* tek talk

employee's publication of Tektronix, Inc.

volume 10 number 2 May 1963

LOIS M GILLESPIE
5020 S W 139TH AVE
BEAVERTON OREGON 3

Tektronix, Inc.
13955 S.W. Millikan Way
Beaverton, Oregon
Return Requested

tek talk Published six times a year by Tektronix, Inc., 13955 SW Millikan Way, Beaverton, Oregon, by and for its employees and with the cooperation of the Printing and Photography departments. Address mail to Tek Talk, Communications department.
Editor, Joe Floren; production coordinator, Willie Henning; graphic artist, Nancy Sageser.

TEK NEWSREEL

(A summary of some of the major recent happenings on the Tek scene)

Thirty Tek managers attended a laboratory workshop at the Gearhart hotel on April 25-27 on how to make group meetings more productive and efficient. John Wallen of Human Relations directed the workshop, which included active participation—working in small groups on similar problems. Each manager served as a group leader, group member and observer during the sessions.

❋

Three additional plant shutdown days for 1963 were announced by Bob Fitzgerald, vice-president, Operations, as a step to call attention to increasing overall costs, high inventory and other results of unpredictable fluctuations in last year's order rate.

May 24, May 31 and July 5, Fridays, will be nonpaid shutdown days for all Portland employees, exempt and nonexempt. Employees may take vacation these days. May 24 was chosen to permit taking inventory on a regular workday if needed; and May 31 and July 5 to provide long weekends. No two of the days fall within the same pay period.

❋

W. K. (Dal) Dallas, vice-president, will retire about June 1. He is now on a vacation trip, and then will be on a leave of absence until his retirement.

Dal will continue as a vice-president until the end of the corporate fiscal year and serve as TEKEM director and president until his term expires.

Dal, at Tektronix since 1948, set up the company's marketing organization during his initial years, including establishment of field offices and arrangements with overseas distributors. He also took a very active part in Tek's selection of Guernsey and Heerenveen for our overseas manufacturing facilities.

President Howard Vollum commented that Dal is the individual most responsible for establishing and developing a worldwide marketing organization "second to none".

❋

Tektronix marketing — international and domestic — underwent a number of significant changes this spring. The changes were announced by Bob Fitzgerald, vice-president, Operations and Byron Broms, Marketing manager.

Foremost is reestablishment of the company's overseas marketing headquarters in Guernsey by the end of May under the title Tektronix, Ltd. The warehouse for Beaverton-made instruments moved from Heerenveen to Guernsey over Easter, and marketing headquarters moved from Zug, Switzerland to St. Peter Port, Guernsey May 4 and 5.

Frank Doyle, European Marketing manager, heads the new operational unit, which will include order processing, goods warehousing, shipping, field engineering and Customer Service parts.

The move will provide a simpler, more integrated operation and thus improve Tektronix' overseas service and support activities. Tek overseas distributors were notified of the change.

On the other side of the globe, Tektronix Australia Pty. (Proprietary) Ltd. has been incorporated in Canberra, in the Australian capital territory, and will serve as Tek's marketing function in Australia. The new organization expects to serve the needs of Tektronix Australian customers beginning July 1. The registered office will be at 39 Martin Place, Sydney.

The International reorganization involved several personnel changes. Don Alvey, formerly European manager, has been appointed International Marketing manager and will be located in Beaverton probably by fall. He will report to Byron, and will be a member of the Management Group. Reporting to him will be Ladd Goodman, European coordinator, and Scotty Pyle, International Marketing.

Don's new responsibilities will consist of development and administration of all marketing activities outside the United States, including Tek marketing subsidiaries in Europe, Australia and Canada as well as representatives and distributors. Support and liaison functions in Beaverton will also be part of his responsibility. Tek's domestic marketing activities are now directed by Keith Williams, new US Marketing manager. He will develop and administer all US marketing activities ranging from the field sales organization to staff and support functions such as Field Training and Field Administration.

Reporting to Keith will be Ed Bauder, Western Region manager; Dale Brous, Eastern Region manager; Bill Ewin, Mid-Atlantic Region manager; Rollie Smith, Field Training; Dick McMillan Sr., Field Administration and John Mulvey, Field Information.

Jack Cassidy, former Domestic Marketing manager, will provide transitional help to Keith before leaving the company May 26.

❋

The company's worldwide manufacturing operations were also realigned this spring. Mike Park, Manufacturing manager, announced the following responsibility changes:

Earl Wantland, Heerenveen Operations manager, is European Manufacturing manager and will direct the entire overseas manufacturing operation. He will assume his new role in Beaverton to help assure that overseas needs are given constant attention here. Earl and his family will return to Beaverton in September.

Tom MacLean, Custom Militarized Instruments manager in Beaverton, will take over Earl's duties as Heerenveen manager in June. He and Bob Gwynn, Tektronix Guernsey Ltd. manager, will report to Earl. Replacing Tom as CMI manager is Hal Busch, Plant Staff 3.

The changes will link European manufacturing with domestic manufacturing and engineering for the first time since Tektronix' overseas operations began. Previously, European manufacturing has been part of International operations with Guernsey and Heerenveen reporting to Don Alvey, former European operations manager.

Relating overseas with Beaverton is the second step in improving the company's manufacturing. Last fall, four separate organizations—Fabrication & Molding, CRT, Instrument Manufacturing and Materials Management—were grouped under a common responsibility.

Mike said he plans to emphasize short-term exchange of manufacturing personnel to and from Europe. He spent two weeks this month in Europe, acquainting himself on manufacturing needs and clarifying responsibilities.

❋

Special-interest tours were a new attraction at this year's Business-Education Day April 10 when 100 Portland public school teachers visited Tektronix' offices and plants in Beaverton. Business and mathematics teachers visited offices and data processing units in the IO building; science teachers visited CRT and industrial arts teachers toured F & M.

The all-day program also included a general session on oscilloscope uses in the classroom by Field Training, question and answer period, luncheon, a tour of the assembly buildings and a showing of the film, "Tektronix on the Isle of Guernsey".

B-E Day is sponsored by the Portland Chamber of Commerce in cooperation with the Portland public schools. Last spring Tektronix managers visited the schools as part of the annual interchange between educators and businessmen.

❋

A $5000 Tektronix Foundation fellowship was established at Stanford University in February. Dean J. M. Pettit said recipients of the fellowship will be primarily first-year electrical engineering students in the field of solid-state electronics. The grant includes tuition and subsidy for the student and a portion for additional expenses in the Electrical Engineering department.

Stanford will endeavor to award the fellowship to outstanding students from the Pacific Northwest to encourage their pursuit of graduate studies in engineering and physics. Each student receiving the fellowship will be considered for summer employment at Tektronix.

During the first three years of the fellowship, Stanford will be eligible to receive matched funds from the Ford Foundation.

❋

Assembly buildings 39, 47 and the cafeteria, 45, received an architectural Award of Honor from the Oregon chapter of American Institute of Architects (AIA) on March 15. Howard Vollum, president, and Norm Zimmer of the Wolfe & Zimmer, architects, accepted the award at the design awards exhibition in the Portland Art Museum.

The jury, in making the award, stated: "Careful detailing, use of materials and colors, give this complex of buildings an integrity and conviction."

❋

Two more Tektronix Foundation lectures were held during March and April. They were given by Dr. Robert W. Terhune, supervisor of Ford Motor company's Physics and Electronics scientific laboratory and Dr. R. G. Herb, professor of physics at the University of Wisconsin. Dr. Terhune spoke on "Non-linear Optical Effects" and "Lassers and Their Applications". Dr. Herb discussed "Atomic Effects on Nuclear Reaction Yield Curves".

The lectures were held on five Oregon campuses—Portland State college, Reed, Linfield, Oregon State University and University of Oregon. Now in their third year, the lectures are devoted mainly to pure or applied physics. Jean Delord (Director of Research) is 1962-63 coordinator.

