, and sustained. New and elaborate bulletin boards placed on each floor of the New York building on Varick St. in September 1967 told a graphic and fluid account of the timetable of the move to Raritan River Center, the status of construction as it progressed, how the company would help employees financially during the transfer, what it would be like living near the new location. These were followed in December by the opening of a large, first-floor information center where people talked at great length with company relocation counselors about living in New Jersey in general, or about a particular town or area.

## **A 100-page profile**

And while the information program was in full swing, the community relations staff gathered data on 50 towns in the Raritan River area, compiling it in exhaustive detail in a 100-page book. This community profile gives two pages of information on each of the 50 towns, with supplementary data on taxes, schools, utilities, transportation, insurance rates and banking facilities.

The 50-town profile, which became the "bible" of the move, was given to all employees facing relocation early in April of 1968, and was followed later in the month by a "move kit." This double folder contained more information on Piscataway Township itself, and a copy of the company's official relocation practice. In May, as walls rose on foundations at Raritan River, a series of slide presentations gave employees in New York a colorful preview of

the 50 towns covered in the community profile. Concurrent with the slide shows were orientation meetings during which counselors explained the relocation practice, reviewed once more the why, where, when and how of the move, and described Saturday bus tours around the site soon to be offered for employees and their families. With the knowledge that many of the people listening were facing their first move, counselors concluded the meetings with a final slide talk on "How to Plan Your Move."

AT&T's managers of its stock and bond division had planned their move with elaborate care; and, in May 1969, exactly on schedule, the doors of Raritan River Center opened to admit the first tide of Manhattanites flowing down from the city into central New Jersey. They were joined by about 150 members of Bell Laboratories' BIS group, and about 50 more to supply essential administrative services. Newly installed computers are now rapidly covering their destined floor space, with a possible future addition to the building planned to accommodate still more. Shared-time use of the new machines provides data processing services not only for the treasury department's share owner records, but also for BIS at Raritan, and AT&T's general departments in New York City.

James M. Wells, director, personnel and results at R.R.C., says, "In most ways, we can write 'Mission Accomplished' over our move. We're here, the hardware is functioning, even the shrubbery is beginning to look good. There have been the inevitable bugs, and we're pretty sure we're going to need more computer space. But that problem can be solved on drafting boards. What can't be solved quite so easily are the people problems. I doubt that anyone is surprised we have them, but I also doubt that anyone has any quick answers. There are no quick answers when you're dealing with the personal affairs — and the emotions — of several hundred people. And the emotions are involved because the roots at home are touched. Although a fair number have moved to date, a large group are still com-

muters. It isn't that they can't find anything attractive here; it's just that it's difficult to leave what they have had for so long, in some cases for a lifetime."

In many instances, too, Mr. Wells points out, it is not even a matter of what the people may or may not *want* to do. There are many who cannot afford the luxury of options. There are women, for example, who are the sole support and companion of an aged parent or other relative — people too old or too ill to undergo the rigors of moving. They may still be living in the original family home in Brooklyn, the Bronx, Queens, Staten Island, or Manhattan itself. The roots of a lifetime in a neighborhood go deep and are not lightly excised. The simple security of daily congress with old friends, neighbors, local merchants; the familiar view from a window, familiar sounds from street or river — these are not easily traded for the unknown quantities of new surroundings, pleasant and convenient though those may be.

There are other stringent obstacles to the unsettling business of pulling up stakes in order to live within practical distance of the job. Although people slated for the transfer had known of it for nearly two years before the fact, many who own their homes in the metropolitan area are reluctant to sell them and buy others in Raritan at the present inflated cost of mortgage money. These same homeowners may also resist the idea of selling, then renting an apartment, because they feel that life in any multiple dwelling cannot yield the qualities of life in a separate house. And there is the ancillary problem of paring down the contents of a roomy home to fit the confines of much smaller quarters.

### **New window on life**

Examples of smooth transition may be conspicuous because of their rarity, but some there are. One woman, recently widowed, welcomed the chance to leave surroundings that had become simply the repository of memories. Another who had always lived with her family near New York embraced a philoso-

phy of if-you-can't-beat-'em-join-'em. She found a congenial apartment within a short drive of Raritan Center, took driving instruction, obtained her license, bought a car, and is now happily assimilated into suburban New Jersey. The move across the river, she says, has opened a new window on life for her.

Many of that large majority at Raritan who have not as yet transplanted their homes come to work from all the five boroughs of New York City by private car or car pools. There are some — about 120 — who, for one reason or another, do not have access to these means of commutation. To help tide them over during the transitional period, AT&T runs a bus service from Brooklyn and Staten Island, the Port Authority terminal on Manhattan's west side, Jersey City and Bayonne across the Hudson, and from railroad stations in Metuchen and New Brunswick.

The company undertakes to pay all relocation expenses for an employee's move up to one year from the date of the original transfer, but not after that time. The relocation practice offers, also within a year of transfer, extensive aid in selling one's home, lease disposal, exploratory trips and other expenses.

### **Writing the book**

Although problems such as these were foreseen, foresight alone could not solve them. The Bell System, after all, has had years of experience in establishing Western Electric works and distribution centers — large installations which involve hiring and relocation of thousands of people. But the move of AT&T's share owner operations from New York to the Raritan Center is unique.

"This is the first of *its kind* for the Bell System," George Armstrong emphasizes. "We've had to write the book as we went along. If we've missed a chapter somewhere, the only way we'll ever know is by living with it for a while. I'm sure our problems will be solved, because they have to be.

"We needed a location with room for the future," he says, "and we have it here." —Don Woodford □

America's interest in the ocean remains overshadowed by other problems. But three leading oceanographers see a coming revolution in exploiting the many resources of the sea.

