tek talk

THE TEKTRONIX EMPLOYEES MAGAZINE

FALL 1966

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COVER—Generations of progress separate the civilization of the Masai warrior in the African bush country, from the sophistication of the Tektronix model 422 oscilloscope that has attracted his curiosity. The scope, with a half-ton of other scientific equipment, was used in an expedition to Kenya, made to collect physiological and behavioral information on baboons in their natural habitat. Several Masai were visitors at the camp, obviously curious about what was going on in the 20th century. (Story is on page 10)

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Tek Talk will be sent regularly to persons outside Tektronix who request it.

A TEK TALK SYMPOSIUM

This century, two technological breakthroughs have been termed major enough to mark turning points in history. One is the atomic bomb.

The other is the computer.

Barely in its babyhood, the computer already has an awesome involvement in our world. It promises to leave no area of human life untouched.

In 1956, computers numbered in the hundreds. Today, there are over 30,000 just in the US. (One company has a backlog of 12,000 orders for its newest model alone.) The nation's computer power now is enough to make about **five billion** computations per second. Should that power falter, the result would be chaos.

One large computer can do more calculations in an hour than a stadium full of scientists could do in their lifetimes. A computer can do the arithmetic of 500,000 men using desk calculators.

On the other hand, computers are electronic idiots: They can do nothing at all unless some human instructs them to. Still, their list of achievements is a formidable one:

Operating at the speed of light, computers navigate ships, schedule airliners, run refineries.

They can, with some limitations, translate languages; read articles and summarize them; turn an engineer's sketch into an exact drawing, and show the design from any perspective, immediately; compose music; write poetry; beat anyone but experts at chess; trigger—or avert—an H-bomb holocaust.

Linked together, they help man do centuries worth of calculations in seconds, making possible the impossible—

A FORCE TO RECKON WITH

like orbiting a spaceman and bringing him back.

They control much of our electricity flow; route long-distance phone calls; set type; mix sausage, and cement; forecast weather, elections and the stock market.

The trite word "revolutionary" has been applied to the computer's activities in two areas: Information processing, and automation. It can not "think," but it does faster and better some of the processes we've loosely **called** thinking.

In tribute to the computer's role, ours has been called the "cybernated" generation. In it, the US has hit an all-time high in employment. Yet, because they do away with the need for human "intervention" in so many business, technical and social applications, computers are looked on with some apprehension. One government report says that each week 35,000 persons lose or change their jobs because of computerization.

Because of computer-aided automation, you'll find three men running a 36-acre oil refinery in the South. Fourteen men in a single glass plant can produce 90 per cent of the US' needs for light bulbs—plus all its demand for radio and TV tubes (other than picture tubes)! Some sociologists foresee the day when only a wee percentage of the "work force" will have any work. Of course, similar dire predictions have been made many times before, to no avail.

Whether its net effect will be to enhance man's abilities or to supplant them, one thing is clear: The computer is helping force a solemn look at what is man's work to do, and what is the machine's.

What about Tektronix?

It is a **highly** computerized company. Computers write your paychecks, doing in hours what would take a manual system days. They predict our needs for parts and materials. Our credit program is automated; the computer selects the proper letter to delinquent customers, and writes it. (Or it may notify our credit manager: "You have a serious collection problem with Jones Company . . .")

Computer tapes run multi-punch presses in our Metals building. In Engineering, 30 to 50 circuitry engineers have learned to write computer programs. And in the near future—experimentally—computer units will be installed in one assembly plant to "capture" production information.

But today's achievements are as nothing compared with the vast role computers will assume tomorrow—when they'll "think" in English.

They'll land planes without pilots, run laboratories and supermarkets. Home telephones someday will be linked to a global computer system providing services ranging from banking and travel facilities to library research and medical care. You'll converse with computers as easily as you now talk on the phone.

Computers will keep updated medical profiles on each person from birth—and on every known ailment, for physicians' immediate reference. Computers will tell the farmer when to plant, when to fertilize and when to harvest.

The most profound changes will be in education. Personalized in-depth instruction through "learning machines," like those in science-fiction stories, will soon be a reality.

Using computers, man will be able to capture and catalog virually **all** information, and make it instantly retrievable. The mass of obtainable computerized data about each person has raised worries about invasion of privacy, and the fear that **machines** will make "decisions" about people (whom to hire, whom to promote).

Despite the computer's complexity and cost, its use is growing at a fantastic pace. It may enable an advance in the thinking process more radical than the invention of writing. The computer promises a **millionfold** increase in our ability to handle information!

It is taking new forms, including desk-top keyboards and TV-like rereceivers. Already, through "time-sharing," the capacity of a giant computer system can be simultaneously used by large numbers of people.

Already, computers control some plants' billing, shipping and warehousing; order materials; calculate how much of what to produce.

Already, computers tell some department stores who the best prospects are for certain merchandise; tell a food company when to offer special "deals"; help select advertising media for proper audience coverage.

Already, some computers can "learn" —from their own mistakes.

People, while applauding computers' growing exploits, also voice some nagging fears: "Will we be forced into lives of idleness? Will we grow resentful and maladjusted in a computerized society? Will computers be watching us? Will we become machine-like ourselves? Will we become obsolete?"

Is the computer a master or servant? Clearly, it can become either. Will it make decisions? That depends on how you define "decision." Can it really think? It depends on what you call "thinking."

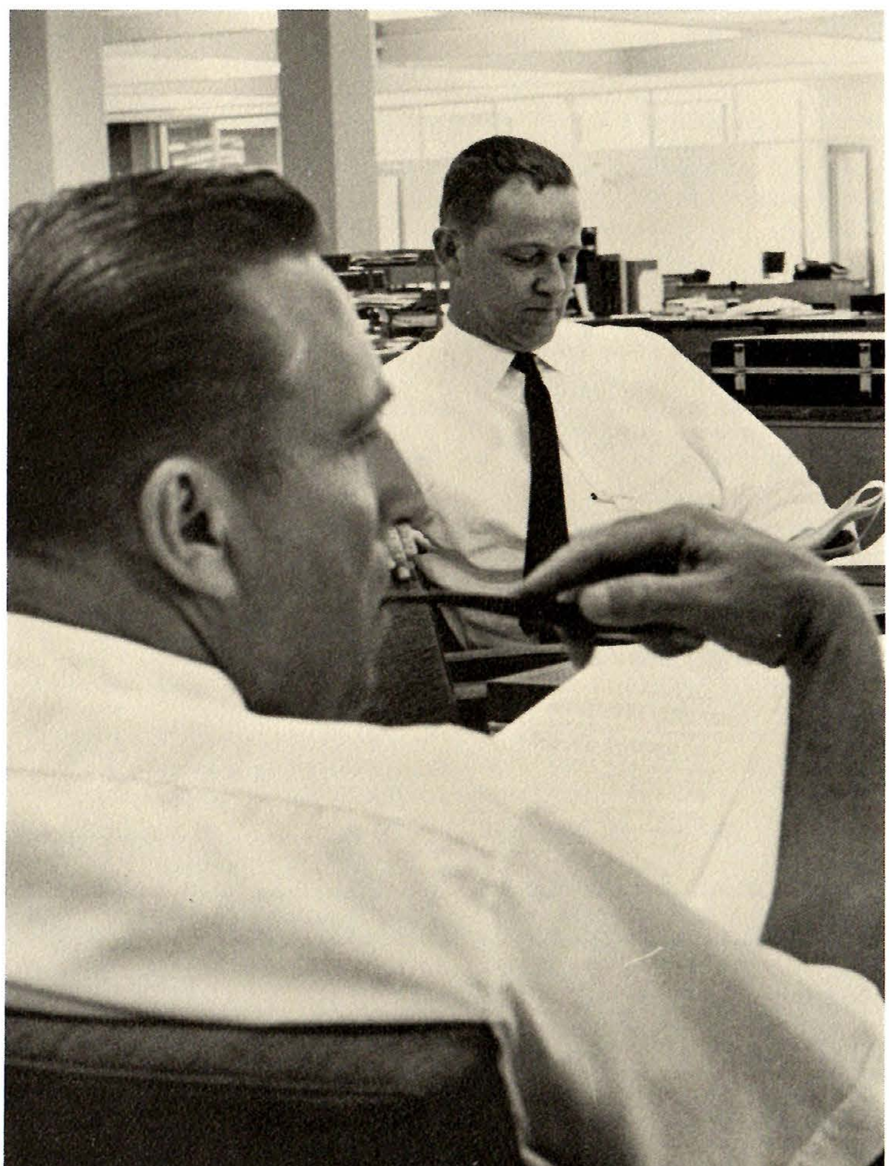
"The potential for good in the computer—**and the danger inherent in its misuse**—exceed our ability to imagine," says Dr. Jerome Weisner, MIT Dean of Science. "Our only hope is to understand the forces at work, and take advantage of the knowledge we find . . ."

continued

A FORCE TO RECKON WITH

The following discussion — among Vice-President Bob Fitzgerald, Components Manager Derrol Pennington and Data Services Manager Dwain Quandt —is a step in the direction of understanding.

DERROL PENNINGTON and BOB FITZGERALD



What are some ways Tek now uses computers?

Derrol—Tek's uses fall into neat categories: (1) Routine things, like payroll; (2) Non-routine operational information, which fluctuates and requires new reports from time to time; and (3) Automation and mechanization.

Dwain—Some uses are: Production reporting information, payroll processing, Accounts/Receivable and Accounts/Payable, inventory control, parts requirements explosion, many accounting processes . . . .

Derrol—To Manufacturing, data processing is a means to handle information. It has two tremendous advantages:

It can cope with huge masses of information, and it can do so in an extremely short time.

Fitz— . . . . And it sorts, clarifies and relates the data.

Derrol—Data processing provides information in time to make a decision. Computer people define "real-time" systems as those providing instant information. But for Manufacturing, in many cases, information within a week is adequate.

I try to get through to our employees that data processing is a tool—not a savior. It won't make them wiser, or give them better judgment.

Sometimes people want to use data processing without first defining their problem. All they'd get would be a report with the same built-in uncertainties, inadequacies and confusion—but they'd get confused **faster.**

An inexperienced person tends to read a data-processing report—much as we sometimes read the newspaper—as if it attained some virtue by having gone **through** data processing . . . .

How does our computer use compare with that of other companies?

Dwain—We spend proportionately less than most. But we're definitely ahead, both of local companies and of similar manufacturers. Our systems are more advanced; we get more information; and we're more automated. Still, we're in our computer "infancy".

Fitz—I, too, feel we're well out in front —in diversified use of computers by **all** segments of the company. Not just purely accounting operations, like many companies, but **strong** use in material control and manufacturing support.

Probably we're less advanced in computer use in Engineering. (I'm not sure this is bad. Some companies are advanced in this use, but it doesn't necessarily improve their profit-and-loss statements.)

Derrol—When Tek was small, we operated—pretty efficiently—by "seat-of-the-pants" management. A competent, knowledgeable manager could personally grasp all the input needed to make decisions. The guy who made decisions often made the **right** ones intuitively.

Now, each top manager depends on information from a number of systems. For Manufacturing, data processing is one of the most important.

We may have gone too far sometimes, and too slow other times—but we've learned from our errors . . . . I think Tek looks at the computer fairly objectively. We're not afraid to use it. Neither are we obsessed with what it can do.

What does the future hold, as far as Tek's computer use goes?

Dwain—Ten years ago a computer could add two four-digit numbers 40,000 times a second. Today it can add them **eight million times a second.** Tomorrow . . . . ?

In the past we've tended to think of machine applications as independent. Today, the output from one system is the input for the next.

Our "third-generation" 360 computer is oriented toward an **information system**, to gather all information into a "data bank" with remote input-output stations throughout the company (typewriters at first, display devices later.)

With display devices, a person will be able to seek information instantly—say to check records and tell a customer where in the plant his on-order instrument is, and when it will be ready. Now, it takes lots of paper work and telephone calls—and it takes **too long.** In three to five years we'll have **many** devices, providing this information in 10 to 30 seconds.

Derrol—A company with 7000 persons has **no alternative** but to use automatic devices to collect and disseminate information.

We're really talking about how to achieve decentralized management. In a centralized system, all information comes into one point; decisions are made, and orders issued. You need information there only. In such a system, people down the line are not "managers," but sort of administrators, carrying out a set of orders. Whether these orders come from people or machines hardly matters . . . .

Tek is basically a decentralized company; we encourage decision-making at the lowest appropriate point. And the thing people overlook is this: The need for information in a decentralized company is far greater than in a centralized company. All information must be available to managers at all levels so they can make decisions. It's been said that "The price of autonomy (or "decentralization") is full disclosure."

The advantage of a centralized system is that the need is less critical for high-caliber middle and lower management. The **disadvantage** is that the strength is all at the top.

Dwain—Someday an order from the field may come direct to a computer programmed to see what instruments are in the warehouse. It tells the field office if instruments are available. The field says to ship, or not. The computer notifies the warehouse; it updates inventory records, reducing the on-hand quantity of instruments; it triggers the invoice, and sends it to the customer.