Newsreel: Richard Koe
Cover photograph: Josef Oswald

JOIN THE CROWD • EVERYONE'S DOING THE NEW SHILLY-SHALLY • TO BE OR NOT TO BE • • WHY DECIDE? USE THIS NEW MIRACLE INGREDIENT AND AVOID ALL DECISIONS • BE THE LIFE OF THE MEETING • PRESENTED, IN SEVERAL (COUNT 'EM • • SEVERAL) WHIMSICAL LESSONS, BY ONE WHO HAS READ UP ON THINGS •

WHERE THERE'S LIFE THERE'S (PROBABLY) SMOPE

by **JOHN WALLEN**
Human Relations Development

The smope is an invaluable resource for any group leader or member. Observation has disclosed that nearly any committee or problem-solving group will use smopes at one time or another.

The origin of the term "smope" is disputed. Three explanations seem to have been proposed.

According to the first, or historical, explanation, a stranger stopped a citizen in a small town to ask directions to Mount Hood. The citizen tried in several different ways to describe the route to the mountain, but each time ended up in something that was unexplainable. Finally in desperation he said, "Well, I guess you just can't get there from here!" The name of that citizen was Thomas Alva Smope.

A second theory explains the term by morphological* analysis combined with linguological* considerations. Adherents of this view maintain that "smope" is an abbreviation for the phrase "skillful method of problem evasion."

* The author, a psychologist, says he didn't make up these words, but found them in the dictionary, under M and L.

A third derivation is based upon psychological considerations. Briefly, this theory suggests that "smope" is merely a skillful mope. Adherents of this explanation point out that a person who mopes is evading his problems. However, his method of problem evasion (or "mope") is not skillful, as indicated by his emotional state, i.e., low spirits and depression.

Whatever the derivation, these three explanations coalesce nicely because Thomas Alva Smope had, wittingly or not, employed a skillful method of evading the problem, which preserved his own picture of himself as a helpful, informed, successful person rather than a failure who could not tell which way was up.

This article will present smopes that have been compiled from observation of groups attempting to solve problems. Acknowledgement is made to Paul Diedrich, who pioneered this field of study with his informative article in 1942 ("How to Run Away from an Educational Problem," **Progressive Education,** Volume XIX, No. 8, March, 1942.)

As Diedrich commented, "Certainly, with all these techniques, there is no

ARE YOU SMOPING MORE NOW AND ENJOYING IT LESS?

excuse for awkwardness in problem evasion."

A List of Smopes
(Adapted from Diedrich)

1. Respond to a proposal or suggestion with, "We must not move too rapidly." This often avoids even getting started.
2. Point out that there is no simple answer. This will eliminate the necessity of having **any** answer. (For "simple" you may also substitute "easy", "one" or "single")
3. For every proposal, set up an opposite and conclude that the "middle ground" (no motion whatever) is the wisest course of action.
4. Point out that an attempt to reach a conclusion is only a futile "quest for certainty". Doubt and indecision "promote growth".
5. Say that the problem cannot be separated from other problems; therefore, no problem can be solved until all **other** problems have been solved.
6. Carry the problem into other fields; show that it exists everywhere. Hence, it is of no concern.
7. Point out that those who see the problem do so by virtue of personality traits, e.g., they are unhappy and transfer their dissatisfaction to the area under discussion.
8. Blame some group or person who is not present and indicate that it is really **his** responsibility. Then steer the discussion onto an analysis of why that person or group is so ineffective or incompetent. Use phrases like "We can't do anything about it here."
9. Emphasize the dangers of formulating a conclusion. You can refer to dangers such as the following:
   a. Others may misinterpret it.
   b. It may arouse criticism.
   c. We may be exceeding our authority.
   d. Somebody may feel offended because he wasn't consulted.
   e. The statement may seem to assert more than is definitely known.

(**Note:** Do not refer to the danger of revealing that no one has a sound conclusion to offer.)

10. Look for a remote philosophical basis for settling the problem, then a basis for that, then a basis for that, and so on—back to Noah's Ark.
11. Change the subject. A helpful phrase is "by the way, ..." Also good are, "Incidentally, . . ." and "That reminds me . . . ."
12. The reverse of begging the question. Begin with a problem like "What kind of grievance procedure should we have?" and end with the conclusion that maybe we ought to have a grievance procedure.
13. Conclude that we have all clarified our thinking on the problem, even though no conclusions have been reached.
14. Point out that some of the greatest minds have struggled with this problem, implying that it does us credit to have even thought of it.
15. As soon as a proposal is made, say that you have been doing it for years (even though what you have been doing may bear only the faintest resemblance to the proposal.)
16. Retreat from the problem itself into endless discussion of:
    a. Techniques for approaching the problem.
    b. Technical details. (These become more effective as smopes if the details are so esoteric that only a few have even heard of them.)

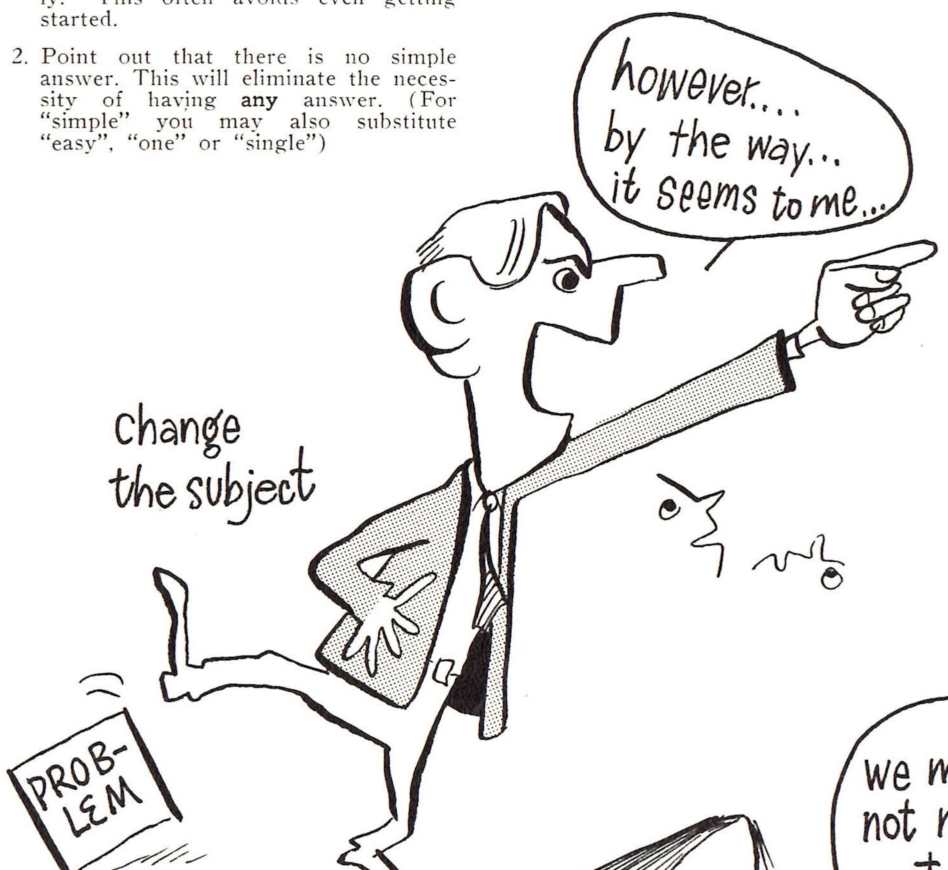
Here's a Thought!

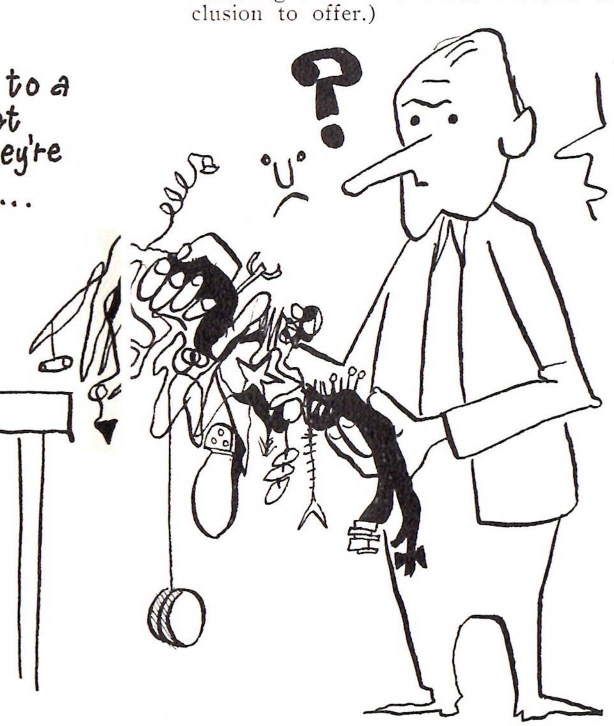
17. Assign the problem to a committee. Specify its authority, and define the task to be accomplished, in vague terms.
18. Point out that there is no necessity to reach a conclusion because each person has his **own** way of handling these things, and we are sure that each will do his best.
19. Point out that agreement paves the way for stifling individuality and developing an organization of conformists.
20. Express thankfulness for the problem. It has stimulated our best thinking, and has therefore contributed to our growth. It should get a medal.