## The Ocean: Waiting to Yield Its Riches

by Michel Silva

The President's Commission on Marine Science, Engineering and Resources presented its blueprint for U.S. ocean development to President Johnson last January. But he left office and President Nixon is at present too deeply occupied with other matters to give American efforts in ocean development the big push. Congress isn't much interested either, except where immediate concerns of national defense are specifically involved.

The ocean — full of promise, solutions to many problems we face, and tangible returns on investments—waits for swelling national interest. It is left largely to pioneers to develop: people like Taylor A. Pryor of Hawaii, a marine biologist, entrepreneur, promoter. Acronymically known as "Tap," Mr. Pryor has spent the last few years establishing Hawaii as a major center of oceanography. He started just a few years ago with Sea Life Park, now a major Oahu tourist attraction. Revenue generated from Sea Life helps support the activities of Pryor's Oceanic Center, an umbrella foundation that covers increasing activity in ocean engineering, testing and basic research.

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*Mr. Silva, special projects editor at Playboy magazine, grew up "in the ocean" near Los Angeles and has written several articles on oceanography.*

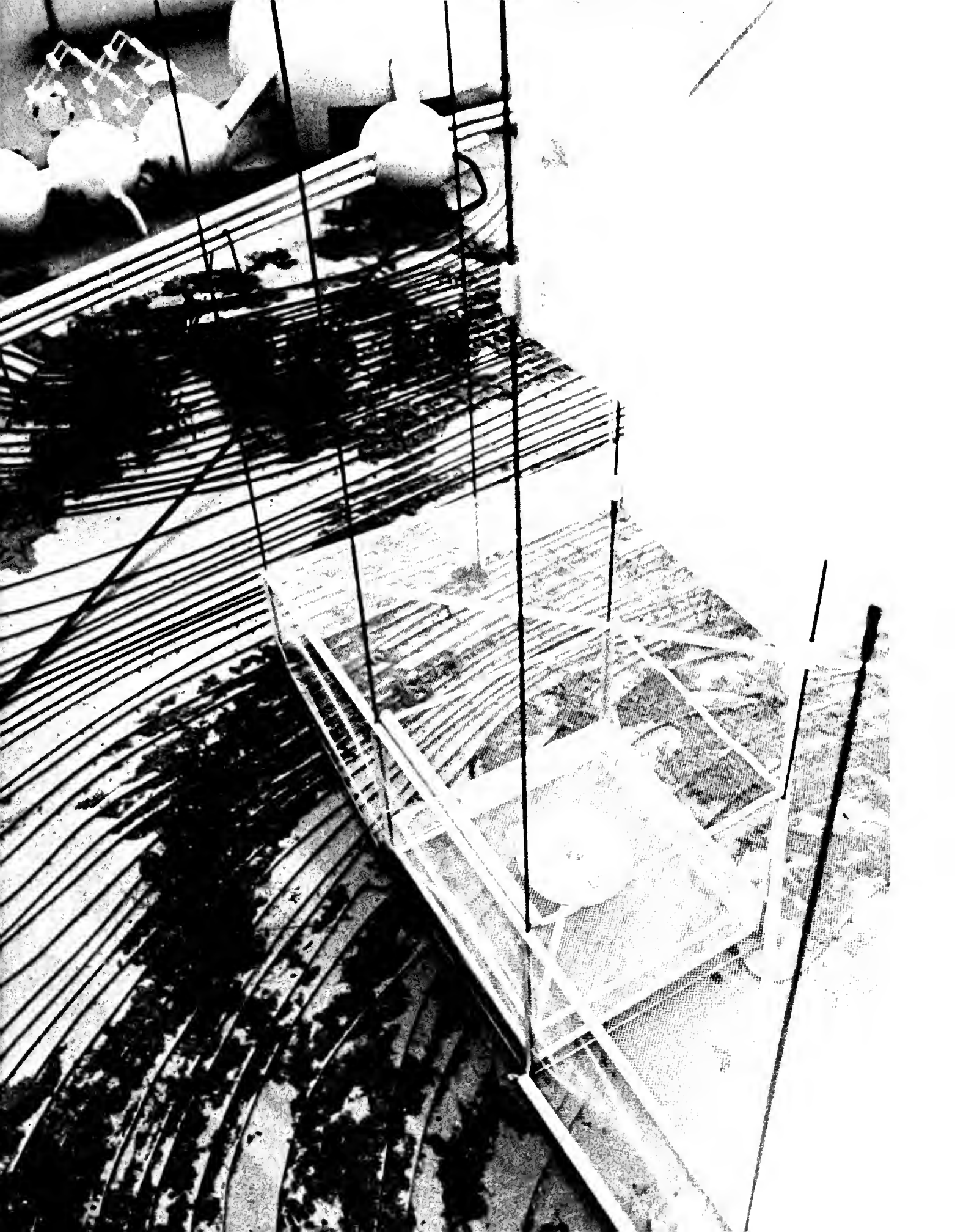
Tap's activities in the ocean earned a place for him on the presidential commission which studied ways this country should begin major efforts in the ocean.

Tap himself sees four revolutions in the ocean coming sometime during the 1970s: aquaculture, aviation oceanography, man in the sea, and deep submersible freedom.

Aquaculture: This, says Mr. Pryor, is in the primitive, almost start-up phase now. Indications are that it can move into the big leagues quickly. "There is," says Tap, "not only a projected but an existing worldwide demand for protein, and the potential for supplying this is in the sea.

"What is necessary is to economically establish, control and harvest that potential. We're just getting there in two ways. First, control over certain fishes, as we have had over poultry, where you can fertilize and hatch eggs any time of the year, raise the young, and select from those the breeding population."