If the instrument is **not** available, the computer sees what the in-process situation is, checking against other orders, and notifies the field. Also, it **could** look at the parts inventory and (if parts are **not** available) issue purchase orders to a vendor. It could look

DWAIN QUANDT

at the Tek-made parts inventory and issue work orders to a plant to build those necessary. It could even notify a numeric-control machine to begin producing—and it **could** do production rescheduling.

Who licks the stamps?

Dwain—It does sound like the computer is doing the entire job.

But people will always have to make the final decision. The field office decides "yes" or "no" on shipment; the warehouse may reject the shipping document. The buyer may question the purchase order—he may know a better vendor . . . .

How long would the process you've described take?

Dwain—About half a minute. This is considered a "real-time" (continuously updated) system. Often a "right-time" system is all that's needed—to yield information, as Derrol said, in time for a decision.

In 15 or 20 years, maybe **all** systems will be classified as "right-time." Field offices will be able to interrogate the computer itself.

Probably in 10 years many TelStars will be available for data-processing rental. We'll be able to transmit data overseas without using phone lines or trans-Atlantic cable.

What are some major worries about the computer's role?

Dwain—People may feel that everything gets wrapped up in the computer, and can't see what's happening—they've lost the ability to look at information when they feel like it. But, once we have remote terminals, they'll be able to find out information—more than ever before, and far faster.

Fitz—I happen not to be terrified by computers, having worked fairly closely with them. But I sure understand the feeling of people who **are**. The inside of a ship perturbs some people. Others feel uneasy in engineering or production areas. All that complex equipment doing something they don't understand makes some uncomfortable.

"...there's nothing more inhuman than tedious work; we want the qualities of a human being..."

Derrol—Some people feel computers restrict their freedom. This means to me they don't understand what data processing ought to do. It doesn't make decisions, which would be a true restriction of freedom, but **increases** freedom by providing better, more timely information for decision-making.

How about the freedom to play a hunch?

Derrol—A guy still will be able to do this. A manager's job is to assimilate all the input he can get. Data processing is only one input.

Fitz—Some people **will** have less "freedom" in their option as to how (and often whether) to record, classify and analyze information.

Information a manager formerly might have been able to keep in his head, he now exposes to others' scrutiny. Then, in his reports, he could be subjective in how he presented information—and sometimes in **what** he presented. But mechanized information systems mean his subjectivity is weighed against the requirements of machine logic. Other people are exposed to his conclusions. The consequences of his acts are "quantified," and judged.

A subjective manager can be damn good. But my premise is this: Data gives you an opportunity to do a better job than you'd do without data. The system may take away some managerial prerogatives, but with disclosure to others comes true freedom. The manager, because his moves are exposed to people who will be able to help, is unencumbered to do a job freely.

We need systems that promote full disclosure. Our 25-manager Council is a sort of example. We **could** set up strict rules so no manager could get into trouble. But we prefer to have a system of meeting often enough to exchange information that he can't get **too** far in trouble.

Some people worry about insidious regimentation going along with computers—something you don't suspect until you're sucked into it. The company **doesn't** want that to happen.

We try always to have jobs that expand. A person tends to look at his job in terms of his abilities **as a person**. And that's proper; a broad job helps him learn about his human capabilities.

We give considerable study to **any** machine project. Part of that study is to look at the **human** consequences of new moves—such as source reporting. Also, a company can safeguard against poor use of computers—or of humans—just by having alert managers.

Dwain—In the near future, we'll have a data-collection system in one plant on an experimental basis—using devices that capture production information without the employee spending undue time reporting. Some people feel the time they take in reporting detracts from their main job, producing. These devices will make reporting easier.

The employee will simply insert a card into the data-collection machine to report the quantity (of parts or whatever) worked on. The data is captured on tape and processed on a computer that evening. Reports are on the manager's desk in the morning, telling him the status of his workload.

Fitz—This whole business of reporting is hard to get at. Reporting each single move you make would be onerous; on the other hand, having **no one** know what you're doing would be intolerable to you.

Dwain—People need to realize that these devices are not "machines watching people". The systems that computers serve are designed by people—people who will need information from you, in some form, in any case. We feel the better the information, the better for the company—and for the individual.

Derrol—We once thought having inspectors would insult the workers. But most employees now see them as aids, not policemen.

How about the much-discussed "technological unemployment"?

Fitz—Nobody has proved to me that society has been more harmed than benefited by increasing technology. Certainly some are out of work through "technological unemployment"—but a lot more are out of work for **other** reasons.

And, non-advanced countries are characterized by **much** unemployment. You won't find technological unemployment in New Guinea . . .

Dwain—People "replaced" by computers are "invisible"; that is, they're people whom, had we not been computerized, we **would** have had to hire.

Fear that computers may do away with your job is a legitimate concern. But people who **have** this concern have it because they don't understand.

No one has lost a job at Tek because of computers. This year—computers and all—we've looked hard for more employees. Including clerical ones . . .

Derrol—We'll always need clerical jobs. You **never** want to plunge into a machine project until you've gone through it manually. Intermediate experimental manual systems are flexible and efficient—and machine programs can be expensive.

Dwain—It takes a long time to set up programs. Implementing computer systems takes a **very** long while — six months to a year, or longer. But processing time is very short—a half hour to a day. This is just the reverse of manual systems, which you can change, say, in a week.

If you compare a machine program with hiring enough clerks to do it, the cost might be twice as much for the latter.

Once a system is set up and "debugged," chances of machine error are slim. (This is not always true of people).

Derrol—In the case of automated tooling and milling machines, we're supplementing skills that are in **very** short supply already. Numeric control merely extends the skills of available tool and die makers. Insertion machines and automated circuit-board drilling replace tedious, monotonous operations.

Fitz—But automated manufacturing processes are somehow looked on differently. A computer-tape-driven milling machine doesn't bother people as much as a machine that gives information—and sometimes instructions.

In almost no time, a computer could tell you the best possible sequence for putting a tape-driven machine through a dozen milling steps. That way, one technician can set up problems so **many** people can solve them.

A high degree of skill is required to do one part—but to use the **same** skill on 20 is highly wasteful. (Compare this with a designer drawing a separate design for each of 20 identical parts.)

Do you foresee a decline in number of Tek employees as computers continue to make inroads?

Dwain—No. I look for continued growth. Some people will accept other positions at Tek—including some jobs that don't now exist.

What about those people whose jobs vanish?

Dwain—Their responsibilities will change, or they'll assume **other** responsibilities. This requires that they gain a better understanding of what the computer can do—for them.

In five years, most of our company systems will use computers. Everyone will be indirectly affected, more in contact with the machines. Responsibilities will change, and opportunities to advance will be upgraded. Not just managers, either—potentially, everyone.

Derrol—I don't think we need to worry greatly about technological unemployment here. We're still a state-of-the-art company. Parts, processes and materials are changing rapidly, limiting our use of automatic techniques.

Data-processing equipment is merely an extension of the pencil, just as earth-moving equipment is an extension of the shovel. But we still have a heck of a lot of shovels. And pencils. The computer is essentially no different from other tools. I see no social, or other, revolution coming.

Fitz—In the Electrochemistry building, a number of people now make etched circuit boards; thus, fewer people in Manufacturing are building and assembling components and ceramics onto mounting boards. We're replacing other manual tasks with the automatic-insertion machine and the automatic soldering machine.

We get **tremendous** "technological unemployment" exposure—constantly. Diodes, transistors, integrated circuits are facts of life. Sure, some people lose or change their jobs as technology changes—but a heck of a lot more **gain** jobs.

The **worst** technological unemployment is when the **competitor** comes up with one of these new techniques, and we don't. There go all **kinds** of Tek jobs . . .

What have been the major effects of the computer so far at Tek?

Fitz—It's been an enabling tool, although sometimes aggravating (in that computer errors, when they occur, are **massive** errors.)

It's hard to express in a meaningful—or general—way, but I think we **have** upgraded jobs here already. I've had experience as a buyer, doing computations—the **same** computations, essentially, for five years. Hardly a fruitful long-term human prospect. The time a buyer spends doing that, he's not doing something more expanding.

We **should** enable a machine to take over such routines. For a person to prefer tedious daily routines is not healthy. We **want** the qualities of a human being. In that sense, you'll never have "technological uemployment".

This seems to counter the fear that machines, being inhuman, will make people more machine-like also.

Derrol—There's nothing **more** inhuman than tedious, monotonous work.

Fitz—That's true. The person who is really machine-like is the person who gets into a rut. If you come to love routine, you'll never get out of the routine. On the other hand, a person with new experiences—even unpleasant ones—is growing. And growth helps him maintain his human capabilities.

People also seem to fear that computers will make their jobs suddenly and radically **change.** I believe their jobs will change—and grow—far more because of their own personal development than they possibly could through some technological process.

Our lives are increasingly involved in computerized records: Fingerprints, tax returns, miscellaneous information . . . Yet the change this represents hasn't been felt suddenly—and it has made our lives "better," however you interpret that term.

Popular magazines talk about computer programmers as the "new priesthood." Is that concept valid?

Derrol—We haven't made a "priesthood" of tool and die makers, although we depend on them greatly—or even engineers, on whom we depend totally.

The data-processing field **will** be a good entry into upper management—for those people broad enough to grasp the significance of management decisions. Middle and upper management must develop a feeling of how data processing should be used. They'll depend on technical assistance to do this, since there's nothing simple about computers.

Dwain—Today there is a shortage of computer programmers but, in 15 to 20 years, programming will change drastically. "Richer" languages are being developed to ease the communication problems between man and computers.

Today's programmer's job will definitely change in the near future, just as other professions have done and will continue to do.

Will these "richer" languages be our own, or a " Me Tarzan - You Computer" jargon?

Dwain—Our own conversational language. The programmer will become a systems designer—far more problem-oriented. Also, in 10 years we'll have a display unit by each manager's desk so he can "talk to" the computer and see the answers.

What requirements will the computer place on employees?

Dwain—A manager must sit back and think: What does he want to get out of the system? It's hard to have second thoughts when the system is so costly and uses so much time to set up or change. The average report now may cost $500 or $1000 in setup time alone.

Derrol—The manager's job is to use all resources at his command to achieve some economic objective. The computer has given him a valuable new resource—but it's not his **sole** resource.

Information processing is costly if the information is not needed, or not accurate. A lot of times, also, a manager already has **made** his decision. If he's at that stage, he doesn't **need** more information.

Dwain—The manager **will** need to be more analytical. He'll rely on information from the computer (put into it, remember, by people). He'll often have to ask, "What effect would this decision have on company profits?" I'm

"...the worst 'technological unemployment' would be if a competitor came up with new techniques and we didn't..."

speaking of the computer's ability to simulate—to ask "If we had certain information, would it be useful?" To simulate, by machine, a number of ways to handle a theoretical, or future, problem—and study the "consequences" of each.

Derrol—Simulation **will** become more and more important as we get into more sophisticated management. But, for us in Manufacturing, data processing will continue to be most helpful in dealing with huge numbers of parts, requirements, planning, scheduling, loading and —recently—interactions between parts and raw materials. Things we can't handle by manual calculation.

Fitz—Among Tek's expectations of its employees, as the computer expands, is that they get an appreciation of what it can do—and of its limits. The more directly they're connected with a computer, the more they need to appreciate it.

The depth necessary will depend on your degree of involvement. Most people can appreciate the telephone, but have no appreciation of the complexities involved in getting phone service. And they don't **need** to . . .

Derrol—It's essential that young managers "on the way up" understand this tool—not look on it with awe but, just as I use a slide rule, acquire familiarity with, and master, it. Most of our plant managers have been to IBM for a computer seminar. We'll see that the rest get there.

Do you foresee a changing ratio of managers to non-managers?

Derrol—I **do** see a growing number of technicians in areas like Data Processing—not necessarily management, but adjuncts to it—and a growth in indirect employees.

For example, automated machines will require fewer direct-labor people, but additional programmers, and more maintenance technicians to keep this complex equipment running. Probably also they will require more (and more skillful) schedulers and loaders.

How far down the line should people become computer-oriented; to what degree; and how should they go about it?

Derrol—Our idea now is to direct our training and expectations at those who will assume higher roles—or **broader** roles. But **all** employees need to be aware of the computer. For one thing, they'll provide input to the system.