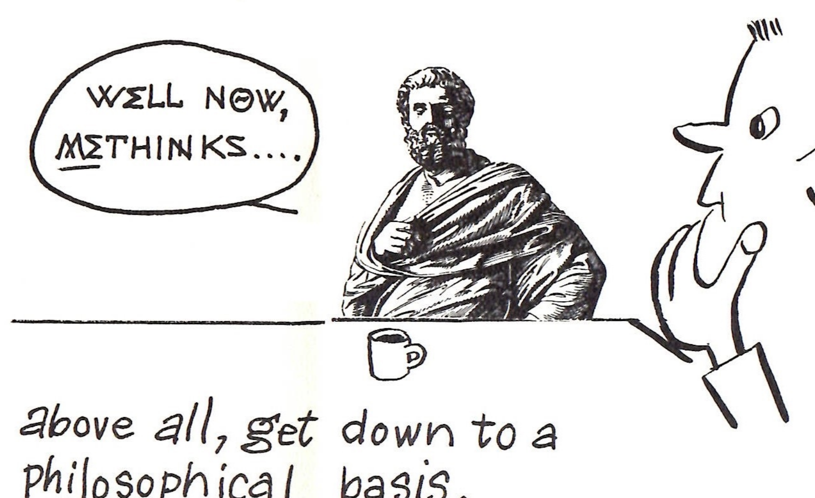
This list is obviously incomplete. Administrators, executives and managers are continually developing wonderful smopes. You can help our research along if you will record smopes you observe, and let us know.

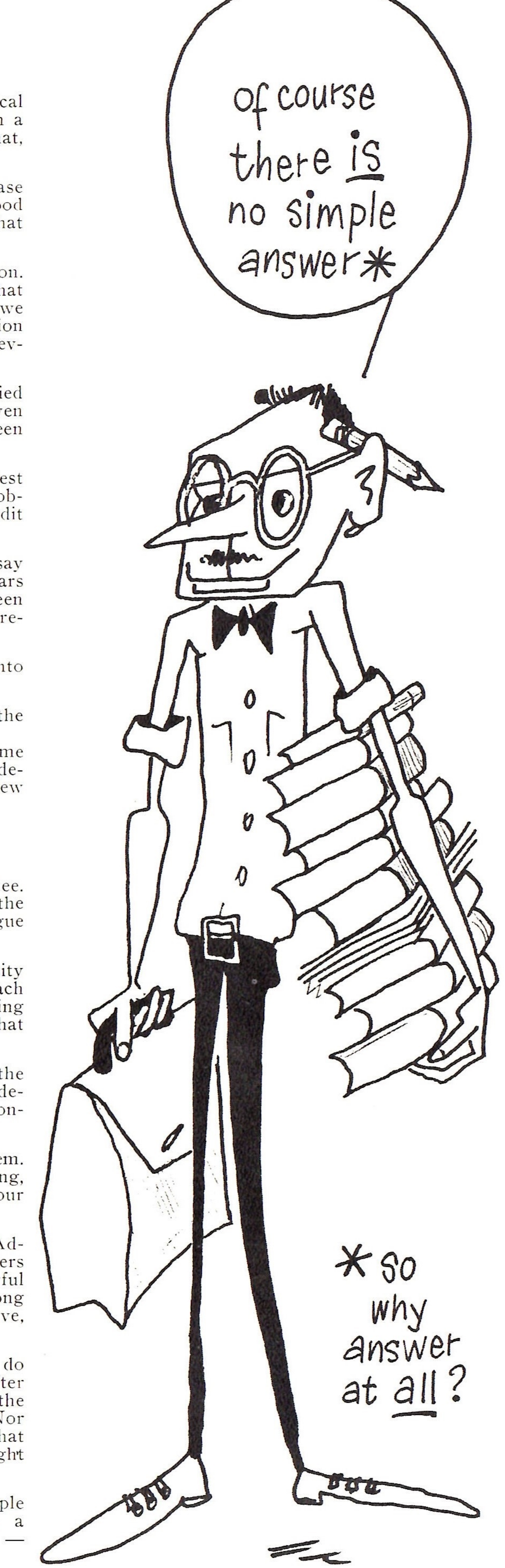
On second thought, for you to do something now may be premature. After all, we have not definitely determined the derivation of the word "smope". Nor have we worked out the philosophy that underlies the smope. That really ought to come first.

I guess I'd better consult some people about the possibility of appointing a group to spend some time on this — smoping.









Cartoons: Joe Floren

The camera manufactured here at Tektronix is the Cadillac of oscilloscope photography devices, keeping pace with the advancement of Tektronix scopes, developed and manufactured with Tek's traditional reliability and precision.

Mechanical Engineering Camera Development project leader Maurie Merrick thought back to mid-1959 when he came to Tektronix from nearby Sawyer's, Inc. The need for an oscilloscope camera had already been established when Maurie was "turned loose" on the camera project.

Camera Needs Realized

The electronics industry wanted improved cameras because:

1. In certain applications the cathode-ray-tube trace traveled too fast to be seen by the human eye or accurately measured. A **record** was needed;

2. A person's mind couldn't remember complicated data or store many details until they could be recorded. A **permanent,** precise record was needed;

3. In unmanned scope observation, **random pulses or timed applications** needed to be recorded automatically;

4. Customers felt that trace-recording cameras would **economically** benefit their operations.

Tektronix needed to manufacture an oscilloscope camera because:

1. We were established as the supplier of, and applications advisor for, the world's most reliable, accurate and complete oscilloscope;

2. Customers began to ask advice on how to obtain permanent records for their findings;

3. By 1957, several instrument manufacturers had come out with oscilloscope cameras;

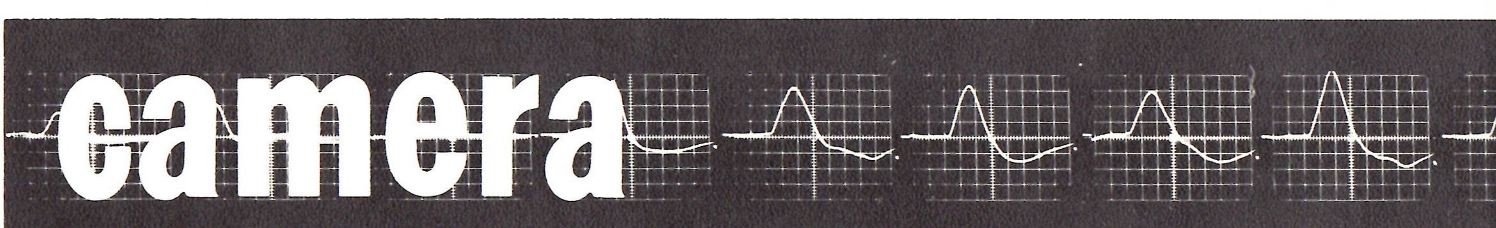
4. Tek felt that in a camera of this type, to be used with Tek scopes, certain features would have to be added;

5. Tektronix lost sales to customers who wanted to purchase the oscilloscope and camera from the same manufacturer;

6. Field engineers were applying pressure to the "folks at home," pointing out the need for a Tek-made camera.

Maurie recalls, it was during 1957 and 1958 that Tektronix realized the need to manufacture this product. Howard Vollum, Byron Broms, Chuck Nolan, George Edens and Will Marsh were among the many employees who discussed the feasibility of a camera.

THE Type 350, a new 35-mm oscilloscope camera-lens combination, is demonstrated here by Maurie Merrick, Camera Development project leader.