Fish can be bred for size, taste, and skeletal structure. And they don't even have to taste like fish. (One operation in Key West is successfully producing shrimp under artificial conditions. The shrimp taste normal, are of good size, but come out an unpalatable brown and can't be sold. But that problem will



*Overleaf—A model of an undersea complex designed at the Illinois Institute of Technology demonstrates how man can exploit the continental shelves for food, mineral resources and other life-sustaining needs. In the foreground is a proposed fish farm, a system of 50-foot netted cubes intended to improve quality and quantity of food fish.*

be solved and there will be shrimp farming.)

Mr. Pryor's Oceanic Center has had a fish-farming project at Molokai for several years. It involves restoring ponds fish-farmed by early Hawaiians, who realized about 200 pounds of protein per acre. Mr. Pryor's project, under the direction of Dr. Ken Norris, head of aquaculture at the center, is aimed at developing up to 2,000 pounds of protein per acre by more advanced methods of controlling the life cycle of mullet than the Hawaiians used. "One of the beauties of fish farming," says Mr. Pryor, "is that such farms can be put alongside hungry villages anywhere they are needed. Most of the time you can eliminate the complications of distribution."

The Ummi Indians are realizing incredible returns on steelhead trout near their reservation at Bellingham, Wash. The technique involves diking tidelands, raising steelheads, and releasing them into the great pasture—the deep ocean—after 18 months. Two years later the fish return at the rate of 20 percent, or a bulk return of about 30,000 pounds of steelhead per acre. The Ummis are building an industry there and, to boot, are becoming able marine biologists.

### Taking away the toys

Aviation oceanography: It begins to look as if anything that can be accomplished from the decks of or inside an oceanographic vessel can be done just as well from the air—only vastly cheaper and easier, says Mr. Pryor, a former Marine helicopter pilot. Cargo aircraft, he says flatly, will replace the oceanographic vessels that are in general use today and are costing the various institutions involved in studying the ocean great hunks of their budgets.

A Lockheed Hercules, for example, could be rigged with equipment for infrared scanning, for dropping and recovering instrument packages, even ultimately to lower and recover men in submersibles.

Oceanographic institutions will scream bloody murder when someone starts taking their toys—surface ships—away. "But," explains Mr. Pryor, "when they begin costing out one mission (surface) against



the other (air), there won't be any justification for not doing it in the air."

The glass submersible: Glass, Plexiglas, glass ceramic, ceramic, and fiber glass will provide access for the first time to the deep sea with the ability to really see it and to have endurance and distance. The use of metal—which would be virtually eliminated in a glass submersible—requires buoyancy in the deep sea. When you add buoyancy, you add bulk, which reduces the efficiency of forward motion, the amount of cargo, and the capability of carrying life-support systems for long stays at great depths.

"By breaking from tradition," Mr. Pryor explains, "and going to a material that has a very high strength-to-weight ratio, you can have good hydrodynamic design for good forward motion—and you can carry enough life support to stay down as long as necessary."

### Heavy traffic on the ocean floor

"The revolution is there and once you have the equipment, you use it," says Tap Pryor. "And that means people in this next decade are going to be all over the bottoms of all the oceans. Depth will no longer be a limitation, either economically or from the standpoint of technology. We will be able to go where we want and do whatever we want to do."

Man in sea: We are in the "open cockpit" stage—men going down in pressure pods and getting out-



*Left—Terminal dock in undersea display receives mining and surveyor vehicles which search out mineral deposits from the ocean floor. Right—Cutaway of sea-bottom dome views part of the coordination and maintenance center for the undersea system.*

side. "But, we're doing enough now," Mr. Pryor believes, "to know that we can do a lot more soon. We can go to the whole systems, man-in-the-sea systems, in which you essentially isolate yourself from the environment instead of fighting it, getting lost in it, or getting killed by it. You can create your own environment wherever you want to work. You'll still be under atmospheric pressure—under pressure tents on the sea floor that cover an entire work area. Man will move from area to area with his habitat alongside."

Once systems such as those Mr. Pryor describes are created, non-divers can be trained to work within the systems as routinely as a stewardess works inside a Boeing 707 without knowing how to fly it. "Once you get the non-divers—the scientists, petroleum engineers and lots of others—working routinely on the bottom, the revolution will be over and a new revolution will begin," Mr. Pryor says.

One other big problem he sees is ownership in the deep sea. "Offshore ownership—past the continental shelf at depths greater than 2,000 feet—is a legal question, of course. By lease or by ownership, we have to stake out private, organizational, and national authority over not only areas and bottom resources but even over populations of fish and organisms so they can be managed in an economic manner. This requires transferring all kinds of ownerships we find useful on the shore to all the areas and resources that

we are going to find useful offshore, he says.

Mr. Pryor is one of a legion who sense now that the thrust of ocean development, for the time being and excluding national defense, will come from the private sector. He doesn't think we can count on the government, or large industries or organizations to create technical revolutions. He is banking on "small, isolated groups of mavericks" that tend to force change to bring about oceanographic revolutions.

One of those mavericks is William B. McLean, technical director of the Naval Undersea Research and Development Center in San Diego (formerly the Naval Undersea Warfare Center). Many of today's young ocean pioneers are devoted to Dr. McLean. Mr. Pryor describes him as "the great leader to us all."

### **'Better than what the Navy has'**

Until Dr. McLean moved to San Diego recently, he was for years at the U.S. Naval Weapons Center at China Lake, Calif. He became especially known there for his garage — a "skunk works" — where he putters and spends a great deal of time. Out of that garage, by the way, came the sidewinder missile.

A great deal of Dr. McLean's thoughts and ideas involve glass and plastic submersibles, which he thinks hold one of the vital keys to deep-ocean development. He compares their position today to the position of skin diving in 1940, when he got involved in the sport. He feels certain that the national thrust into the ocean will come from people getting involved in glass submersibles as a recreation rather than a labor—the same way popular interest and involvement in skin diving led to the development of the sophisticated and varied equipment of today. "Much of what's available to the public today," Dr. McLean says, "is better than what the Navy has."