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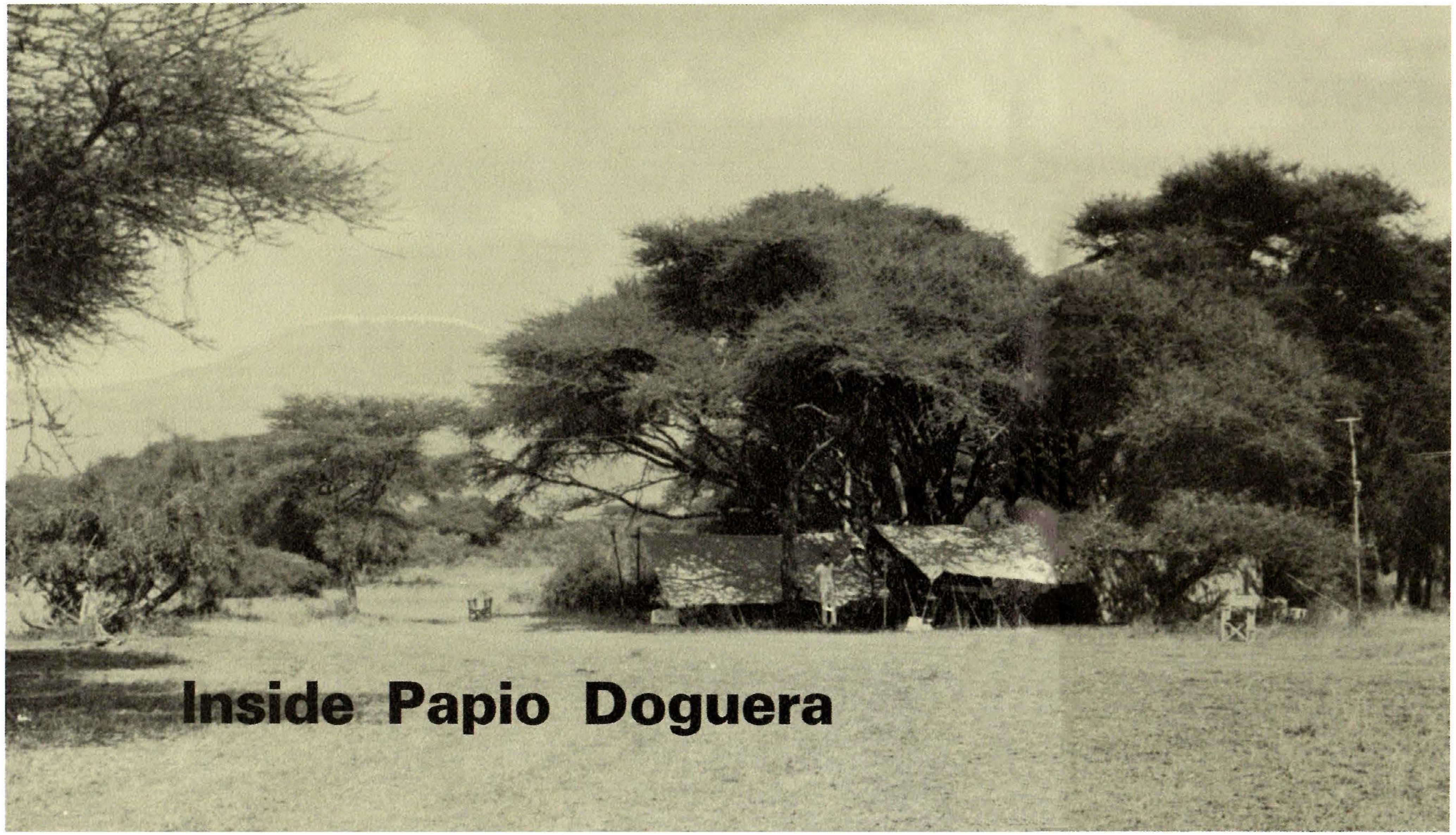


Inside Papio Doguera

In the dusty bush country of Kenya; at the toe of Kilimanjaro, Africa's mightiest peak; near the camp where Ernest Hemingway once sat and wrote, color-coded baboons with electronic backpacks romped, scratched, slept and otherwise went about their appointed rounds. Little did they know their privacy was being invaded.

Meanwhile, back at the camp, five US scientists with a half-ton of lab equipment monitored the primates' activities. It was the closest tabs man has yet been able to keep on a wild animal in its native home. As a result, he now knows quite a bit more about the baboon.

And, there in the camp, you'd have found a Tektronix type 422.

Clearly the grandest oscilloscope in the jungle, the 422 played a key role in the baboon safari, according to Nolan Watson, electronics technician with the University of Washington Regional Primate Research Center, Seattle.

"Much of our equipment was field-tested for the first time on this trip," he says. "Thus, some redesign was necessary; the 422 made it possible. I can safely say we would have been in a real bind without it, even though we had a 321 . . ."

The goal of the mission—jointly financed by the Washington State Heart Association and the National Institutes of Health—was to implant the cardiovascular systems of healthy adult **Papio doguera** baboons with miniature transducers and telemetry systems, send the animals back to their troops, study their behavior and, remotely, record signals from their heart and cardiovascular systems as the animals lived their normal lives.

Similar tests had been made on baboons at the Center, but it was felt that captivity is an artificial environment, and that a baboon ranging in the wilds of Kenya would yield results different from those of a baboon dutifully trudging on a treadmill in Seattle.

Actually, orang-utans and chimpanzees, because they're higher on the evolutionary scale, would make even better subjects for experiments, but they're hard to come by in the US, whereas baboons are a glut on the market. So, baboons it was—in the US, and thus in Africa.

Also, since a baboon has little economic worth (its main value, presumably, is to other baboons), the Kenyan government gave willing cooperation to the safari.

The expedition lasted two months, including six weeks in the bush. Of the five scientists, representing the Primate Center, and Scripps Clinic and Research Foundation, none had been to Africa before.

The exploit was made possible by miniaturization of electronic gear and refinement of telemetry techniques—and by the comforting presence of a professional hunter: Elephants were in camp about 60 per cent of the time; rhinos somewhat less frequently; leopards prowled the premises at night, while lions roared in the dark. As a precaution, each scientist learned how to climb thorn trees—not the most comfortable refuge, but the handiest.

A main function of any field study is to **observe.** This function gained a new dimension through the sophistication of electronics. The expedition used a variety of ingenious devices, including:

1. An implantable blood-pressure gauge, developed by Dr. Robert L. Van Citters of the Primate Center, working with Micro Systems, Inc. A solid-state strain-gauge bridge was bonded to a stainless-steel diaphragm welded to a stainless-steel carrier, and sealed against one atmosphere. It gave an absolute pressure measurement.
2. A flow telemetry system, designed by biomedical engineer Dean L. Franklin of Scripps. The system couples a continuous 5-mc ultrasonic wave into the blood vessel. The formed particles absorb and reradiate part of the energy; the shift in frequency indicates the particles' velocity. This "back-scattered" sound compared with the transmitted sound results in a measure of the flow velocity.
3. A system to combine pressure information from the gauge with flow information, so the two can be transmitted together. This, the first blood-flow and blood-pressure telemetry system, was developed by Bill Kemper, an electrical engineer from Scripps.
4. A remote-control feature, for data systems and power, which allowed the system to be used with wild animals. It also provided for remote stimulation of the central nervous system (to attempt to change the animals' behavior) and for anesthesia injection so they could recapture the baboons after the tests. Watson designed this system.

While these projects were going on, Dr. Orville A. Smith, physiologist, psychologist and assistant director of the Center, was working to learn how the brain controls and modifies heart output, particularly under the stimulus of fear or anxiety. He wanted particularly to locate the mechanisms, and the brain areas, that controlled the change in heart output in response to "warning" stimuli.

The 422 was used to adjust the animals' backpack systems, and to monitor the telemetry information as it went on tape.

The base area—a day's drive from Nairobi, Kenya's capital—was picked partly because several baboon troops lived there, and partly because it was mostly open plain, allowing easy tracking and observation.

The climate in Kenya posed no problems ("more pleasant than Seattle" is Watson's comment—probably a compliment.) But the unrelenting wind blew fine sand into every cranny. And ants got into the electronic equipment and ate the insulation (not on the 422, however; it proved to be ant-tight.)

Recording equipment was carried on a five-ton truck with receiving antennae, telemetry receivers, a four-channel magnetic tape recorder, a direct-writing recorder, a motion-picture camera, 12-volt storage batteries for power, and miscellaneous communications equipment.

First step was to capture some baboons, using box traps baited with maize. The traps, placed near waterholes or beneath trees where the primates slept, were surrounded with dried corn and sugar cane—tempting fodder, judging by the number of baboons who let themselves be trapped over and over again.

In all, thirty-two animals were caught. Three of the females and the 16 males were implanted with gauges and transducers. All the 27 major surgeries were performed under the open sky by Dr. Van Citters and Watson, with the local Masai natives kibitzing. Somewhat incongruously in this jungle setting, aseptic procedures were used, such as pre-operative scrubbing, and use of masks, surgical gowns, gloves and pre-sterilized disposable surgical equipment.

Fifty transducers were installed to indicate blood flow and heart pressure, and electrodes were implanted in the brains of four animals, for remote stimulation to temporarily change their behavior—a procedure tested in captive animals but very new in the field. (A typical controlled change would be from docility to anger.)

The number of sensors and gauges differed from animal to animal, to study various combinations of parameters. After about five days, when the baboons had convalesced, they were fitted with fiberglas backpacks spray-

continued on page 26

The Eyes of Sunday

Josef Oswald

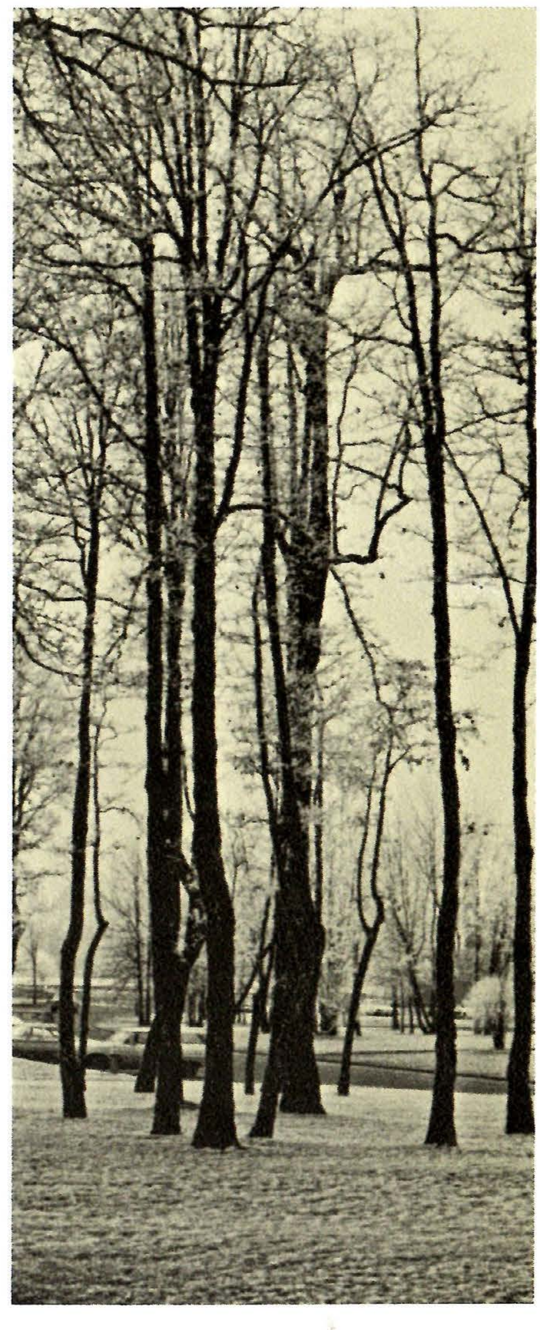
"My camera is my notebook," says Tek Talk's Josef Oswald, "in which I record what my mind becomes aware of."

Still, it isn't the camera that takes the picture, but the human eye, he points out. A photographer needs to discard his everyday way of looking, and "see with the eyes of Sunday."

Josef's color photographs of our industrial park comprised an entry which recently brought Tektronix an award from Gov. Mark Hatfield for beautifying Oregon. Here Josef looks at the park again, this time in black and white, but still through Sunday eyes:

"As our company grows and the park takes shape, a greater order crystallizes. Through the piecework of photography, I try to make the pieces of that order visible.

"What's remarkable to a European like myself is the manner in which those who create this park are generous in holding the soil, making a symbiosis of scenery and architecture—and creating something, in that moment, that is **culture** . . ."