Story: Carol Day
Photograph: Josef Oswald

During 1959, a run of 50 C-11 cameras was produced and sold. The design was initiated by Chuck's Special Products department. Then Maurie was hired as Camera Development project leader. He "pitched in and helped" complete the design and production of these cameras. Based on the valuable camera manufacturing and marketing experience gained from the C-11 effort, the company then decided to direct full-scale effort toward the design of an even more versatile and complete camera line.

Many design approaches were considered between November '59 and January '60. Prototype models were built, their features studied and evaluation sessions held. By January Tek had agreed upon a design approach which would offer the most promising advantages.

On the basis of preliminary drawings, Gale Morris of Industrial Design contributed styling sketches. Many hours of drawing-board time by Bob White, Denny Smith and Dwane Romine followed.

From the preliminary drawings, models were made in the Instrument Engineering Model Shop, under Slim Sorenson. Since most of the work involved precision machining, rather than sheet metal work, Dale Helbig's section of the Model Shop was elected. "Through the enthusiasm and skill of Dale, Harry Hendrickson, Max Messmer, Les Wold, Shorty Spencer and many others, we were able to build and evaluate models and to finally meet our deadline," Maurie said.

C-12 Goes to IRE

After a final prototype was built and evaluated, a decision was made: Try to build a show model for the March 1960 IRE show in New York.

Remembering that hectic week before IRE makes several engineers shake their heads in wonderment, asking themselves, "How in the world did we do it?" Maurie remembers that they "practically didn't go home at all for weeks." But in spite of the last-minute rush a brand-spanking-new Tektronix product, the C-12 camera, made its debut at IRE.

Reactions from field engineers and customers were enthusiastic; the decision to manufacture C-12s followed. "We got the GO! GO! GO! signal," Maurie related. Formal engineering began that month.

By December 1960, preproduction was underway and the first 100 cameras were being made in Engineering from production parts. Training of production people (in assembly, testing, etc.) was in full swing.

Since the assembly techniques required in camera production were considerably different from the skills which had been built up in Instrument Manufacturing, Precision Mechanical Assembly was set up by Fabrication & Molding. Armon McDowell of F & M was selected to head this group because of his extensive mechanical experience at Tek. The group was organized and trained by Armon in the special problems involved in high-precision mechanical work. PMA has the responsibility of assembling, inspecting, testing and packaging the cameras for finished goods inventory. They also repair and recondition cameras and shutters.

"There were many production problems to be worked out, and these people deserve a lot of credit for the work they are doing," comments Maurie. "Their efforts are certainly a big factor in the success of the camera program."

The seven men who work in Camera Development are termed "the greatest" by their project leader, Maurie. Jaime Navia, mechanical designer, is administrative assistant. Denny Smith and Sid Broughton are also mechanical designers. Len McCracken (draftsman), Duncan Bergeron (plastics engineer, expediter) and Norm Hughes (photo technician) help keep things running smoothly.

"We're not in the camera business to drive any competitor out," Maurie points out. "Tektronix is interested in satisfying its customers—giving them a unit specifically designed for use with Tek scopes, a unit which can periodically be upgraded to keep up with scope advances."

Three types of scope cameras are being manufactured by Tektronix—the C-12, C-13 and C-19. All take Polaroid film and use Polaroid backs. No major changes have ben made in the C-12 since it was introduced three years ago. Naturally, Maurie tells, there were "bugs" to be worked out, but those were minor. "Camera sales were encouraging right from the start," he said. "We are selling many times above the original estimate."

Many Features Offered

The C-12 camera features light-tight construction; focusing to compensate for unavoidable variations in CRT positions; a swing-away hinge to pull the camera away from the CRT; precise, calibrated magnification lenses featuring interchangeability; accessible controls (no boxes to open or screws to remove); and, finally, an attractive style that complements Tektronix oscilloscopes. Patents are pending on several camera features.

Two other versions of the camera, both embodying all the features of the C-12, are being manufactured. The C-19 contains a special mirror system and a very fast lens for photographing fast-rise transients. The C-13 has a lift-up viewing door in place of the hood, for compactness and economy.

The Latest: Type 350

In preproduction stages now is a unique new camera named the Type 350—a 35mm. automatic sequence camera and lens combination useable on the C-12, C-13 or C-19 front casting assembly.

The spring motor automatically actuates the shutter and advances the film each time the manual trigger is depressed. Or the camera, with a special power supply, can be triggered or sequenced electrically. Using a 35mm. 36-exposure roll of film, one winding of the spring motor will take 55 photographs.

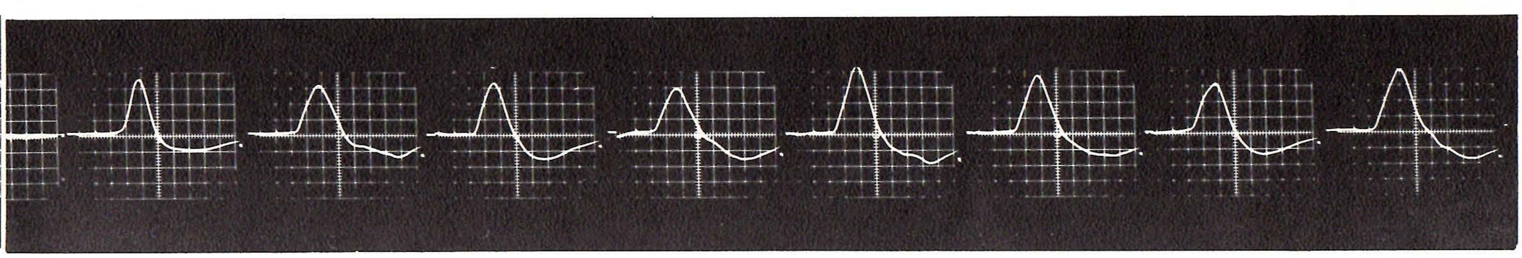
The versatile Type 350 can be oriented so that the film runs vertically or horizontally, depending on the application. Provision can also be made for triggering from the scope trace or from an external source, and for a lamp to indicate when the shutter is open.

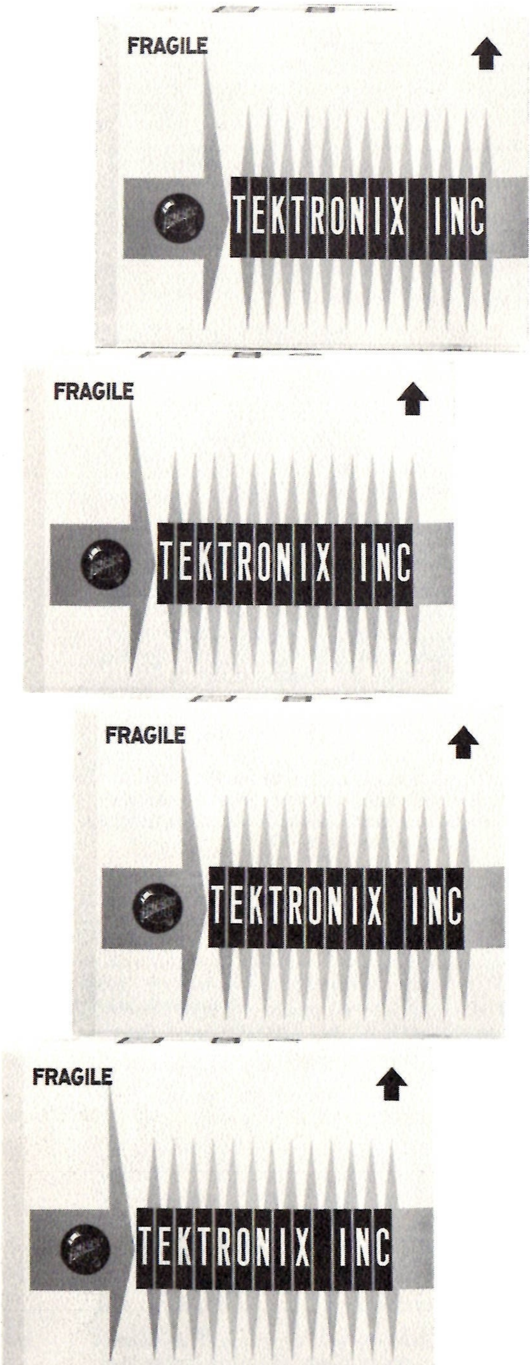
There has been continual demand for cameras with automatically sequenced moving film. The Type 350 Camera Attachment will be an entry and a "feeler" in this market.