Dr. McLean foresees developing submersibles that people will trailer around just as they do pleasure boats today. He sees plastic submersibles as best for widespread use because of low costs.

He's certain that the glass or plastic submersibles will make the ocean available to people without phys-

ical endurance, and who don't even swim. Non-swimming sports enthusiasts, just like Mr. Pryor's workers-within-a-system concept, will be able to go to deeper, more exciting depths because their submersibles will be at atmospheric pressure.

"Submersibles should allow the individual sportsman to extend operations from 60 feet, which most skin divers achieve now, down to 400 and 500 feet, and eventually throughout the whole ocean," Dr. McLean says. "The number of pleasure boats in the country indicates the tremendous reservoir of funding available for exploring something new and that many people love the sea and want to be in it. For these people, I think it's very important to be working toward the creation of a vehicle as reliable and as economical as the private automobile or airplane."

### Traveling at 18,000 feet—underwater

The first major feat in a transparent hull vehicle will be taking place shortly in Hawaii—a mission Tap Pryor has been planning for several years. In about a year, Tap and his close friend and associate, Will Forman, designer of the glass sphere, will go on a 3,000-mile nonstop underwater trip from Hawaii to the coast of California, sometimes reaching depths of 18,000 feet. That will be a feat as vital to ocean development as Lindbergh's trip was to aviation.

One of Dr. McLean's concerns is the need for more money being devoted to ocean research. "The real source of funding for undersea exploration," he says, "has to be private capital if it is going to move ahead rapidly. Big installations will have to be funded by the government because they are not commercially suitable. Industry will fill in between the big installations and the interests of the private citizen."

He expresses doubt about whether large organizations—government or industry—have the ability to innovate quickly enough; he sees a need for smaller organizations to become involved in ocean research. "The inherent size of big organizations makes anything they do of general concern, and therefore anything they do wrong creates a greater handicap than

it would for a small organization," he says.

But Dr. McLean also believes, that in the international ocean, the government ought to be ready to protect U.S. interests.

"The main problem with anything in this area," he explains, "is that none of the nations involved is yet willing to give up its sovereignty. If you want a replay of the arguments and problems involved, consider the arguments put forward by the Colonies relative to the establishment of our government."

### Monstrous meetings vs. useful work

He adds that the attempt to coordinate all ocean exploration activities "generally transfers useful work into planning, and results in things like the monstrous oceanographic meetings prevalent today. The people doing things now are few in comparison to those who want to hear about events."

One of the big doers is John P. Craven, chief scientist of the Navy's Deep Submergence and Strategic Systems Projects in Washington, D.C. Dr. Craven divides his predictions for the coming decade into the "two-and-twenty" program — activity on the continental shelves to 2,000 feet and in the deep ocean to depths of 20,000 feet. Most of the activity, Dr. Craven feels, will be at continental-shelf depth and oil will be the big resource. Offshore platforms are reaching unmanageable heights, and accidents like the Santa Barbara misfortune cannot be kept at acceptably low levels, he believes, and therefore oil companies will be moving quickly to the ocean floor.

This scientist is deep into thinking about ports and harbors. "As we know them today," he says, "their day is about over. The 200,000-ton tanker is the way to transport bulk wet cargo and few ports and harbors can take that size ship. So there'll be increasing development of offshore loading and unloading. Although we don't have any now, I think we'll develop some underwater terminals which connect with large craft at open sea to discharge wet cargo. The large tanker is just not going to enter the port any more.

"At a slower rate, this will happen to dry cargo.



*Below the sea-bottom dome, housed in a nuclear-blasted cavity in the ocean's floor, is the control center for all undersea missions and home for the 50 persons who operate the system.*



In Tasmania, they have an ore transportation system in which ore boats make up to a heavily fendered pier essentially on the high seas. A long conveyor belt carries ore 80 miles across Tasmania out into the open ocean—independent of any port or harbor—and just dumps the stuff into the hold of the ship."

This is indicative of the fact that technology is looking for ways to cross the sea-land interface without coming into port. This means the use of continental-shelf areas once thought fairly rugged as perfectly legitimate bases of operation. "The idea," explains Dr. Craven, "is to convert the whole coastline into a continuous 'T' for transporting goods and cargo, rather than be bound up to a harbor location."