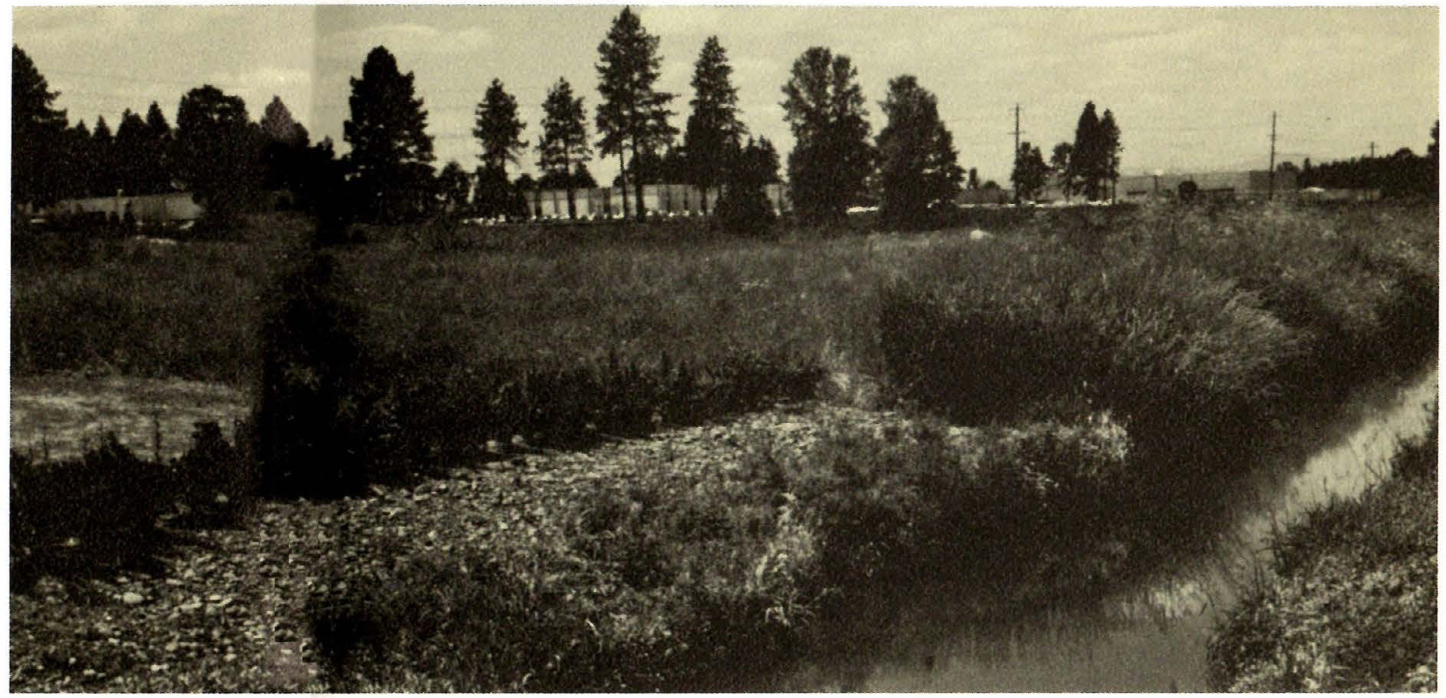


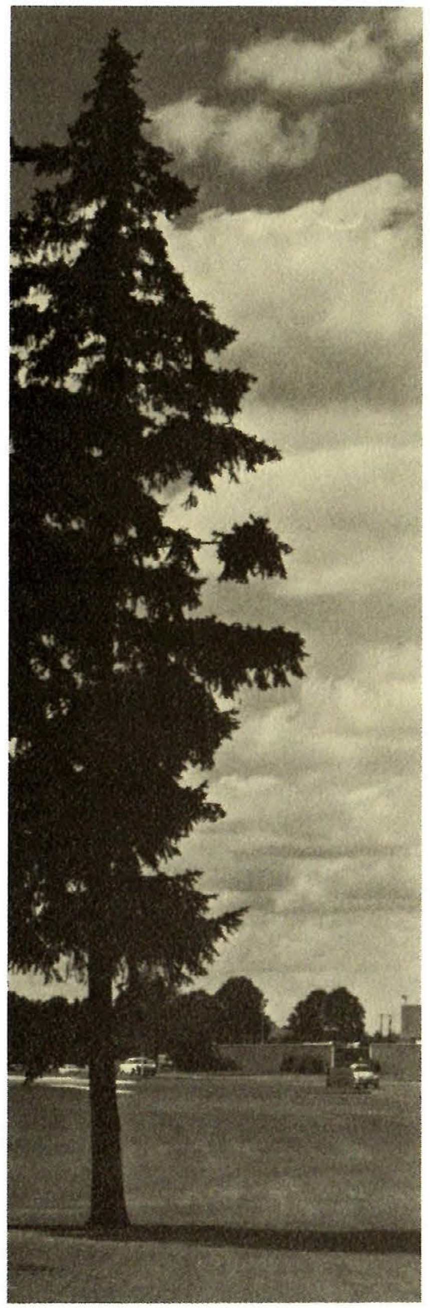
Industrial parks are rare in Europe—space there is too valuable to "waste" on scenery. But Josef sees our park as a New World equivalent of the Old World's large plazas. "The Technical Center is **truly** a center, onto which the industrial complex focuses.

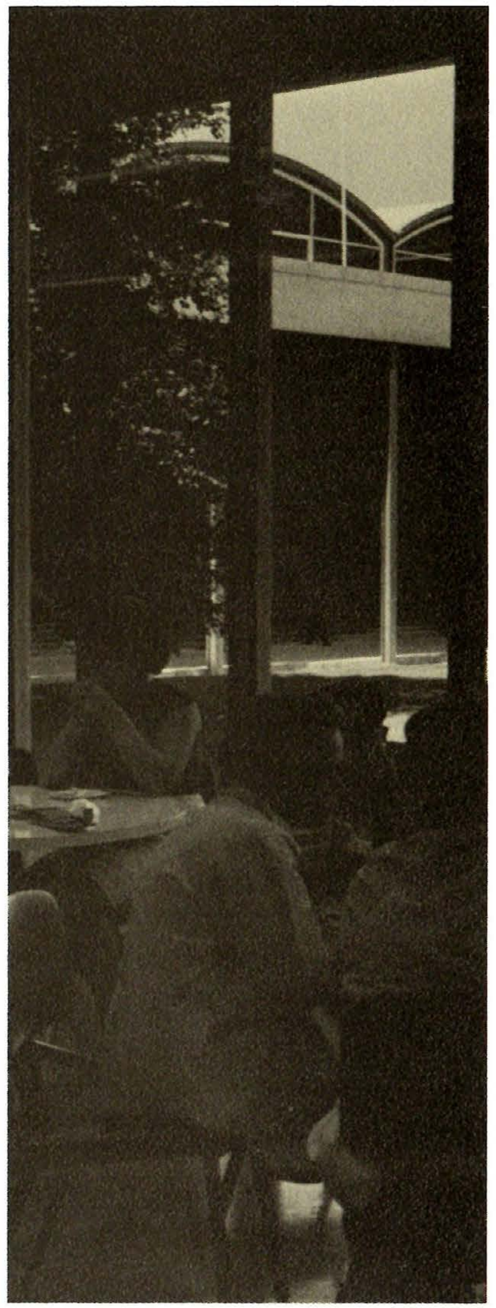
"See the great care with which old, big trees are kept functional; they still bear the features of the genuine scenery, the fruits of the local spirit . . . The buildings are **added** to the scenery; they do not **replace** it.

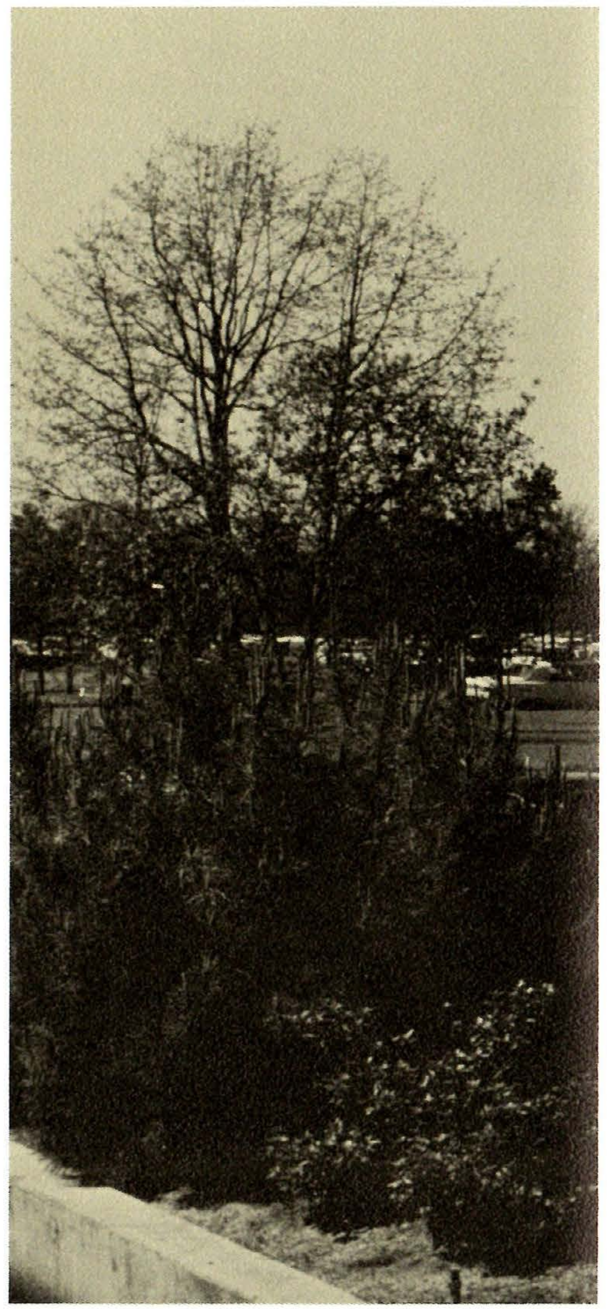
"You see Nature just as she was, living as partner with the most industrialized creations. And they don't hurt each other; but each enhances the other's face.

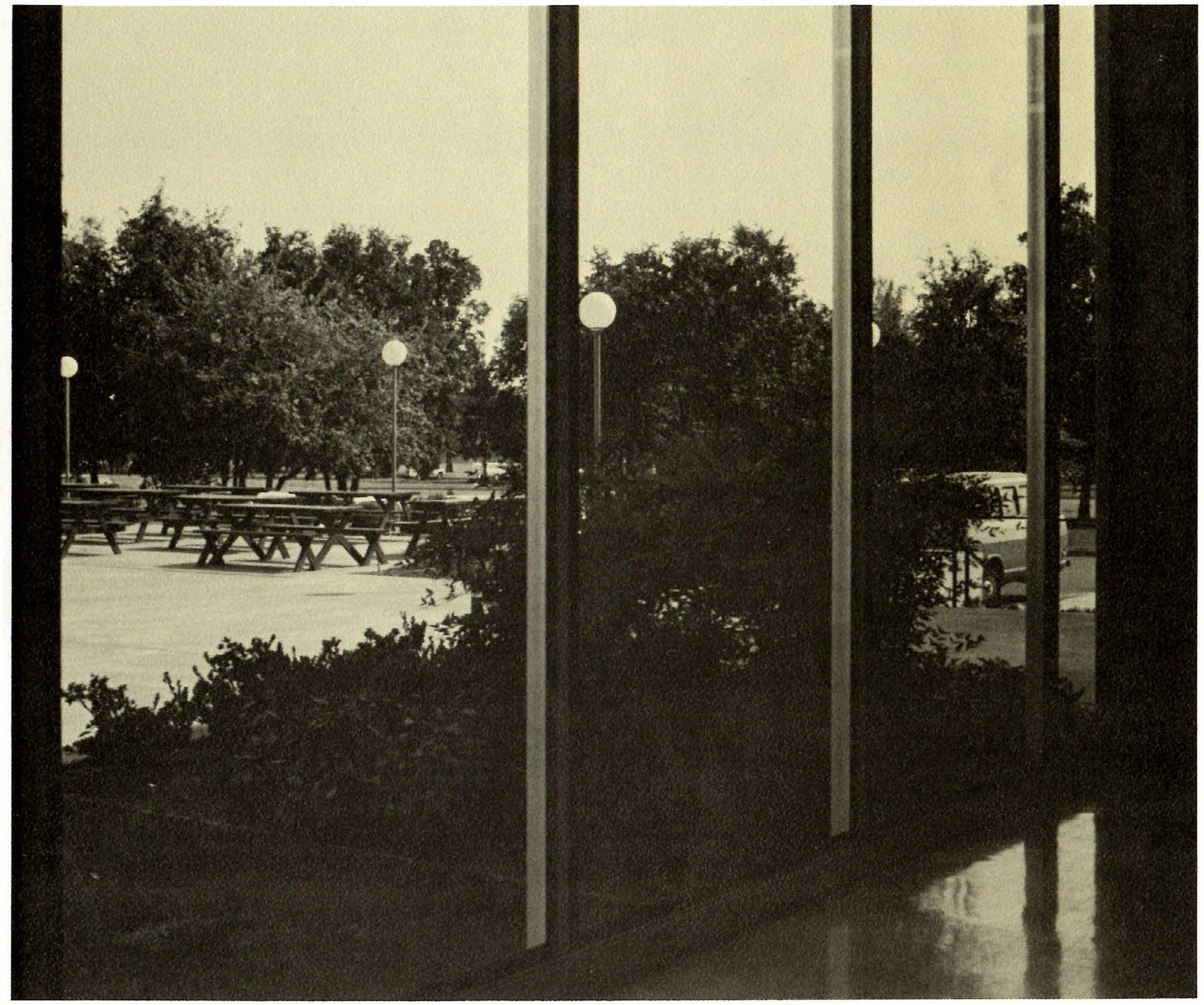
"In our plants, the human being gets all the aesthetic comfort—in form, color and connection between architectural and natural elements—to feel in balance with himself. For a moment, he forgets he is in a working place. His "breaks" are more intensive, have more depth . . . That intimate bit of scenery before the door of your building—that is the **soul** of Tektronix.