Most component parts of the camera are manufactured at Tektronix. Lenses, shutters and Polaroid backs are purchased outside the company. Die castings are built by a Portland firm, under Tek supervision.

Tek departments which contribute to camera construction include Plastics, Screw Machine Shop, Paint, Sheet Metal Fabrication, Welding, Electrochemical and Panelcraft. Supporting groups—Manuals, Printing, Advertising, Field Information and Photography—also aid camera operations.

"Every day we see significant advances in the electronics field," Maurie remarked. "These advances are reflected in scopes now on the drawing boards and in planning stages at Tektronix. In turn, the camera program is constantly being advanced to keep pace with the needs of the users of these new scopes."





PACKAGING:

Sil Arata gestured toward a scope in a shipping box. "We ship more than a thousand instruments this size every week. By using square foam-plastic rings which fit over the ends of the scope, instead of corrugated packing, we should save over $14,000 a year in material costs."

Sil, packaging engineer from Manufacturing Staff Engineering, was explaining an engineer's approach to packaging.

"In this packaging group, just one of several we're looking at, we eliminated 32 different cardboard parts. That means 32 items that don't have to be inventoried and kept in the warehouse. In addition to the material cost will be savings in labor and storage space, and an intangible, the general simplification of the system.

"Many companies get into trouble by letting a packaging program just grow . . I see us in danger of falling into the same trap. In any operation, what's good in a small system is likely to be inefficient if it's merely enlarged. Established procedures cost a lot to alter and it's hard to do. It's best to consider them before they are firmly established. . . ."

Packaging is Engineer's Job

Shipping, packaging—not things you usually think of as an engineer's job; yet the packaging and container industry spends millions every year on engineering research and development. Keeping up with new developments and determining their optimum use here is a full time job for Sil.

Do we need this effort? Why should Tektronix need people to coordinate and research packing methods when so much information is already in the packaging industry's journals?

Let's look at some of the problems: A customer plugs in a new scope; it doesn't function. The Tektronix field engineer finds that fragile parts were damaged during shipping. The scope gets repaired, but the customer has been delayed, his confidence in Tek quality lowered, and our FE has lost time.

A box is dropped, transformer mounts bend.

Labels are paid for, to carry information that might have been printed on the boxes. No one's responsibility, exactly, because Tektronix has three packing areas and one shipping area. It's hard to coordinate information.

Other problems occur during in-plant, or prepacking, operations. A metal part, increasing in value as it moves through shearing, stamping, forming, bending, marking, finishing and sub-assemblies, must be increasingly protected. So, as it is stacked and moved from place to place it is interleaved with papers, soft padding or plastic material, or bagged in paper or sheet plastic.

It might be possible, Sil believes, that certain parts could be prepacked in packaging that would also serve as materials-handling trays and as jigs for certain operations.

Any scratch, scuff, nick, flake or imbedded debris is cause for rejection and means some of our profit share goes into the scrap barrel. Assurance that parts will arrive at Assembly undamaged means Assembly won't have as many rejections at final quality check.

Because prepackaging is done where the parts are made, coordination problems exist. Sometimes parts packed for transit to shipping areas must be unpacked there and repacked for shipping; this is also true of some components received from vendors (outside suppliers). A finished part is usually stored in the warehouse until "called out"; some parts tarnish and must be protected by expensive airtight plastic bags. Others will keep in cheaper bags and boxes.

Lane Gossett, working with Sil in packaging coordination, is at present concerned with vendor packing. Tektronix packaging engineers may be able to recommend to vendors packaging which will serve as prepacking handling protection, which could save labor and materials costs of repacking by Tek.

Fitz Appoints Coordinator

In 1961 the increasing headaches of packaging operations, damage claims and packaging inventories caused Bob Fitz-

Story: Ken Ireland
Photographs: Josef Oswald

SIL ARATA places foam plastic "doughnut" rings over ends of a scope model. These shipping pads may save Tektronix thousands of dollars annually, it has been estimated.

unspectacular but vital is this step between producer and customer.

gerald, then Domestic General Manager, to appoint a packaging coordinator, Sil. In a small office in Plant 4, among boxes, drafting tables, charts, records and models, Sil pursues his goals: To standardize cartons and labels, simplify packaging procedures, improve protection and decrease packing inventories.

Picking up and coordinating ideas from packaging journals and conferences, implementing ideas suggested years ago at Tektronix and adding new ones, Sil attempts to put a dollar value on the best way of insuring that the high-quality Tek scope reaches the customer at minimum cost.

Results: Plastic foam "doughnut rings" slipped over the ends of scopes replace inner liners of heavy corrugated board and several folded corrugated pads—a few different sizes of rings replace several different types of cardboard pads. In one consolidation, parts number are reduced from 14 to four; in another, one plastic clamp replaces 12 wooden parts used to hold down plug-in chassis; in a third case, a savings of $2400 per year will be realized. Reduced inventories of package parts could eventually lead to saving the wages of one or more men who might have to be hired to handle inventories.

In the examples just mentioned, decreased shipping weight passes a savings on to the customer, too—$21,000 per year or more. It's good customer relations.

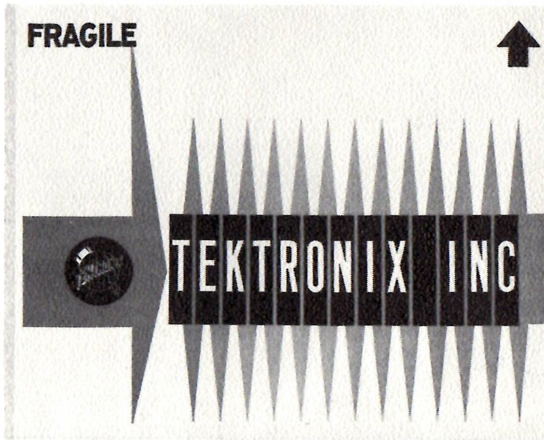
At the Sunset plant, Bill Pickering's environment test lab gives packaged scopes a real working over. A truck-jounce machine, jogging away in the corner simulating a cross country diesel, can wear out a package in hours. If loose packing can rub off paint and make a scope look bad, the simulator will show it up. Parts loosen or bend, borderline calibrations slip. When these things happen, engineers and package designers are notified. There is no use producing scopes that won't survive cross-country shipping.

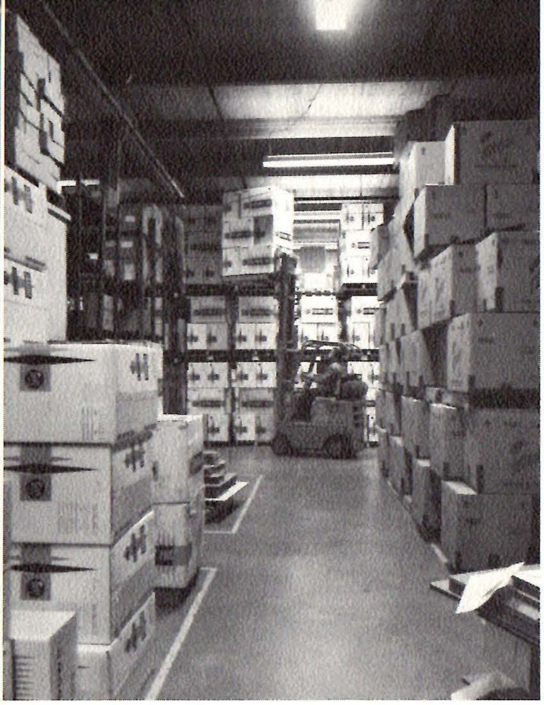
Accelerometer Measures Impacts

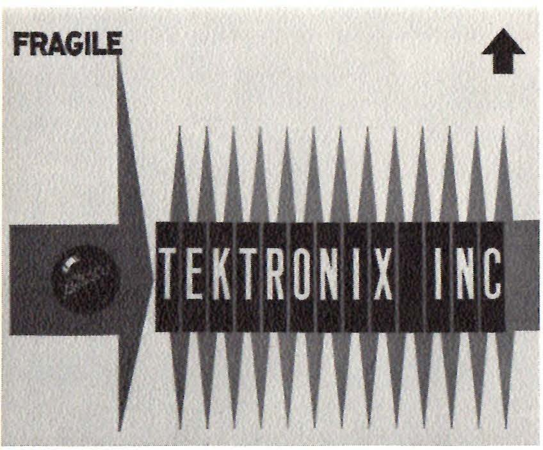
The lab's most useful test instrument is a thumb-sized crystal accelerometer placed at critical spots in a scope. During drop tests, forces inside a scope are measured by the trace of another scope. The accelerometer, like the crystal of a phonograph arm, gives out a minute electric current when jolted; the time and amount of any impact at any point can be seen on an oscilloscope, photographed, and compared with a reading at the same point after changes are made. Bill and others determine a likely trouble point—swing gates, transformer mounts, sensitive or critical circuits—and test there first. If it doesn't meet minimum requirements the scope part is redesigned before packaging is attempted. This helps determine the lowest-priced part that is sturdy enough.