### Crossing a cultural gap

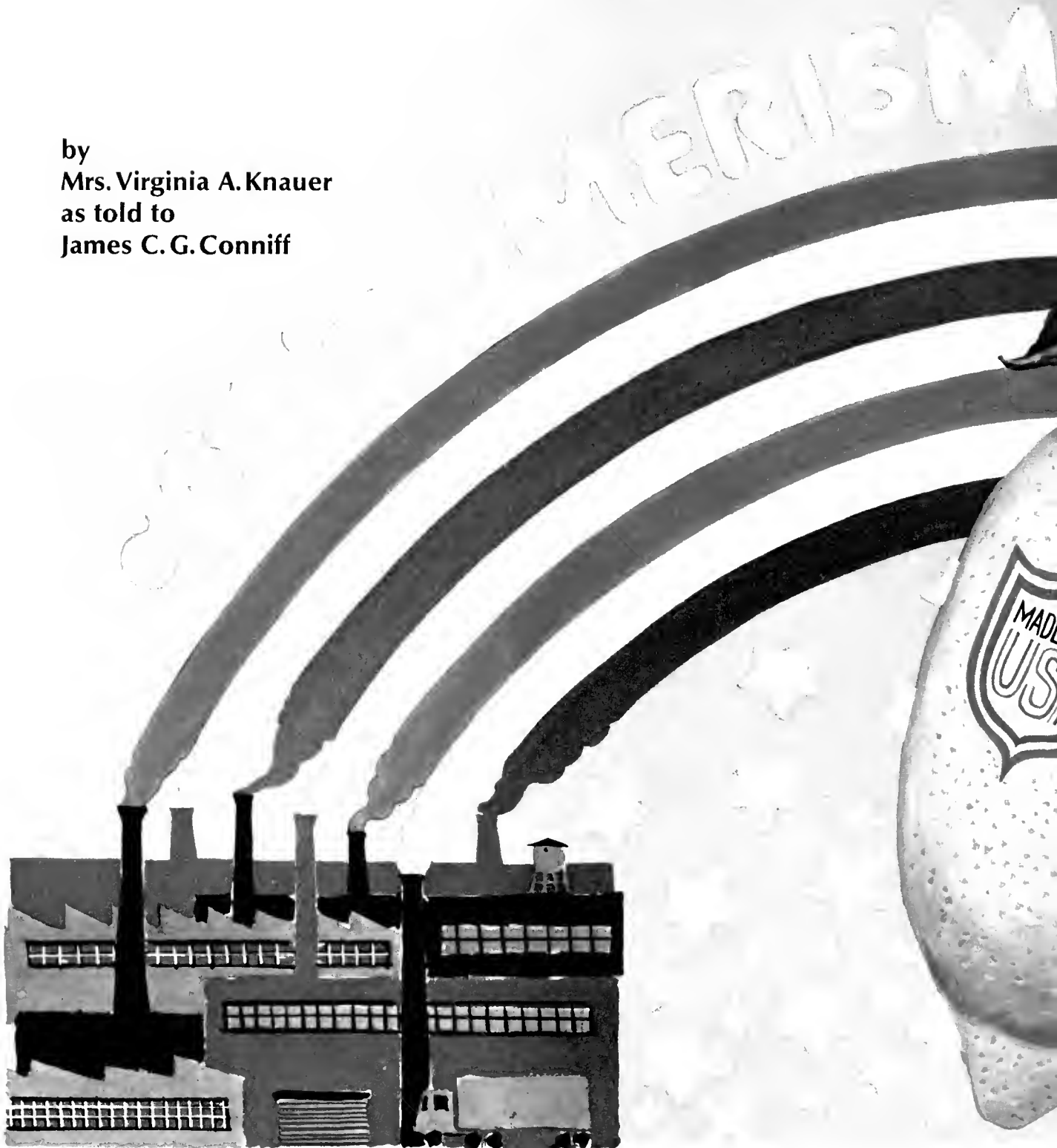
Dr. Craven feels that the potential for the deep ocean is more long range: "Oil in the deep has a curious factor—hydrostatic power as well as the oil itself. By the time you bring oil up from the deep ocean, it is developing hydrostatic power that could turn turbines. But that's way down the pike.

"For national prestigious and military purposes (and for arms control inspection purposes) nations will develop limited, 20,000-foot search and salvage capability. When they do, they'll learn that if they use the right materials, like glass, the whole thing will not be as expensive as they thought.

"We have to get way past this point, however, before people will start to look at the ocean as anything more than a place to look at. In my view, we have to get across a whole cultural gap here. We need Tap Pryor-type vehicles before people will begin saying that this is really worthwhile. Then we have to get a fair number of military vehicles down there before the military and industry will agree that the technology is good enough to try it. Then the oceanographic institutions have to realize they can buy a few submersibles to go down. Then, finally, someone realizes there is a pilot plant for manganese nodules or oil explorations. I take that as end of the century. That's the ocean for you." □

Do you sometimes wonder why "zero defects" standards—or at least a closer approximation of them—cannot apply in consumer goods the way those standards have had to apply in space hardware, for example, to put men on the moon?