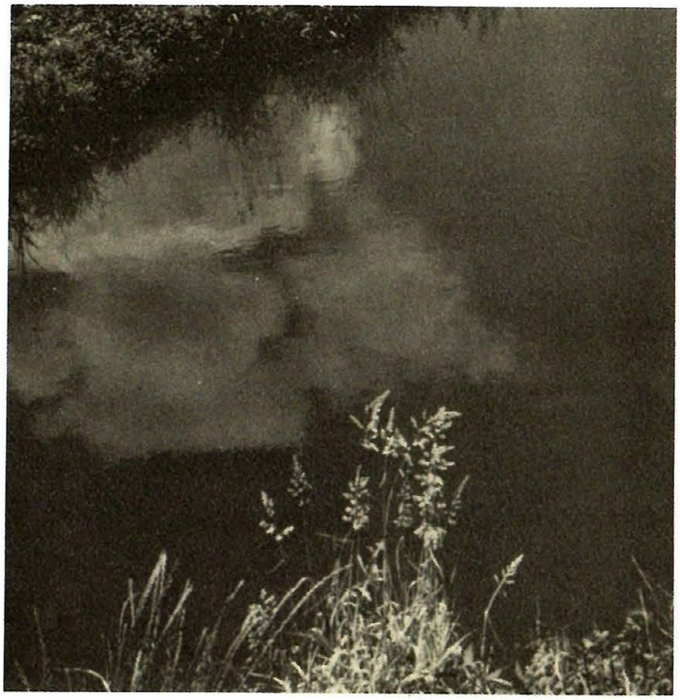


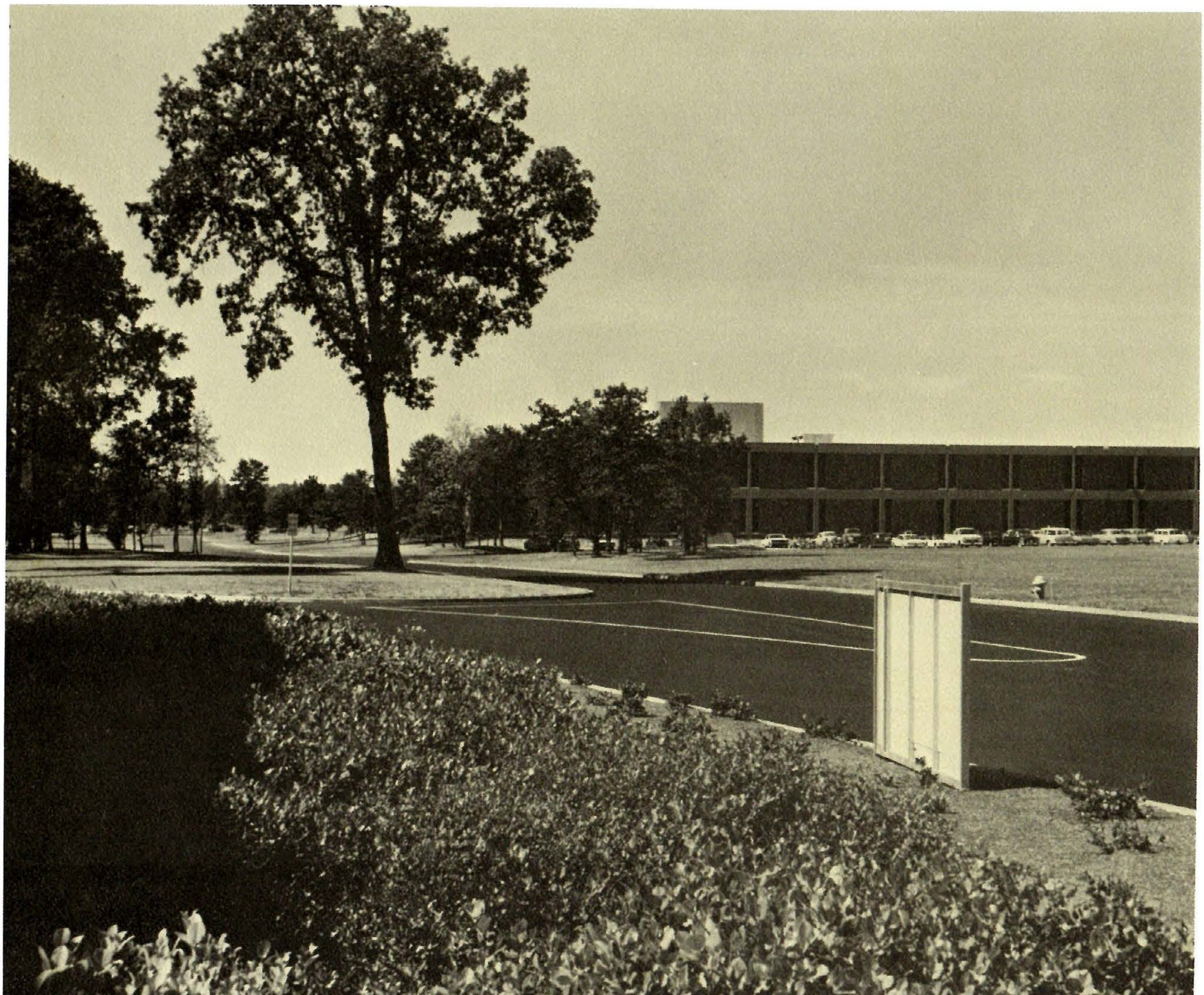


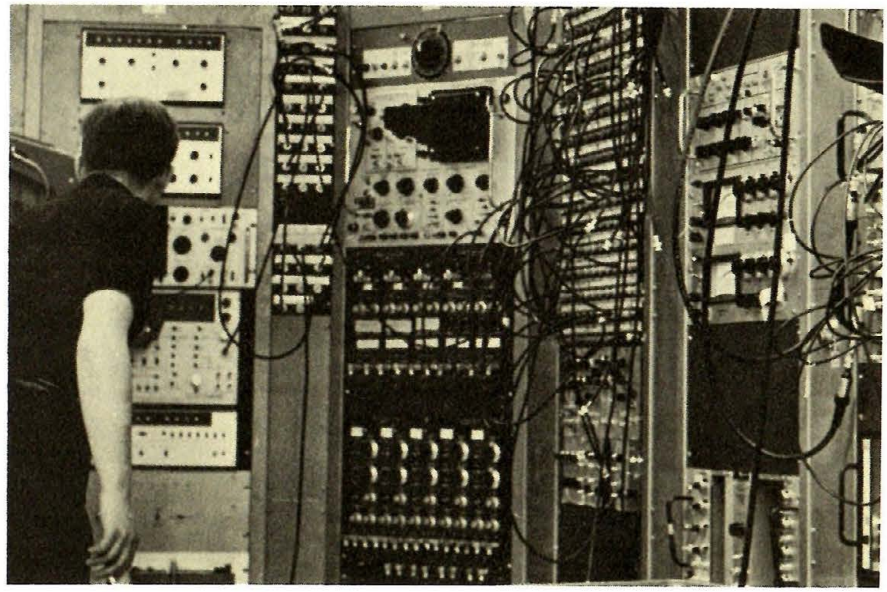
"Parking lots can be the most effective irritant, the biggest destroyer of landscape feeling, the greatest enemy of form. But they, too, have been mastered in the planning of Tektronix park. The buildings' **faces** look at the scenery; parking areas are on the periphery, as they should be.

"Here, the hand of man is taking care of Nature to keep it in a state of grace. The human being should **keep** his awareness of these things. He **shouldn't** get used to them. He should —always— have the feeling of the extraordinary. A moment of refreshing."

And this is Josef Oswald's parting advice:
"To be able to truly see reality, you **must** have fantasy."







Breaking an Atom's Heart

The atomic explosion over the New Mexico desert in mid-1945 unleashed an awesome power that defies the imagination. It culminated the many years of exploration and study that finally enabled science to harness a small portion of the energy trapped within an atom. But it was only a milestone in mankind's never-ending pursuit to explore—and understand—the heart of matter itself.

Speculation and exploration into atoms—the building blocks of matter—date back for many centuries. Many questions, however, remain unanswered; and the exploration to probe further into the unknown goes on in research laboratories around the world.

Basic research into the atom has been under way since 1948 at the Nuclear Physics Laboratory of the University of Washington in Seattle, where Tektronix oscilloscopes are widely used as diagnostic tools.

An atom—which is neutral in its normal state, carrying equal positive and negative charges—is truly infinitesimal: It is the smallest subdivision of any element that maintains all of its chemical properties. Its nucleus, or hard core, is composed of positively charged particles, called protons, and particles that do not carry a charge, called neutrons. Circling around the nucleus are negatively charged particles, called electrons.

Researchers at the laboratory—faculty and graduate students of the university's Departments of Physics and Chemistry—conduct studies to determine the structure of the nucleus, in their search to understand the interaction among its many particles.

The study of an atom is complicated by the fact that it is so small it cannot be seen. An atom's diameter is about one hundred-millionth of an inch. If all the men, women and children of the world spent their **lifetimes** counting at full speed, they could count the atoms, one by one, in a pinhead. The same population could count all the leaves on all the trees of the world in a few months.

The nucleus—which accounts for 99.9 per cent of the atom's entire mass—has a diameter about one ten-thousandth that of the atom: Making the diameter of the nucleus less than one trillionth of an inch. Yet the distance between the nucleus and the surrounding electrons is relatively many times greater than the distance between the Earth and the Sun!

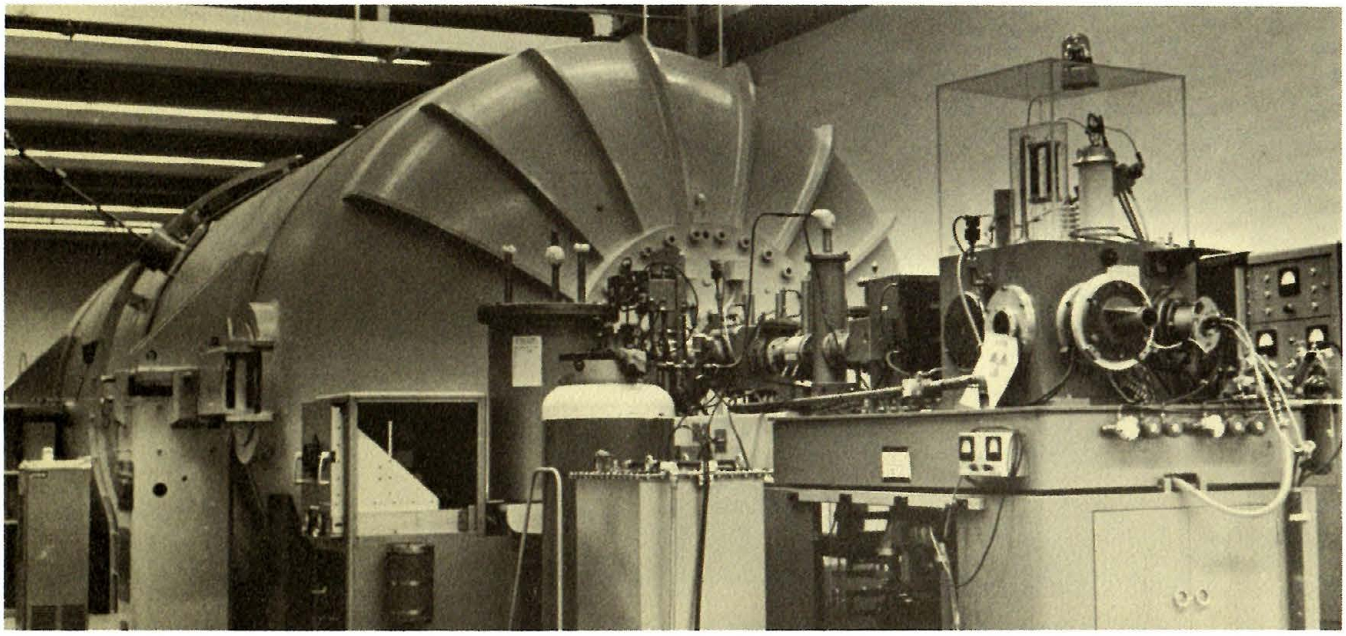
Experiments are conducted at the Nuclear Physics Laboratory, one of the largest university low-energy nuclear physics research laboratories in the United States, to discover what **can** be be discovered about the nucleus: What is its structure? What forces hold nuclei particles together? How do nuclei interact? And questions that have not been formulated as yet about nuclear reactions.

Situated underground to safeguard the public against nuclear radiation, the laboratory's 60 - inch fixed - frequency cyclotron—a type of **accelerator** or "atom - smasher" — accelerates minute projectiles that penetrate the nucleus, enabling it to be studied. An accelerator is a nuclear physics tool that produces the nuclear reactions needed to study the atom.

A charged proton is shot against the **target nucleus** to penetrate it. The proton obtained from an atom of hydrogen gas is the projectile usually used as the "bullet" or **probe** to penetrate the target nucleus, partly because a hydrogen atom has only one electron and one proton, making it a simple element to control.

Hydrogen gas is released into the **ion source** of the cyclotron, where the electron is removed and the proton accelerated by electrical fields. The proton, now known as the **ion**, is hurled against the target atom at terrific speed; the ion penetrates the nucleus of the target atom, displacing some of the particles within the hard core of the target.

Detectors at the cyclotron convert the energy of the particles coming from the target nucleus into electrical impulses, which are amplified and their existence recorded by various instruments, includ-



ing oscilloscopes. The visual display on an oscilloscope, in the form of voltage level or height, enables researchers to measure the amount of kinetic energy in the particle coming from the nucleus, and thereby measure the forces that hold the particles of the target nucleus together. Other data displayed on oscilloscopes enable researchers to identify the types of particles that come from the target nucleus.