Deceleration force is measured in "Gs" (for "gravity"). A body at rest is 1 gravity. When a fall is interrupted, for a moment or two the pull will be several times the force of gravity. Lift one end of a scope to a 45-degree angle, with the other end resting on a bench and let fall. Even though the end of the scope drops only a few inches, the impact forces may reach 60 Gs. The abruptness of the stop is what counts.

"This often happens on the technicians' benches," Bill says. "Accordingly, we've set 60 Gs as a minimum standard for instrument strength; if it won't stand that, there's no use building it. Instruments get far higher impacts during shipping and handling, so the difference between 60 Gs and shipping forces must be taken up in the packing. We test







standard packages, we test experimental packages and we test new vendor's packages."

The lab is certified by the National Safe Transit Committee, an organization which sets minimum package standards. Our certification indicates our cooperation in meeting standards, but we want **more effective** packing than the NSTC minimum standard.

The findings of the lab have not only contributed to improvements of existing scope parts, but have led to replacement or redesign of parts that are innovations in themselves. Discovery of built-in weakness leads to new approaches.

Hissing, panting machines make the Plastics Fabrication area sound like a railroad roundhouse. Sharp, undelicate odor of chemicals unite in a smell diplomatically described as pungent. Here in one room two drums feed liquid through a mixing control into a metal mold. As these are chain driven through a curing oven the chemicals expand into a plastic sponge that can slip neatly around a CRT. One thousands sets per week have almost eliminated massive breakage problems that plagued us a few years ago. The last broken CRT arrived at its destination with truck tire marks on the box.

Dick Kruger coordinates packing manufacturing in Plastics department. He has found well-designed plastic packing to be excellent protection against general abuse—if not truck tires.

Field engineers carry Tekamera samples in rubber-coated plastic foam inserts in a suitcase. The shipping case for the camera is a foam container with **no** cardboard container. It replaces a cardboard box with 11 inserts, a system so complicated that field engineers often couldn't figure out how to repack it. Thirty-two of these camera cases are packed and shipped in the same time we once packed and shipped 11; the cost of the case is overbalanced by reduced labor costs. Packing engineers consider the possibility of someday shipping everything this way—in a plastic 'box' rather than cardboard.

Colored popcorn, once used as loose packing for small parcel-post packages, attracted vermin. Now we use a soft plastic pellet, expanded, chopped and exploded. Dow Chemical company originated this process, but we've improved it in a patentable way, and other companies are interested in licensing from us.

The capital investment in machines and dies for plastic molding is high and evaluation of results difficult because our products change shapes and our production runs are low. The nearest large molding shop is in California; our own is the largest custom molding shop in the Northwest. The machinery snorts eight hours a day and if trends continue may go to 16.

Paul Belles remembers that 14 years ago he was the first fulltime Tek shipping employee. "We put the scopes, wrapped in Kraft paper, into wooden boxes and packed three inches of excelsior on every side. Everybody packed them . . . everyone did **everything** then."

Nowadays each instrument is boxed in the assembly area and sent to the warehouse. As shipping orders come in, Paul's group seals the boxes, labels them and sends them across country and overseas, by truck, ship and plane, whichever is the best manner.

The wooden boxes were replaced by cardboard in 1950, when Tek became convinced that cardboard lining inside a cardboard container would be safe. Basically we still use the same system, except for a change to white boxes designed by the Industrial Design group in late 1958 to take advantage of the advertising factor.

For export we slip the boxes inside other boxes for better moisture and abrasion protection—**unless** they are going by air freight, which in fact most of our overseas shipments do. Probably one third of our total shipments are made by air. On an overseas shipment this can mean shipping time of two weeks—compared with sometimes two months—plus better handling. Military packaging needs special methods and materials and consequently is done "outside."

When, a few years ago Jim Peabody switched from cardboard padding to foam for CRT shipments the packages became so light and strong we could mail by parcel post, saving $2 each on over 300 cartons per month.

New Systems in Offing

Shipping, like the rest of our company, becomes bigger business every day. In the near future a system of belts and rollers will be installed, eliminating handling and restacking and getting packages out the warehouse door in jig time; a feature will be built-in weighing scale so the shipping clerk may rapidly select the cheapest shipping method.

Some of the answer to packaging problems may lie in educating the carriers. Almost every cargo handler respects the need to handle TV sets, radios and glassware carefully, but no reflex understanding of the delicacy of "electronic instruments" exists; indeed, probably recent propaganda about the ruggedness of gear for missiles and military hardware produces an exaggerated picture of their sturdiness.

One lesson we can all learn: Oscilloscopes ARE delicate, expensive, instruments. We're USED to handling them; familiarity may have bred a belief that they are tougher than they are. Even in the plant,

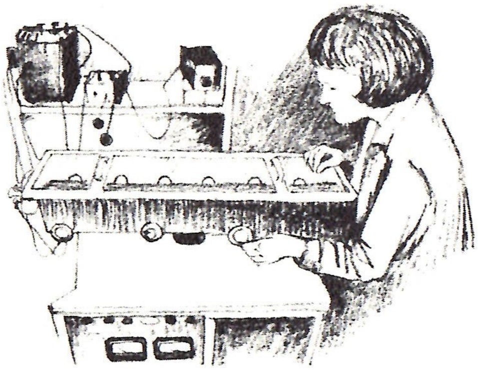
HANDLE WITH CARE.

RESEARCH

Shows Still Another Face

Very few electron optical benches exist in the United States, and few people can tell you much about them. . . .

Story: Jane Martin
Photograph: Josef Oswald
Drawing: Nancy Sageser



Very few electron optical benches exist in the United States, and few people can tell you much about them. Tek not only has such a bench, which is being used in the Research division, but has just completed a second and begun talking of a third.

Tek also has Dr. Gertrude Rempfer, employed part-time in Research as a physics research consultant since June 1960. An associate professor of physics at Portland State college, the quiet, friendly woman is considered a leader in her field.

Dr. Rempfer graduated from the University of Washington, received her PhD in 1939, worked for six years in industry during the early years of World War II and in 1945, as an employee of Farrand Optical Co. in New York, worked with an electron optical bench for the first time. Since then she has been teaching college, designing and building an electron microscope and the optical bench and conducting research studies in electron optics.

The electron optical bench is a box-like rectangular device, cast from high-density, non-magnetic bronze and mounted on a vacuum system. The removable lid is made of heavy ¾" plate glass, through which an experiment can be observed. While open an experiment can be set up; then the lid can be replaced and the box evacuated. Fifteen pounds of pressure per square inch is exerted on the glass lid when evacuated. Components can be positioned inside the box by external controls. Six insulated feed-throughs provide a means for supplying voltages and making electrical measurements.

The primary purpose of the optical bench is to study the focusing ability of electrostatic lenses. However, it is a highly versatile instrument that can be used in many studies requiring a vacuum environment.

Without an optical bench, each time an experiment is made to improve a lens for a CRT or create a new one, an entire cathode-ray tube must be constructed. If it fails to perform as expected, it ends up where many CRTs end up—as a very expensive lamp.

Dr. Gertrude Rempfer and Bert Cathery (preceding page) worked closely together in building Tektronix' electron optical bench — a unique instrument used in Research. Dr. Rempfer performed the basic research and developed the specifications; Bert designed all of the components as well as directing the assembly.