by  
Mrs. Virginia A. Knauer  
as told to  
James C. G. Conniff

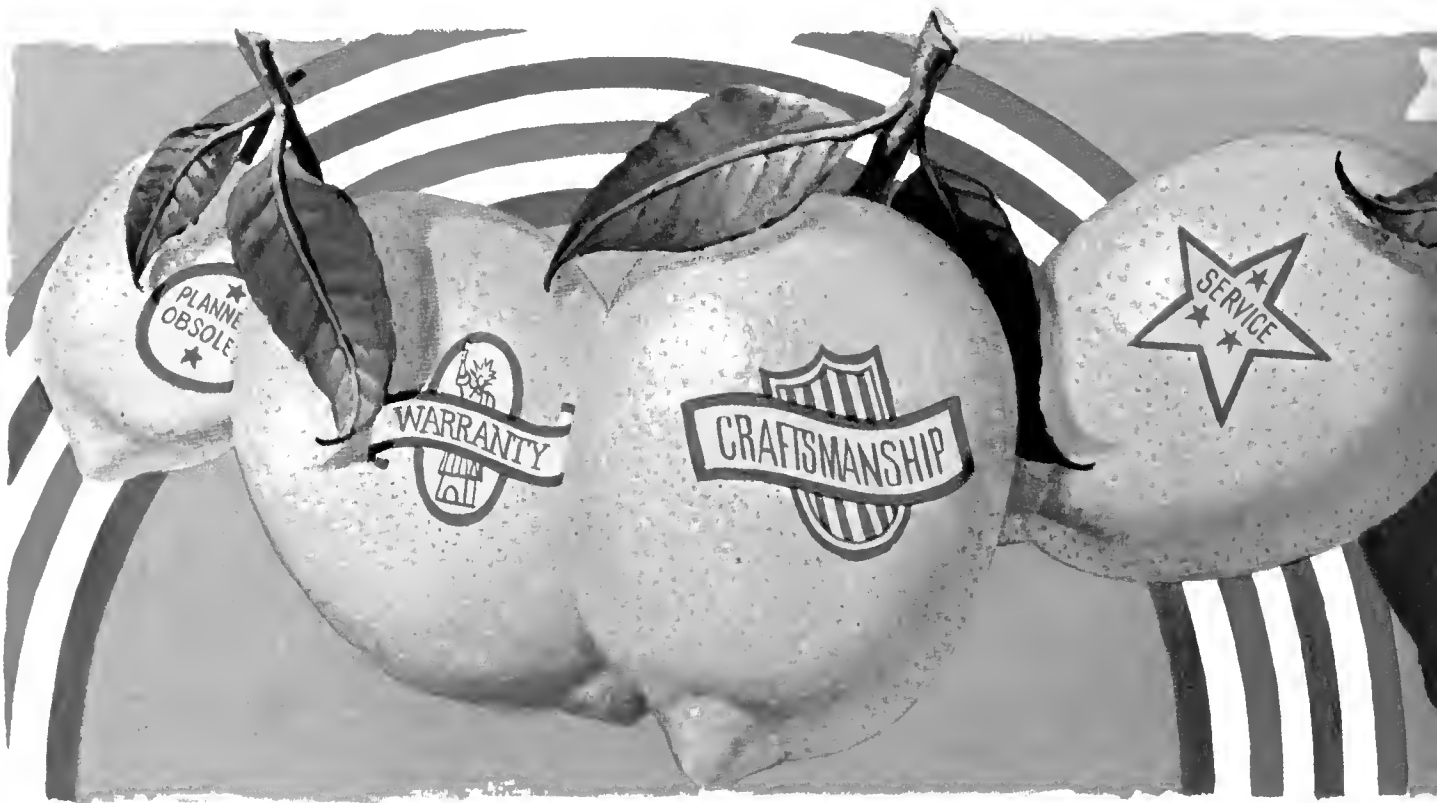


Would you like to see a car, a dishwasher, a tire—a pair of blue jeans or a girdle, for that matter—which could reasonably be expected to deliver what the ads promise? If the product failed, as anything man-made can fail, what about having those responsible make

good on your purchase 1) without a lot of argument and 2) promptly, with a smile?

Don't give up hope. It's no longer an impossible dream. Consumers are today on the march for what they regard as long overdue fair play from business and industry. Their increasingly vocal statement of their case has begun, here and there, to make the more market-sensitive entrepreneur undertake a re-





vision of his approach to consumer needs in our demand-oriented economy.

For what the fed-up consumer is saying, as perhaps never before, should bring home clearly, to the Main Street retailer and automotive giant alike the obligation to "put your house in order or have Uncle do it for you." Too many in business, alas, seem neither to be listening nor to be studying the handwriting on the wall.

There is a double irony at work here for which businessmen have largely themselves to thank. Consumers feel they are still unable, for the most part, to get top management to take the initiative by adjusting quality control in manufacture and maintenance dependability in service to satisfy legitimate consumer expectations. Lacking that kind of con-

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*Mrs. Knauer is the special assistant for consumer affairs to President Richard M. Nixon. Mr. Conniff is an assignment writer specializing in business and medical subjects.*

cerned cooperation—the kind that could do much to slow the trend toward overly severe regulatory response—they have turned in despair to government in increasing numbers.

Firsthand experience with consumers and industry and the more than 1,500 letters of outraged complaint which pour into my office every month show the severity of the problem.



These letters come from consumers who feel they've been had by every type of businessman, from panty-hose manufacturers whose sizes on this non-return item don't always jibe with individual anatomic imperatives to the drug manufacturer who—whatever detailed label informa-



tion the Food and Drug Administration may require of him—"neglects" to print instructions on his products in letters big enough for older people to read without the use of a magnifying glass.

Consumer protest focuses also on such matters as shoe sizes limited to "granny" styles, frocks which by concentrating on the teenage market ignore the needs of those no longer in their teens, and anything-but-cheap clothing which falls apart when rot-prone seams and "economy" zippers collapse. Almost as trying is the persistence with which clothing manufacturers overlook special problems the elderly may have in dressing—easier-to-get-at zippers, for example—and, for that matter, the continuing desire for attractive styles which, believe it or not, a lot of us grandmothers entertain.

From cars to carrying charges to privacy of credit data, there is no sector of the buyer-seller relationship that does not bristle with consumer complaints.

That the bounteous productivity of our affluent society should involve its share of letdown is, humanly speaking, almost inevitable. Look at some of the figures. According to *Automotive News*, we have 91 million automobiles on our highways and are adding to them at the rate of some nine million new cars a year. In our homes we have in service nearly 60 million each of electric refrigerators, washing machines, vacuum cleaners, toasters, and irons, and between roughly 10 and 50 million each of electric dishwashers, food-waste disposers, blenders, air conditioners, coffee makers, frying pans, freezers, can openers and so on.

It is hardly surprising that among so many categories of machinery in such overwhelming numbers, headaches arising from one kind of malfunction to another should comprise the bulk of consumer complaints. On that score the manufacturers' view seems to be, "With the vast majority of such an enormous

number of units quietly doing their job, we think we deserve more praise than censure. And we're constantly improving service for the comparatively few that do conk out."

The consumer-owner of a conked-out unit takes an even more simplistic position: "Why mine? Couldn't you have put it together more carefully? What are you going to do about it?"

I have a mandate from the President to do something about it. That mandate is to see to it that consumer interests are fully and fairly represented "at the highest levels of government" by my serving there as "the voice of the consumer."

I try to articulate that role at every opportunity. Where none serves, I am not above making opportunities. For instance, I plan to drop in unannounced on a number of plants where manufacturers are either innovating consumer-helpful practices or need to be stimulated in that direction. I believe firmly in seeing for myself.