Oscilloscopes are used with other nuclear-detection instruments, to determine the angle at which a particle is displaced in relation to the angle at which the target nucleus was penetrated by the ion. Researchers, conducting these **angular correlation studies,** can determine the size and surface properties of the target nucleus. By using oscilloscopes, they can also determine the time it takes for a certain particle to travel a given distance from the target nucleus to the detectors after the collision, enabling the energy of that particle to be measured.

Two laboratory physicists — Harold Fauska, senior physicist, and Dr. Claude Williamson, research assistant professor —explain that the energy of visible light is measured in electron volts, but the energy of ions used to probe the target nucleus is measured in **millions** of electron volts (Mev); and in many cases, the probing action becomes more efficient as the energy is increased. (An electron volt is a unit of energy equal to the energy gained by an electron falling through a potential difference of one volt.)

The cyclotron at the Nuclear Physics Laboratory accelerates the ions to about one-seventh the speed of light. The energy needed to accelerate the ion to a given speed, however, varies with the size of the particle to be used as the probe. And the probe is chosen in relation to the energy needed to penetrate the target nucleus.

For example: A proton ion from hydrogen gas, the element most commonly used, is accelerated to a level of 10.5 Mev to obtain one-seventh the speed of light. A deuteron ion from heavy hydrogen, on the other hand, has a mass twice that of the proton ion and must be accelerated to an energy of 21 Mev to obtain the same speed. An alpha ion, obtained from helium, has a mass four times that of the proton ion and must be accelerated to an energy of 42 Mev.

To complement the cyclotron, the laboratory has another particle accelerator—the Van de Graaf, purchased about two years ago by the National Science Foundation. For radiation protection, this accelerator is enclosed in a room with five-foot-thick concrete walls and doors: The room is 32 feet wide, 224 feet long and 20 feet high. The Van de Graaf gives physicists greater control than the cyclotron over the energy of the accelerated particles.

The cyclotron, housed in a circular room that is 40 feet in diameter and has five-foot-thick concrete doors, was built at its underground location in 1948. Above the room is a pool of water four feet deep, enclosed by a fence. Flashing lights, installed on both the cyclotron and the Van de Graaf, are turned on before the "atom-smashers" are put into operation. And, before the thick concrete doors slide shut, sirens sound to warn researchers to leave the rooms.

There are more than 30 oscilloscopes in use at the laboratory. Almost all of them bear the Tektronix trademark—including our earliest instrument, the Type 511. And how valuable is the oscilloscope in this area of basic research?

Mr. Fauska: "I was about to say it's like the microscope to the biologist. But that isn't a very good analogy, because more and more oscilloscopes are finding their way into biology labs. Perhaps I can put it this way: In this type of work, an oscilloscope is more useful than a third hand.

"In the study of nuclear reactions, it is necessary to measure the angle and energy of particles emitted from the target being bombarded by ions. These particles are detected by a wide variety of devices which yield electrical pulses when struck by high-speed particles. In order to 'see' these particles and align the complicated electronics necessary to

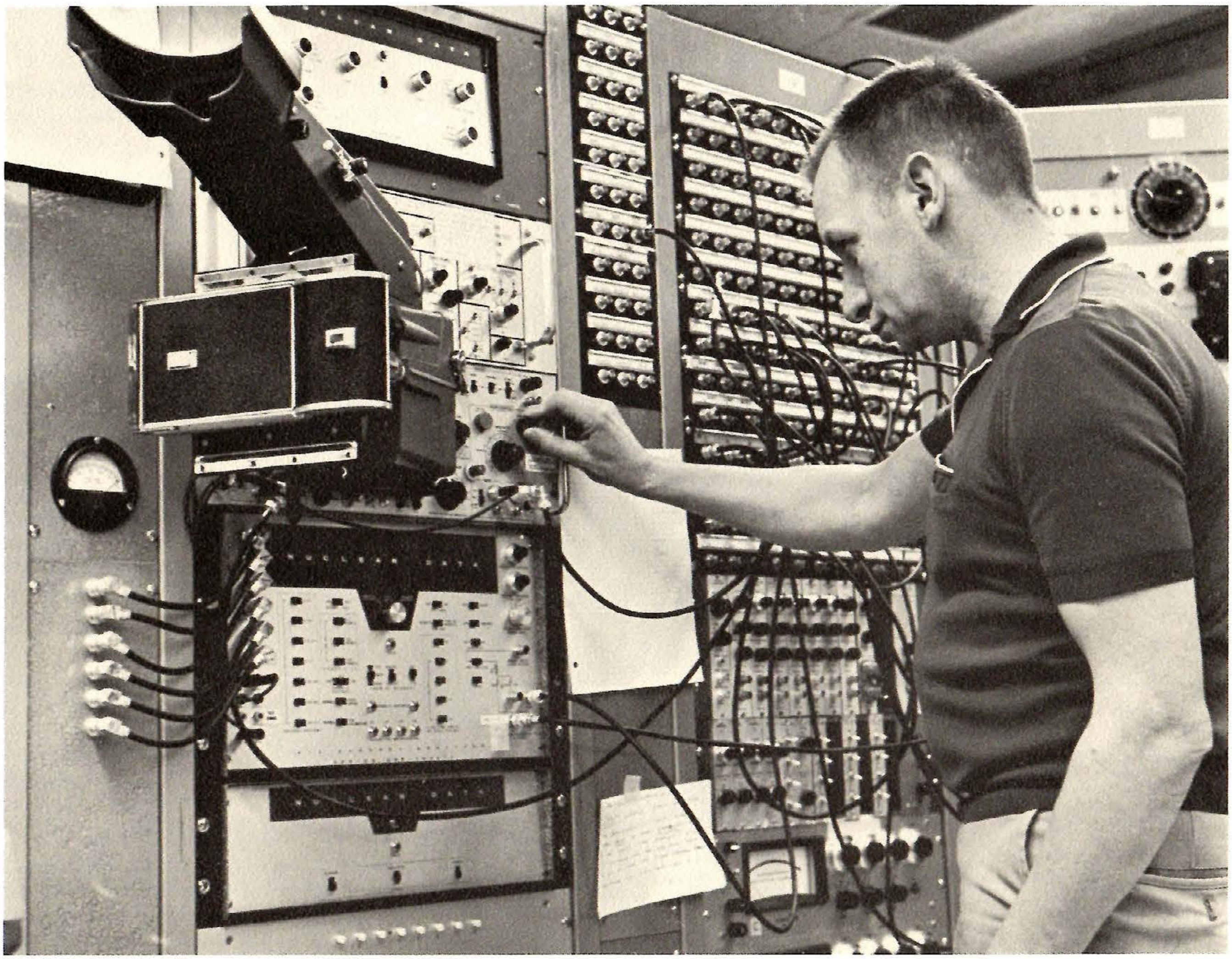
VAN DE GRAAF "atom-smasher" (left) enables physicists to study nuclear reactions in their search to understand the atom. Harold Fauska (below), senior physicist, checks test data on a Tektronix oscilloscope.

separate and count them, oscilloscopes are invaluable. Often very complicated troubles may be spotted by a quick inspection on an oscilloscope, and a useful qualitative feel for what is right is gained quickly when high-reliability oscilloscopes are available."

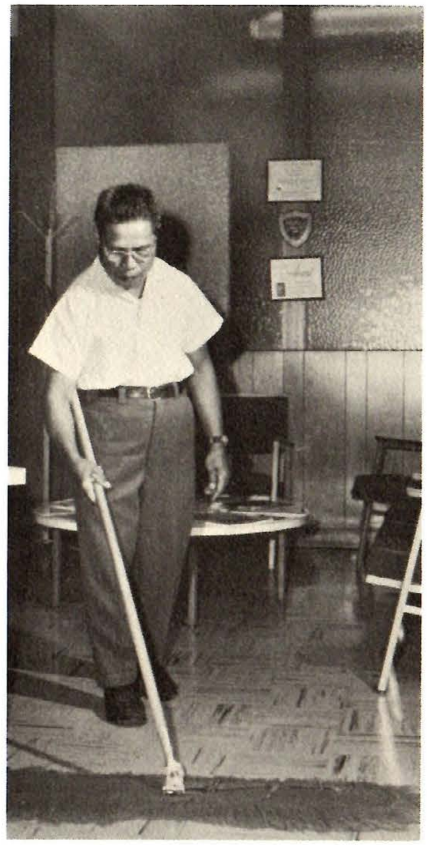
The research at the laboratory—supported by the State of Washington, the US Atomic Energy Commission and the National Science Foundation—is conducted by students and faculty. The laboratory deals in abstract ideas—pure science—under the administrative supervision of Ted J. Morgan, research associate professor. The research is not motivated by any commercial demand and is not performed with the intent of an immediate practical application: It contributes to the ever-increasing sources of basic knowledge which are available to students, engineers, chemists and physicists.

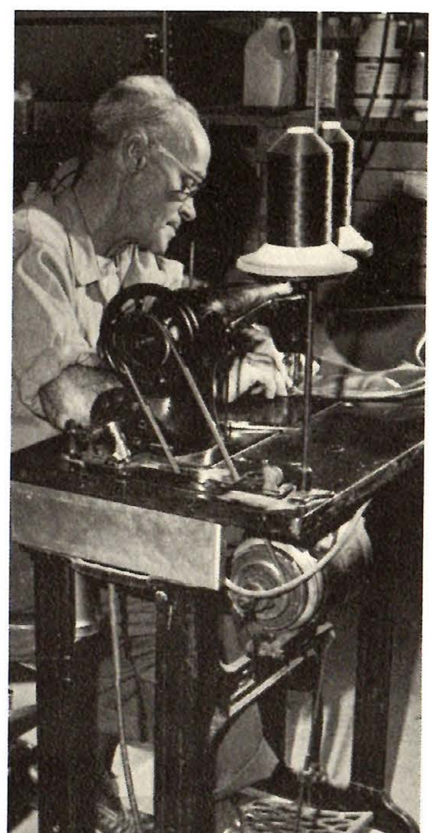
The laboratory is a teaching place for PhD's in physics and chemistry. The results of these experiments are published in professional journals which are read by physicists and nuclear chemists throughout the world. They appear in technical papers and PhD theses; and are just as exciting to the physicist as climbing an unconquered peak is to the mountain climber. As a climber reaches the summit step by step, physicists can "picture" an atom only by building upon—and adding to—an existing body of knowledge.

And, by "seeing" an atom more clearly, a larger portion of the power trapped within the heart of matter itself can be harnessed—to, perhaps, light cities, operate power plants, provide the power for vehicles, conquer disease . . . The possibilities are abundant, limitless as the imagination of mankind.



The Dimensions of Custody





When a job is done well, it is often taken for granted. So it is with cleanliness at Tektronix. Employees come to work in a clean and orderly place, day after day. And many a visitor has commented about it. But few people stop to think about the staff needed, or the cost involved.

Building Services, under Manager Rudy Glasnapp, cleans 1,188,775 square feet of floor space every day. Last year it cost 45 cents per square foot, well below the national average.

The group, which comprises about half of the Facilities department's staff, has 69 employees—most of them custodians—in addition to a six-man part-time fire-watch patrol. Three matrons are responsible for cleaning the rest rooms in the buildings where there is a large concentration of women employees: Assembly East, Assembly West, CRT, Electrochemistry, Metals and Ceramics buildings.

Custodians must be active and in good health: They do far more than just clean the buildings. On short notice, they may be asked to move chairs and tables for important meetings or blood drawings; repair or upholster furniture; turn machinery and processes on, or off; and shuttle cars from one building to another.

Applicants for custodial positions come from many walks of life: Farming, logging, custodial, carpentering, plumbing, accounting . . . In deciding whether to hire an applicant, Rudy weighs heavily past performance, regardless of background, in addition to appearance and personality.

Building Services is one of four groups in Facilities under Manager F. W. (Beich) Beichley. The other three are Facilities Engineering, Plant Maintenance, and Landscaping and Grounds.

The activity of Building Services is diversified not only to cover a wide variety of jobs, but also to enable employees to work in every area of the company, "checking out" possibilities for advancement.

The opportunity to advance into jobs in other areas of the company is probably greater at Tektronix than would be true of a custodial force in any other company, and is characteristic of Tektronix' policy of utilizing an employee's abilities to the fullest.

Rudy estimates that 40 to 50 former custodians are now working in other areas of the company: Facilities Landscaping and Grounds, warehouse, production areas. Rudy himself began working at Tektronix as a custodian some 15 years ago.

"Custodians remain at their jobs for at least one year before they transfer out of the department," Rudy says. "This not only holds down the turnover rate, which is fairly high, but gives the employee an opportunity to find out what he wants to do rather than jump from job to job in the company."

Some custodians either have additional qualifications or develop them on the job through educational courses. They join Rudy's group with the idea that they will be able to transfer into production or other work after a year.

"In fact, production people often look to Building Services when they have openings in the shop," Rudy explains. "Production managers have an opportunity to see the custodians as they work through their areas, and can evaluate how well they do their jobs."

Building Services is one of the few groups in the company that works around the clock—cleaning, repairing and watching out for fires.