Cost of stock cathode-ray tubes varies from $40 to $1000—an experimental tube usually costs even more. If many trial tubes are made before a lens with the desired properties is found, much money is wasted. As many as 50 tubes may be required to complete an experiment. By using an electron optical bench, operating conditions can be duplicated without having to build a CRT.

In a cathode-ray tube, lenses focus the electrons emitted from the cathode, producing the spot on the face of the tube. The term 'lens" to most people brings to mind a glass lens, similar to those in eyeglasses or light microscopes. In electron optics, the focusing is done by electric or magnetic field. The lenses are the structures which provide these fields.

At the present time we are working primarily with lenses using electric focusing. The electric focusing field is supplied by appropriately shaped electrodes, between which a voltage is applied. Each electrode is essentially a circular plate or cylinder with a precisely made hole in the center through which the electrons flow. These electrodes are positioned in axial alignment with each other. A suitable metal such as stainless steel or brass is used for the electrode material.

For the parameter studies in the optical bench the electrodes are made of brass. Electrodes at different potentials are isolated from each other by lucite spacers. A lens cell holds the components in axial alignment. This assembly is readily demountable for variations of lens geometry.

Shadows Photographed

The lens cell rests on a precisely machined V-block running the length of the box. The V-block aligns the lens with other components of the electron optical setup. In the parameter studies, an electron source at one end of the bench provides a nearly parallel beam of electrons for the test lens (which is placed some distance away along the V-ways) to focus. In front of, and following the test lens, accurate fine wire grids are placed. The shadows which these grids cast in the beam form a pattern on a fluorescent screen at the other end of the bench. The fluorescent screen fits over the photo plate, making a light-tight compartment. When the desired image is obtained on the phosphor screen, the operator pulls a knob which opens the screen and exposes the plate. When the knob is released the combination cover and screen returns to its closed position.

From these photographs, measurements can be made, and the focal length and focal position, as well as the aberrations of these quantities, can be calculated. (In a beam of light the outside rays come to focus before the center rays. The same thing occurs in a beam of electrons. This phenomenon is called spherical aberration.)

Dave Granteer (Junior Physicist, Research) is engaged in parameter studies of the electron lens. Sets of interchangeable electrodes have been made so every combination of these may be tested. As many as 300 combinations are used in one study alone. Charlotte Benedict, a Reed College senior working on her thesis, is performing similar studies using electron mirrors. The electron optical bench is an essential tool in both these projects.

The bench is also used by Frank Christiansen (Physicist, Research) in his study of the motion of cross-over as a function of grid bias in a CRT electron gun. As the demand for faster writing rates in oscilloscopes increases, the need for more electrons to pass through the lens (to maintain the brightness of the spot) also increases. The more electrons used, however, the greater the problem in keeping the spot size small enough to make accurate measurements. The motion of cross-over has a direct bearing on improving size and brightness of the image seen on the scope's screen.

Bert Cathery (Senior Mechanical Engineer, Research) designed the optical benches, using Dr. Rempfer's specifications, and is responsible for the actual building of the parts and assembly of the instrument. Each part is custom-built—the largest piece being the box itself, which weighs about 150 pounds and measures 5¾ inches deep, 8¼ inches wide and 36 inches long on the outside.

"Loren Cox and Clarence Jones of Research's Model Shop did all the precision machining, which is instrumental in the success of the optical bench," Bert commented.

During the machining process, extreme care was taken to prevent warp or distortion in the box or parts. One 1/1000 of an inch distortion will cause problems in alignment. The optical bench has 207 parts (it doesn't look like it does) and although silicon bronze is the primary material used, brass, neoprene, stainless steel, teflon, aluminum, bakelite, rubber, alumina and porcelain are among its "ingredients". The box is lined with magnetic shielding, and tubular shielding is placed along the V-block for added protection from magnetic interference from the earth's magnetic field.

The second optical bench, recently completed, will be donated to the Portland State College Physics department, through the efforts of Dr. Rempfer and with funds from the Tektronix Foundation. Total cost of the instrument is about $5000, including the vacuum system. The bench will be used in advanced research studies in electron optics and also by the upper-division physics labs. Portland State College will offer a course in electron optics the summer of 1964—the first of its kind on the west coast.

Deficiencies Limit New Designs

Dr. Rempfer emphasized the need for advanced research in the electron optics field: "In many applications, only a qualitative understanding of electron optics is necessary to design a system which works well; for example, it isn't necessary to know the focal position of a lens precisely if the desired result can be obtained by adjusting the voltage on a focus ring. This fact has probably reduced the stimulus for more exact, quantitative research in electron optics in the past. However, the need for advanced research becomes more apparent as we reach the point where deficiencies in electron optical systems are limiting factors in designing new applications. I feel that the major obstacle limiting the performance in most electron optical applications is the spherical aberration of the lenses. As one of its prime functions, the electron optical bench is providing us with information which we need for the correction of electron lens aberrations."

one engineer talking...

about instruments, interrelationships, ideas

Interview: Willie Henning
Photographs: Joe Floren

How does Tektronix design new instruments? Where do new ideas come from? How does the company keep ahead?

This interview is with Charles "Dusty" Rhodes. He's one of several project engineers of Instrument Design. Probably not all of his views are the same as those of other project engineers. However, they may give a better understanding how a project engineer does his job.

What does a project engineer do?

A project engineer does engineering and supervises the work of a number of other engineers and technicians. The size of a project engineering group varies. It may change with changes in emphasis on different kinds of new products. The engineers in my group are Doug Dickie, Larry Briggs, Ron Olson, John Horn and Phil Crosby.

How do you get ideas for a new instrument?

Ideas for new instruments come from many sources. Of course, in a rapidly changing business like ours, new inventions (if that is the right word) constantly open up the door to new products. The important thing is to recognize a new opportunity and to properly exploit it to make new products of wide appeal and good value.

New product suggestions come from just about everyone. The problem is to sort them out and see what they might represent to Tektronix' future.

Project engineers may help out with this sorting, but they claim no monopoly on ideas. Sorting is a Product Planning Strategy group function.

Feedback from our field engineers, who contact our customers constantly, is a major source of information leading to new product ideas. Direct customer contact when our engineers attend electronics shows is very important too.

In general, we don't design a new instrument for a specific customer's application. We try to understand his problem, and design to fit his need and, at the same time, many similar needs. Thus we're not building test sets but general-purpose instruments.

Chuck Nolan is the project engineer who heads Special Products. His group **does** cater to specific customer needs. By monitoring the requests Chuck gets most frequently, we get information on changes which many people might want in our instruments. This information influences future designs. Examples of this would be the 122C, 502A and several others.

How many people work with you on a project?

In the earliest stages of engineering, perhaps just one engineer is concerned with a project. But as it begins to develop, the number of people concerned grows very fast. The Preproduction and Manufacturing Staff Engineering areas help effect the transition into Production. Of course many other groups soon become involved: CRT,

Manuals, Tooling, Purchasing and Marketing are all very much included.

What relationship do you have with CRT during design of an instrument?

Usually, one of the key parts in a new scope design is getting the right CRT. Often that means a new tube design; thus a very close relationship exists between a project engineer and CRT Design. Much negotiation on the design of the CRT usually occurs.

We can't very well ask them for the impossible and expect to get it. But we usually arrive at compromises between the complexity of the CRT and the scope circuits which will represent good value and performance to customers.

When is an instrument turned over to Manufacturing?

We turn an instrument over to Production only after it has gone through a number of design stages and there has been agreement between Production, Engineering and Marketing that it is ready.

This doesn't mean that Production one day assumes full responsibility for a new instrument and that we don't have anything more to do with it. On the contrary, modifications are a fact of life, and we participate in making mods when needed during the life of an instrument. Manufacturing Staff Engineering, which handles mods, generally checks with Engineering on proposed mods. Engineering must okay these mods.

What relationship do you have with Future Products and Research?

Several of our new projects, in particular the sampling scope and the storage scope, very much hinged on the efforts of Research and Future Products. Research developed diodes for the sampling scope and Future Products the CRT for storage. Their contributions to the future success of the company will depend on a good working relationship with Instrument Engineering. They must know what problems **we** face that **they** might help with, and we must be aware of **their** capabilities and the results of **their** work.

What instruments have you worked on?