I publicly applaud the introduction of "tell-tags" this Christmas season by an Ohio department store chain to give shoppers instant information about key performance and maintenance factors on three brands each of blenders, coffee makers and steam irons, but I also urge their trade association to extend the practice nationwide, and to other appliances as well, and to involve manufacturers as one means of absorbing the considerable cost of mounting and evaluating such a needed system.



When one of the leading appliance manufacturers sets up—as one has done—a central number which consumers can call collect from any point in the United States to get immediate help with a service or repair problem, I say, "Why not do this on an industrywide basis, with an ombudsman-type clearinghouse to arbitrate and

adjust consumer complaints about any manufacturer's appliances?"

Recently the Southern Furniture Manufacturers Assoc. voluntarily decided to put care and cleaning instructions for wools and fabrics on their membership's entire line. I commend them in the name of every housewife—and hope out loud that trade associations in other industries will look into kindred opportunities to assist the consumer.

To counter the cynical philosophy of "planned obsolescence"—that economic myopia which wastes our resources and helps poison our environment—I like to speculate that if the average consumer thought he could get a 5- or 10-year guarantee which meant something, he might be quite happy to pay extra rather than muddle through with today's often iffy 30- to 90-day warranties.



Manufacturers tend to hem and haw when I talk that way, so I ask them, "Have you tried it lately?"

I know it can be done. For instance, while I understand that, apart from complaints about highly crackable plastic instead of porcelainized interiors, refrigerators now stand up pretty well, they can't compare with one I had as a bride which a relative is still using without a sign of breakdown 30 years after it was built.

Granted that industry began to respond in June to the report of a presidential task force last January on how to revise warranties so that they do more for the consumer. Granted that its representatives will meet with us again shortly to present more consumer-slanted warranty concepts which we have requested. Granted all this, we are still far from the kind of assurance the American consumer has a *right* to that he is getting his money's worth, that the integrity of his good name will be safeguarded in all credit trans-

actions, that the products he buys will serve him and his family as well as they are advertised to do—and, above all, that they will do it *safely*.

My own feeling is that the American people themselves are today on crusade—a consumers' crusade, a consumers' "revolt" if you will, which has as its watchword the determination to rediscover and reactivate at all levels of American life the demand for excellence that we like to think has always been our hallmark. Probably that goal has taken on new luster from our unparalleled achievement in getting hundreds of thousands of people in thousands of industries to blend their talents with such surgical precision that we were able to bring off the historic touchdown of Apollo 11's *Eagle*, and the astronauts' return, without a notable hitch.

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ut I suspect that, even before our Apollo series of moon shots stirred us, there had begun to take form among us a deep dissatisfaction with the decline from excellence. I believe this dissatisfaction bodes well for America. Multithousand car call-backs make nobody proud. The idea that because one's job is to turn two bolts on a production line he is a mere cog in a machine can only erode morale and self-esteem. Too far removed from seeing the fruit of our labors, we have tended to lose perspective. Under the thrust of consumerism, I feel strongly that we are about to regain perspective, and with it our pride in a job well done.

I doubt that any worker enjoys having to turn out shoddy work. But our excessive emphasis on production at all costs is forcing many to do just that. Removal of the line inspector who could reject a faulty piece on the spot has also contributed. I'm no engineer, but maybe some more work should be done at the drawing board, too, for improved quality control.

The pressures of our expanding population have

kept pace with rising expectations to create consumer problems no one could have foreseen a few years ago. It makes no American feel very good, I'm sure, to reflect that the President found it easier to telephone the moon than many of us do to call New York. With family concerns on my mind, three times in one week I could not get through to my home in Philadelphia. That really ticked me off.

Speaking of telephones, I have proposed to the National Association of Attorneys General an instant alert to serve consumers better at only a slight increase in the cost of using Federal telephone lines. When consumer laws with injunctive power—such as I was empowered to use when I headed Pennsylvania's Bureau of Consumer Protection—enable us to send packing the shady character who operates just within the law to prey on the elderly and the ghetto dweller, a phone call to attorneys general of surrounding states will let them know what his bag of tricks consists of, and that he's headed their way.

We've come more than a country mile from the time when a craftsman could see every stage of production from the day he cut down and seasoned the wood and built a chair with his own hands right on through to the satisfying moment when he personally sold that chair to his customer. In the course of that progress, we have in a certain sense regrettably lost the way—but not, I insist, irretrievably.

**I**

feel safe in saying that if reaction continues at its present healthy pace, consumer demand for *quality* will force manufacturers to go back to producing the kind of goods which said it all when we stamped them MADE IN AMERICA. In a free marketplace enlivened by judicious legislation, that same demand will force them—if they do *not* respond positively—to sink in the competition. □

# Bell Reports

## International DDD to Be Initiated

Touch-Tone® customers served by three switching offices in Manhattan will be offered International Direct Distance Dialing (IDDD) between New York City and Great Britain on Jan. 15, 1970.

The first commercial offering of IDDD will be followed two months later by expansion of the service to all customers of those offices plus two others in Manhattan and one serving Kennedy International Airport. Later, two offices serving the World Trade Center will be similarly equipped.

The service will then be expanded on a gradual basis to include other offices throughout the country and to reach additional countries overseas.

In addition, operator handling of overseas calls will be improved by introduction of International Originating Toll Center operations.

## AT&T Forms New Department

AT&T has established a Department of Environmental Affairs to identify and focus attention upon the problems and opportunities created by present social conditions and prospective changes in the environment.

Among the new department's responsibilities: the relationship of advancing Bell System technology to the environment, including physical appearance; aid to urban education; equal opportunity for employment and development; special environmental factors affecting communications service in the cities; liaison with national groups and agencies concerned chiefly with environmental affairs; and development of understanding within the Bell System of its environmental relationships.