Custodians are not intended to be fire fighters. They are, however, trained to detect and report fires promptly, do whatever they can to contain them and alert proper production management personnel, minimizing "out of production" time.

Four utility men do "whatever needs to be done whenever it needs to be done." This includes mass relamping; Tektronix used $17,294 worth of fluorescent tubes last year. These men can also be found cleaning the buildings, repairing furniture or servicing the fleet of 23 company vehicles.

Building Services is given partial responsibility for destroying old or confidential company documents, a duty that does not usually fall within the realm of a custodial staff.

Custodians maintain a liaison with the Plant Maintenance group and report any maintenance work that needs to be done. As they work in the buildings, the custodians also watch for safety hazards or any unusual sounds, making observations important to continuity of production.

Building Services also maintains a lost-and-found "department" for personal items left behind by employees: Wallets, wrist watches, rings . . .

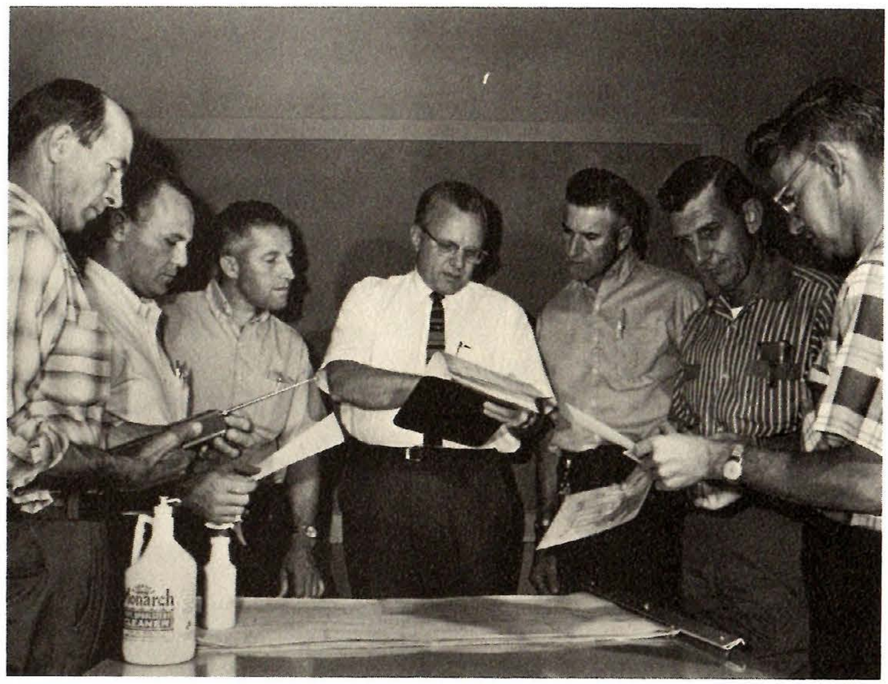
Good custodians, obviously, empty wastebaskets every night. Some custodians, however, have a problem in deciding whether to empty some of them. Rudy says a number of employees use wastebaskets to file papers; or go home leaving a stack of papers lying on top of them!

Fire watchmen, on duty at night and around the clock on holidays, tour CRT, Electrochemistry, Metals and Ceramics buildings. Their activities are in close coordination with other groups that work around the clock—plant security patrol, boiler operators and roving mechanics. They are now linked by radio contact, enabling instantaneous communications during emergencies.

The fire watch discovered a blaze in the CRT building in 1965, the result of a failure of a mechanical piece of test equipment, and quickly called the fire department, avoiding a costly fire. The watchmen have also prevented costly losses by turning off malfunctioning equipment.

Building Services once handled garbage and debris pick-up service on the industrial park, but now the work is contracted through the group to Glanz Brothers of Portland. Security patrol on the grounds, also contracted through Building Services, is maintained during the night and on holidays by Northwest Industrial Guard Service.

Rudy sums up the activity of his group: "We try to remain as flexible as we can so we can give whatever service is requested, whenever it is needed."



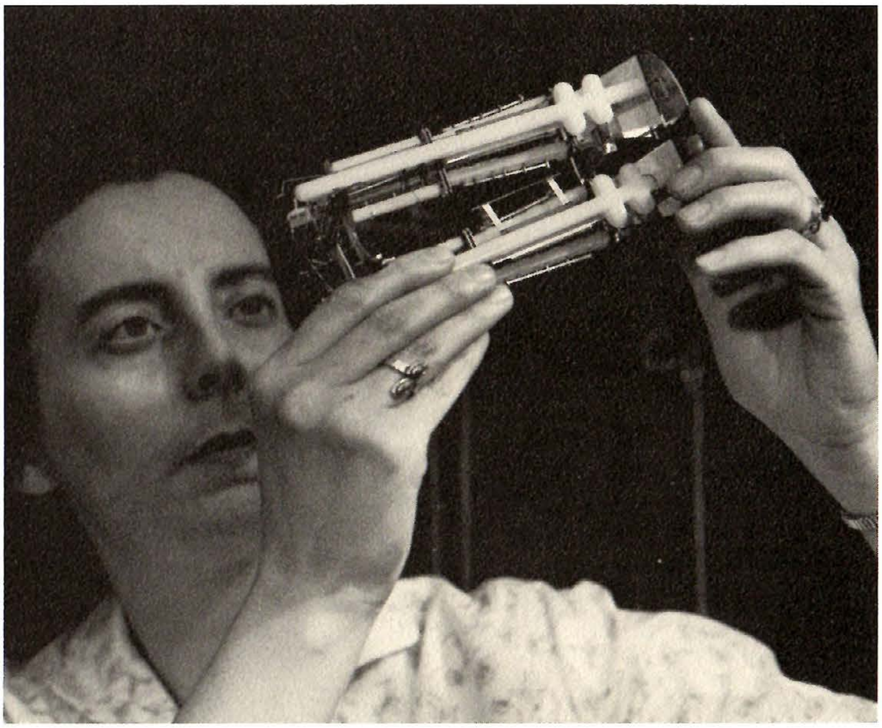
RUDY GLASNAPP (center), Building Services manager, and his managers (from left) Ralph Vandehey, Al Klein, Jim Martin, Frank Braukman, Bob Krise, Steve Vandecoevering.

THE INDIVIDUAL

"If we draw our strength from the uniqueness of each individual, together we become more than the sum of our numbers"
—Tektronix philosophy statement, February 1962.

CONNIE WILSON

a way with CRTs



During her college days, Connie Wilson (CRT Engineering) had her sights set on being a laboratory technician.

But money, or rather lack of it, thwarted her plans. She has become, instead, one of the few women engineers in the Portland area: A self-made engineer through experience, not formal education.

Living at home, she worked nights and week ends to earn enough money for three years at Portland State college (in the mid-1950s, merely an extension center with no college status of its own), where she majored in biology in preparation for becoming a lab technician.

But then her parents, who operated a small grocery store in Portland, decided to move to Missouri. And Connie, instead of attending the University of Oregon Medical School to finish the lab technician's course, had to quit and go to work.

After working in the Portland area for about two and a half years, Connie joined CRT Production's Gun Fabrication group in June 1957. After six months she transferred to a new group (that finally became CRT Engineering), as a technician. She has been an engineer for five years and is now the project leader of the engineering group responsible for designing conventional CRTs. Reporting to her are three engineers and two technicians.

She credits her ability to become an engineer to the generosity and willingness of her supervisors to let her try something new, something she had never done before.

"I learned it all right here," she says.

Connie's never-ending curiosity led her to ask questions; through the answers she learned a little more about how and why a CRT works, enabling her to assume more and more responsibility. Her curiosity and competence did not go unnoticed by her supervisors.

As a technician in the new group, she assisted in the design of the 5032 tube for the 561A oscilloscope. The 5033 tube for the now obsolete 506 was the first tube she designed as a junior engineer.

As an engineer, she designed the 547 tube for the 540 series, the 529 for that television waveform monitor and the 556 for that dual-beam oscilloscope.

In her spare time, Connie is the manufacturer for Medical Instruments, Inc., a company operated on the side by a Portland radiologist, which makes the Shipps Automatic Injector for x-ray equipment. Connie, for five years, has been building the electronic parts for the Injector.

Also in her spare time, Connie plays volleyball with Dr. Bernard's Molarettes, bowls in the Tek Bowling League, and goes hiking and camping. She is also interested in other sports—skiing, swimming, and playing golf and tennis—although she doesn't have much time for them.

Her memberships in professional organizations include the Society of Women Engineers and the Executive Women's Club of Oregon.

Born and reared in Portland, Connie is a graduate of Grant high school. She also took an x-ray technician's course at Western States Chiropractic college in Portland.

Engineering is a specialized field. Designing cathode-ray tubes—critical components of oscilloscopes—is even more specialized; no colleges graduate students as tube engineers. It has to be learned through curiosity, and experience on the job.

Connie's transition from her college-days goal to an engineer, and a very specialized one at that, emphasizes graphically Tektronix' policy of encouraging each employee to accept as much responsibility as he can handle, and to "grow" in his job.

ERNST MASSEY

he's glid (glode?)

(His) English is too good . . . that clearly indicates that (he) is foreign.

. . . Lerner and Loewe, *My Fair Lady*

When he talks, you peg Ernst Massey (IDD) as an Easterner. His crisp and flawless English gives no hint that he's a native Austrian who's lived two-thirds of his 43 years abroad.

He's skin-dived in the Red Sea, skiied in the Alps, flown gliders in eight countries and traveled from London to Calcutta the hard way—driving his own Land Rover. ("Mostly on roads.") He falls in the trite category of "interesting people," but that can't be helped; he **is** an interesting person.

After a Vienna boyhood, he completed high school in New York state; attended Cooper Union, studying engineering nights while working days in a machine shop; served with the infantry in Germany and The Phillippines; returned to Cooper Union (also working in a development lab and teaching electronics classes), where he met and married his wife, Blanche.

They graduated in 1950, then used the GI bill to study for three years in Paris. He was hired by General Electric to repair radar in Europe, Asia and North Africa. After five years, he left GE, bought the Land Rover and he and Blanche logged a roundabout 30,000 miles to Calcutta (pausing once for surgery on a leg broken earlier while skiing).

Then, via Japan to the US West Coast. There he visited a childhood friend from Vienna, living near Beaverton, who introduced him to three Tek employees . . . and so it went, from there.

So much for the "duller" side of Ernst Massey.

He's skiied "pretty much since I was six," and for the last three years has been a member of Mt. Hood Ski Patrol. He's a skin diver, having explored under the Red Sea, the Indian Ocean, the Gulf of California and the chilly waters of the Pacific Northwest. He's flown airplanes since 1962, is a member of the local Civil Air Patrol and has been president of Tektronix Flying Club; he holds commercial and instructor's licenses and has his instrument rating, and he's now taking aerobatic flying lessons.

But what he likes even better is soaring—piloting motorless gliders.

For 10 years before he flew an airplane, he had been an avid glider pilot. To earn his International Achievement "C" badge with silver wreath, he had to make a five-hour flight; soar (gain altitude) 3280 feet above starting point, and travel 32 miles in a single flight.

He's talking now about trying for a gold wreath. That requires a 186-mile flight (like from Beaverton to Medford) and soaring 10,000 feet.

(The world-record glider trip was over 640 miles; the longest in time lasted 70 hours—a two-man flight over Oahu.)

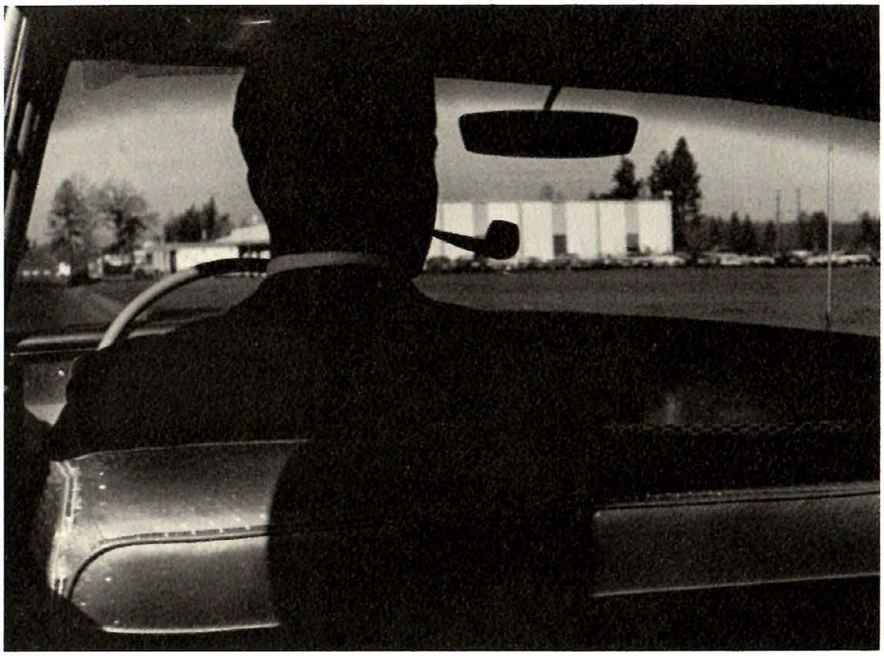
Ernst is now chief instructor for Willamette Valley Soaring Club, which stashes two gliders at Oregon City and glides at various locations in the state.