I was involved with the 526 vectorscope for color TV broadcasting, the 527 waveform monitor for TV and the Z plugin unit, which is a general-purpose product. Currently my group is working on four more plugins and several new and rather unusual scopes. If one of my group comes up with an idea, he can follow it up. I also assign projects.

How long have you been at Tek?

I came in September 1956 from a field engineering job with a division of the Columbia Broadcasting System. I've been a project engineer for more than three years.

What qualifications do you look for in a design engineer?

Project engineers probably won't agree exactly on what we are looking for in a design engineer. The project engineer does not actually hire an engineer — Instrument Engineering does this. Possibly one project engineer may be sold on hiring a certain engineer, but three or four others disagree. Probably we wouldn't hire the man. We have to hire a person who has the ability to change from group to group, because he may not always work for a certain project engineer.

What do you consider before designing a new instrument?

In a new instrument proposal, we must keep our eye on value to the customer and on wide usage throughout the industry. It is foolish to try to match competitors' specifications every time they have a new instrument.

It would be foolish to devote our efforts to what is called "one-upmanship". That is, letting our competitors' efforts serve as minimum standards which we improve upon slightly in all ways. This is, in a sense, like the horsepower race in the automobile business. It doesn't lead anywhere— and it can't be kept up forever.

We must keep our eye on what will serve large areas of need and will represent value to many customers. A few years ago, one of our competitors built a huge instrument with all specs upped 10 to 20 per cent over our comparable instrument, except that they had to about double the price and weight. Clearly, the small improvement in performance offered wasn't a good value at the price compared with our product. That product failed.

On the other hand, customers will generally pay more if performance is really improved. The effort is to provide better performance without drastically increasing cost. Tiny improvements in specifications generally don't permit additional uses to be made of the product.

How long do you work on designing an instrument?

I think everyone agrees that engineering takes too long. Steps are being taken to reduce lead time. Now a year is perhaps an average engineering period, unless a project's goals are changed. Often we make important changes in our concept of the product (based on field feedback, competitiors' efforts, technological innovations, etc.) and perhaps another year's engineering may be required.

Do project engineers keep informed on each other's projects?

One of a project engineer's responsibilities is to be aware of what is going on within other engineering groups, and to see that his people are up-to-date on efforts relevant to their own projects. For instance, a new instrument project is headed by Bob Rullman; one of our new plugins has to work in it, and so there are many design points on which compatibility must be checked. Thus Bob and I must communicate. This doesn't mean that engineers working directly on these new units aren't free to communicate; quite the contrary, all information exchange **shouldn't** be via project engineers.

What do you do when you run into a seemingly unsolvable problem?

We can always get help on a problem from other engineers here in Instrument Engineering. If need be, we can go to Future Products or Research. Some companies maintain outside consultants and rely on them when their engineering department is stuck. I think our firm has such a wealth of technical know-how that outside consultants haven't been required.

What do you consider the most important breakthroughs Tektronix has made?

Perhaps the willingness to develop and market an oscilloscope that could be made with the expectation that a truly versatile scope would find many applications and generate sales volume enough to justify the effort. Many other firms could have done this, but they didn't foresee the market potential and thus didn't put forth the effort it takes to make good scopes. Keeping the product useful to as wide a range of customers as possible, by using the plugin concept, was our means of getting this versatility. We have capitalized on this in the 530-40-50 series, 561 series and 661. This accounts for their importance and success.

What is the limit of the scope market?

New markets come with economic and technical growth. Military needs and advances in transistors serve as new markets, also new medical treatments. Space requirements hold some interesting prospects: Scopes that can work by remote control without manual operations, and so on.

There are no unique solutions to engineering problems. We seek solutions which allow us to build instruments in which the **performance** more than justifies the **price.**

"...one-upmanship doesn't lead anywhere.... like the horsepower race in automobiles..."

TEKROSTIC

(A) ___ ___ ___ ___ ___ ___ ___ Restored
6 103 49 9 85 41 34

(B) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Singly (four words)
44 115 70 25 97 107 32 1 73 80

(C) ___ ___ ___ ___ ___ ___ ___ ___ ___ This **and** this (2 words)
17 63 72 110 39 51 95 132 47

(D) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Ultimately
90 11 7 66 30 101 83 119 88 111

(E) ___ ___ ___ ___ ___ ___ ___ ___ ___ Extend beyond (two words)
10 78 65 129 14 92 56 104 21

(F) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Who argues with those who don't believe in ghosts? (three words)
84 105 126 75 116 117 69 74 67 113

(G) ___ ___ ___ ___ ___ ___ ___ ___ Trail
2 121 37 123 42 71 93 82

(H) ___ ___ ___ ___ ___ ___ ___ ___ Eight eyes (Or is it 12 million minus 888,889?)
48 86 31 18 62 58 99 22

(I) ___ ___ ___ ___ ___ ___ ___ ___ Dig through or under, toward a higher point (2 words)
50 122 112 57 4 108 128 45

(J) ___ ___ ___ ___ ___ ___ ___ Musical instruments
59 20 13 40 106 79 24

(K) G L U E D Stuck together
55 19 131 52 127

(L) ___ ___ ___ ___ ___ ___ ___ ___ By tradition, what the rich do at dinner time (two words)
12 28 98 8 81 35 60 89

(M) ___ ___ ___ ___ ___ ___ Tug again
54 91 5 33 87 46

(N) ___ ___ ___ ___ ___ ___ ___ ___ ___ Mental concentration
16 29 100 43 64 109 118 114 26

(O) ___ ___ ___ ___ ___ ___ ___ Final two or three (two words)
120 96 36 61 38 23 3

(P) ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ What the Cockney did to hotcakes (three words)
27 125 53 124 76 130 102 68 94 15 77

INSTRUCTIONS

Every so often, somebody says Tek Talk ought to have a puzzle. So here one is. It's an acrostic, and for folks who've never done one, here's how to go at it:

1. Fill in the word blanks A through P. (We've done word K as an example). Do as many words as you can, then . . .

2. Transfer the letters from the words into the indicated spaces on the acrostic square. (The letters in word K have been transferred, to start you off.)

3. The acrostic square — when completed — will spell out a complete quotation about Tektronix. The message reads left to right, **across** the puzzle. It does **not** run up and down like a crossword puzzle. Words in the quotation are separated by dark square **only** — not by the end of a line.

4. Puzzlers often find it easiest to work not only from the word list to the acrostic square, but also back **from** the square **to** the list. That is, when you can guess a word in the quotation, fill it in and transfer the letters to the proper blanks in the word list.

5. When the puzzle is completed, the first letters of words A through P, read from the top down, will spell out the **source** of the quotation (the person who said it, or the publication it came from, or both.)

6. If you solve the Tekrostic in less than 45 minutes, that's pretty good. If less than 30 minutes, wowie for you!

Let us know how you do, and how (or if) you like this kind of feature.

		1 B	2 G	■	3 O	4 I	■	5 M	6 A	7 D		
	8 L	9 A	10 E	11 D	12 L	■	13 J	14 E	15 P	■	16 N	
17 C	18 H	19 K L	20 J	21 E	22 H	23 O	24 J	■	25 B	26 N	27 P	■
28 L	29 N	30 D	31 H	32 B	33 M	34 A	35 L	36 O	■	37 G	38 O	■
39 C	40 J	41 A	■	42 G	43 N	44 B	45 I	46 M	47 C	■	48 H	49 A
■	50 I	51 C	52 K E	■	53 P	54 M	55 K G	56 E	57 I	58 H	59 J	60 L
61 O	62 H	63 C	64 N	■	65 E	66 D	67 F	■	68 P	69 F	70 B	■
71 G	72 C	73 B	74 F	75 F	76 P	77 P	78 E	79 J	80 B	■	81 L	82 G
83 D	84 F	■	85 A	86 H	87 M	88 D	■	89 L	90 D	91 M	92 E	■
93 G	94 P	95 C	■	96 O	97 B	98 L	99 H	100 N	101 D	102 P	103 A	104 E
■	105 F	106 J	107 B	108 I	109 N	110 C	111 D	■	112 I	113 F	114 N	115 B
	116 F	■	117 F	118 N	119 D	120 O	■	121 G	122 I	123 G	124 P	
		125 P	126 F	127 K D	128 I	129 E	130 P	■	131 K U	132 C		

Puzzle: Joe Floren
Cover photograph: Josef Oswald