Walter W. Straley, former vice president-Information, heads the new department.

## Bell Builds a Better Battery

A new battery with a life span double that of other batteries and the capacity to actually improve its performance during its extended lifetime has been developed by Bell Telephone Laboratories to protect telephone service.

Bell System companies will use the new battery primarily for emergency power when commercial power sources fail. More than a million storage batteries are currently maintained for standby power in the System's telephone buildings across the country.

Now being made in limited quantity—to determine "manufacturability and production economics"—by a Western

Electric Company subsidiary, Nassau Smelting and Refining Company, the new battery has an anticipated life span of more than 30 years.

It features circular grids of pure lead, which corrodes more slowly than commonly used lead alloys, and an energy-producing paste with a crystal structure designed to interlock for additional mechanical strength.

Corrosion, detrimental in other batteries, works to advantage in the new battery by increasing the amount of energizing paste, which leads to an increase in the total capacity with age.

The battery is not intended for use in automobiles in its present form, but the principles involved ultimately could be applied to cars.

## Emergency 911 Expanding

Some 10 million people in 15 states are now served by 911, the universal emergency telephone number introduced by the Bell System in early 1968. Thirty more communities in 12 states will begin using the service within the next 18 months.

Most municipalities use 911 to coordinate police, fire, and first-aid calls. Other services, such as a poison control center, can also be included. Telephone switchboard operators continue to assist in emergencies when people dial "O," even in those areas using 911.

Establishing the service involves some complex problems such as coordinating central office and local political boundaries, providing required telephone equipment, and arranging for the answering and dispatching of 911 calls from one central point.

Installation of 911 service nationwide is expected to take several years and cost more than \$50 million. □



*Plastic used in making Bell System telephone cable insulation and sheathing arrives at Western Electric locations in the form of tiny polyethylene pellets such as these displayed at Western's Phoenix, Arizona, cable plant. Tanks in background hold more than a billion pellets apiece. Air pressure feeds them to production areas. The plant receives more than ten billion pellets weekly.*



# Business Service and Society

Excerpts from  
recent talks  
by Bell System officers

"We cannot . . . forget that ours is a business that is operated — that must be operated — for the long pull. Only a sound business can provide superb service. And we cannot — in our preoccupation with the sheer mass of our undertakings — forget that ours is a business that, though it numbers its customers in the millions, serves them one at a time. Our business' service reputation was built . . . on the basis of the individual consideration we extend to our millions of customers — one person at a time, one need at a time, one call at a time."

"Consumerism seems to outrage a good many people in business. And I would agree that ill-considered efforts to protect consumers — by which I mean rules and regulations and tribunals that are based on imperfect understanding and even ignorance of facts — can do consumers, as well as producers, far more harm than good. Yet in a consumer society, as our society has come to be called . . . what could be more natural than consumerism? And how can we possibly expect it to go away? The only way I can see to beat it is by doing a better job."

". . . what seems to me to be most significant about the growth of the telephone industry in the United States is that it came, not simply as a response to demand, but rather as a consequence of the industry's own innovative drive, its increasing efforts to make the telephone more and more useful to the public. But no single innovation or combination of innovations contributed so much to the proficiency of the U.S. telephone system as the fact that, composed though it is of billions and billions of separate

parts, it is to all intents and purposes one — designed, engineered and operated as one." *H. I. Romnes, Chairman*

"Is there room in the establishment — in my own business, for example — for adventure? If I say, 'Yes there is,' I must also remind myself that we have a continuing obligation to ask ourselves, 'Is there room enough?' We must and we do because our future depends in the final analysis on an asset that appears nowhere on our balance sheet: the innovative capacity of our people, their ability to sense and respond to society's new demands, their ability not merely to change but to lead it."

"A great many of today's young people, regardless of their backgrounds, possess attitudes and opinions that conflict rather sharply with those of previous generations. And I think the reasons for that are clear. They have grown up in a somewhat bewildering era. They are entering the world of work at a time when traditional values are being challenged by a vocal minority, a time when the establishment — including business institutions — is considered by many to be outdated and irrelevant. . . . The problem, then, is largely one of convincing these young people that our business . . . is wholly sincere in its efforts to serve the public well. It is one of convincing them that we mean precisely what we say when we speak of telephone people's commitment to the customer's welfare, and that 'service with a smile' is not a mere advertising slogan." *Ben S. Gilmer, President*

"What about the years ahead? We see more and more demand for our service. We estimate that over 75 percent

of the total interstate facilities required in 1980 has yet to be built. We'll probably add 70 million phones by that time, and the total number of telephone calls on a typical business day will rise from 300 million to 500 million. Interstate calling will probably triple. . . . Problems? Of course. Competition? Increasingly. Changes? Definitely. Our business is changing constantly. We are not the same business we were 10 years ago. We won't be the same business in 1980 as we are today. But this change and growth enhance our prospects rather than diminish them. . . ."

*John D. deButts, Vice Chairman*

"Business' contribution in the past has been largely a materialistic one. It has been the harnessing of natural and human resources to develop a strong economy and provide a good life for our citizens. These are worthy objectives, and we are justifiably proud of having very largely achieved them. . . . Not *all* our citizens, however, share equally in the benefits of this strong economy and this good life. Call them the forgotten Americans, the neglected Americans, the hard-core disadvantaged, or what you will. The current of American prosperity has swept past them. Restoring them to the mainstream of full citizenship is a major challenge facing American businessmen."

"What we must do is to learn how to use our vast technological resources to solve our problems — without creating new problems in the process. We must come to grips with the ecological consequences of our actions. We must try to engineer stress, turmoil and chaos out of modern life."

*Robert D. Lilley, President,  
New Jersey Bell*



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