The local club doesn't face the problems some gliding groups do: Lack of towplanes and shortage of instructors. It **does** have some troubles, though: Launching fields are hard to find; Oregon doesn't have ideal gliding weather (the Pacific air mass is a stabilizing influence that hampers formation of thermals — updrafts — necessary for prolonged flights). And there is a decided membership problem.

"This lack of interest is hard to explain," Ernst says. "There's a lot of local activity in 'chuting, and gliding is lots more thrilling, in that you use your own skill to take advantage of the forces of nature." Yet, despite its total reliance on the pilot and the wind, a glider is safer than an airplane; it can land safely in smaller, less improved fields.

But, even though it combines thrills and safety, gliding lags far behind other sports in this state, in popularity.

To the true believer, however, that hardly matters. When all's said and done, it's the next best thing to being a bird. And that seems to suffice.



NORMAL DRIVER

accidents will happen

"Stop Murder by Motor," pleads a booklet by a national lawyers association. It's a frank publication, and not a pleasant one.

It says the public accepts death on the highway as part of life in America. The government has no comprehensive plan to help. Specialists are apathetic.

The responsibility, then, must lie with the individual—with the Normal Driver.

The carnage can't be blamed on bad guys. Not even on bad drivers.

So, you're a "good" driver. So are most of the people who have accidents.

So, you obey speed laws. Four-fifths of the drivers in accidents are driving within speed limits, and under 50 miles an hour. Eighty-seven per cent of fatal accidents occur at speeds under 35 miles an hour.

So, you've never had a traffic violation. Neither had eight of 10 drivers killed in their vehicles. For seven of the eight, the fatal mishap was their first accident.

Over 70 per cent of accidents happen to normal drivers. On straight, safe roads. In good weather. In moderate traffic. At reasonable speeds.

Does all this worry Normal Driver? Not him. Studies show that a large percentage of seat-belt owners don't even take the trouble to buckle up.

Does it worry authorities? Not them. Only one state requires driver's-license applicants to have a physical exam. (Its findings, that 1.7 per cent were unfit to drive, indicate that probably 1½ million physically impaired drivers are now operating vehicles in the US.)

In another state, 10 per cent of the persons receiving aid to the blind still had their driver's licenses.

A driver who loses his license in one state may apply for another in a neighboring state. If he gets it, he may again drive anywhere in the US.

And so—increasingly—accidents **will** happen.

Fatalities last year—not to mention maiming accidents — totaled 48,500. That's about the population of Hoboken or Dubuque.

Traffic injuries exceeded four million. Incredibly, that about equals the total population of **nine states:** Alaska, New Hampshire, Wyoming, Nevada, Vermont, North Dakota, Hawaii, Delaware and Idaho. Had these injuries occurred all at once, they would have filled every US hospital bed.

There have been more than twice as many traffic deaths since 1900 as there were battle dead in all US wars.

During the first half of a person's life, his most likely cause of death is the automobile.

The worst accident cause is tailgating. A car slamming an obstacle at 30 miles an hour tosses passengers like bullets against interior metal and glass. At 60 miles an hour, it takes the length of a football field to stop **after** the danger is perceived. In spite of this, we still drive bumper-to-bumper.

Drinking is a major factor in 55 per cent of fatal vehicle mishaps. Of those killed, 45 per cent had been drinking (67 per cent, in single-vehicle accidents). Of the **innocent** (not at fault) drivers who died, 44 per cent were killed by a driver who had been drinking.

So, you drink only moderately. You're a worse risk than the stone-drunk driver. Chances are he's taken off the highway, either by himself or by friends. The guy with a few "sociable" drinks under his belt is courting disaster.

Among the many recommendations by the lawyers' group—affecting legislation, driver training and so on—is a strong plea for adoption of these expert-driving habits:

1. **Aim high**—Glance repeatedly well ahead of the center of your intended driving lane.

2. **Get the big picture**—See the objects right ahead as only **part** of the picture. "Sweep" the scene for a full city block. Look frequently to sides and rear.

3. **Keep your eyes moving.** Or else you invite "highway hypnosis" and over-relaxation.

4. **Leave yourself an out.** Leave a space "cushion" for maneuvering, and extra space ahead. In any doubtful situation, reduce speed.

5. **Make sure "they" see you.** Signal your intent early, while you still have space and time to avoid them if they **don't**.

Never cease to be vigilant—anywhere, anytime. It's easy to look for protection in the law, in safety devices, in the skill of the other guy.

When you're tempted to relax, remember:

Last year 300 persons were injured while standing on traffic safety islands.

They must appreciate the need for accurate and timely information. Carelessness could make the whole process fall in.

Dwain—Helping the employee inform himself is a problem for management. We **must** provide training. For our part, we'll continue our own data-processing courses. And an employee can read articles on computers to find out how they perform and their capabilities.

Derrol—Actually, managers have no reluctance to use data processing. I suspect most of them overuse it.

The need is to convince them it's not an automatic solution to all difficulties. Sometimes data-processing people add to the problem, if they assume the manager **has** identified his needs. If you don't talk through your problem, no program writer can save you.

Fitz—Some things, once you have them, you can use and use, with increased unit value—like highways. The computer isn't one of those things.

I think Derrol has the key: Overuse is when you do a job more because computers **can** do it than because such data analysis has value. I'm sure we do a lot of reports on machines that we wouldn't do had we analyzed better. And even if a manager does think out his problem, he's not always in a position to evaluate how much the company should spend to **give** him his information.

It's easier to measure the value of something tangible, like a desk, than the value of timely information, or someone's use of it.

Do you intend, in the Data Processing committee, to make this kind of cost as "visible" as, say, the desk?

Fitz—That's a good point: The invisibility of this kind of decision and its cost—even to considerate people. On the other hand, if you hire a person, that's immediately noticed.

Computer people say, jokingly, that if machines ever start to take control, you can always pull out the plug—a negative approach. What WILL the ultimate man-machine relationship be?

Derrol—Even machines with social impact are tools—doing things that have been done before (although clumsily, by machine standards). I don't see the computer as being as revolutionary as, say, radio or TV—which did things that **weren't** ever done before.

TEKTRONIX' NEWEST COMPUTER, the "third generation" IBM model 360, may be used for both business and scientific applications. It's shown with Dwain Quandt.

Science-fiction accounts of machines taking over are written by people who lack understanding. (I'm not saying that data processing can't be misused—by people, for instance, who put in inadequate information and then base their decisions on the machine's output.)

The day a manager does something just because the machine said to would be a sad day. It the answers came from machines, there'd be no need for managers.

Maybe that's one of the manager's worries.

Fitz—But an unrealistic one.

The computer does let man do jobs he couldn't do even with a large number of people. The logic required to calculate force and direction of earth satellites requires immense computer systems—and centuries' worth of computation. Still, the success of our astronaut program has rested with **human** judgments. As to the worry about machines giving us instructions, I disagree that this is always bad.

For instance, in an air terminal, a "machine" tells you flight such-and-such leaves at 10:02. That's very helpful information—whether or not you consider it an "instruction" to get on board.

There is a difference between looking at something that **tells** you what to do and something that gives you information on which you act in full confidence. A whole lot depends on your attitude toward information; it's the difference between "instructions" and "orders".

Derrol—I think the thing is this:

Not only would an organization in which machines give orders be undesirable from a human standpoint; it also would be ineffective—too rigid and too inflexible to work.

No matter how far we go with computer technology, the manager will assimilate all information—and make the decisions.

One mark of civilization was the beginning of the use of tools. Man now has control over more and more sophisticated tools. The machine **can't** have mastery—unless we all quit thinking.

painted with brilliant fluorescent colors, to make it easier to track and observe them.

Trapped animals not used in the tests were painted bright colors and released back into the troop, to use as controls; that is, the scientists had to make sure that the mere fact of being captured wouldn't somehow change the animal's behavior. Observations of control baboons showed that their behavior had **not** been affected.

The lightweight (under two pounds) backpacks contained the electronic gear, including combinations of flow and pressure telemetry systems and a control system for anesthesia capsules. The packs, held on bandolier-style by plastic and steel cable, didn't bother the wearers. None tried to remove theirs.

The baboons were released to their troops, and the scientists' vigil began.

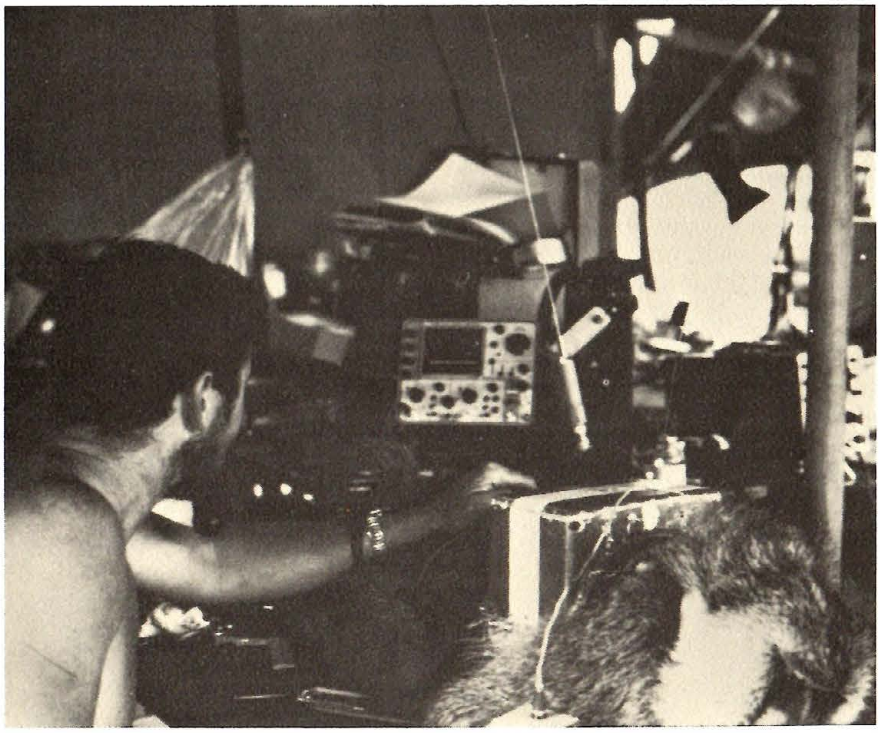
Because the need was to get simultaneous physiological and behavioral information, only one animal was generally studied at a time. Two scientists spent about five hours of the day tracking and watching an animal, and making notations on his posture, activities and relationships with other animals. This information, in three-digit letter code, was recorded onto the same tape that was electronically recording bloodflow and pressure signals.

The code was simple but comprehensive. "PR", for instance, meant "walking upright," and was defined in degrees of intensity, from 1 to 10. Thus, PR-10 would be a full run. And even finer breakdowns were made; PR-10 while running from a leopard differed (understandably) from PR-10 while chasing a girl baboon.

Recording usually began at daybreak, when the animals could be easily located sleeping in the trees. (When aloft, they transmitted as far as two miles; on the ground, often less than 500 yards.)

"We learned," says Watson, "that you can't measure physiology without seeing what the situation is; telemetry systems get us closer to the **whole** animal."

TECHNICIAN NOLAN Watson uses a Tektronix 422 to make last-minute adjustments to the backpack of a Papio doguera baboon, before releasing the animal back to its troops.



For instance, heart rate is far slower in baboons playing on their home field than in baboons in cages. And, whereas a baboon in captivity is likely to gnaw the hand that feeds him, in the bush country "you can damn near walk up and pat him on the head," according to Watson.

Baboons, as it turns out, have a very routine routine. The day begins when they come down from the trees. Then is the time for a whole gamut of activities that, if they were humans, you might classify as human relations: Social, mating, grooming, flea-removal activities and so on. Then they're c forage in the denser bush or to r about the local bogs—followed v possible by scientists. For four or hours at midday, they snooze. T just before bedtime, comes anothe cial hour. This goes on, pretty dictably, day in, day out.

In most cases, the troops accepte "bugged" baboons without incident. in the rigid structure of simian soc some of the returning males seeme have been "demoted" from leade subordinate status in the troop.

Data was taken for a maximum c days per baboon. All in all, about hours of cardiovascular activity recorded, on 57 rolls of magnetic Some records contained flow info tion, some simultaneous flow and sure. Most of them had accompar notes on the animal's behavior.

"It is expected," says Watson, ' some of the classical concepts of distribution under stress may wel challenged by the findings of the boon safari."

In any case, the expedition w "first" for science—and for the por oscilloscope that helped make it sible. And, vicariously, for the pe of Tektronix who designed and duced it.

Plans are already being talked o a follow-up project, this one ı giraffes—to find out, among (things, why they don't faint every they stoop to get a drink of water.

BLEND OF NATURAL and architectural beauty typifies Tektronix industrial park. In recognition, Gov. Mark Hatfield recently presented the company with an award for beautification of Oregon. Back cover: A Tektronix oscilloscope displays a 5-megacycle "beat note" arising from the difference in frequencies of two laser beams, in an optical heterodyne configuration at Spectra-Physics, Mountain View, Cal.