DATAMATION 59

September / October

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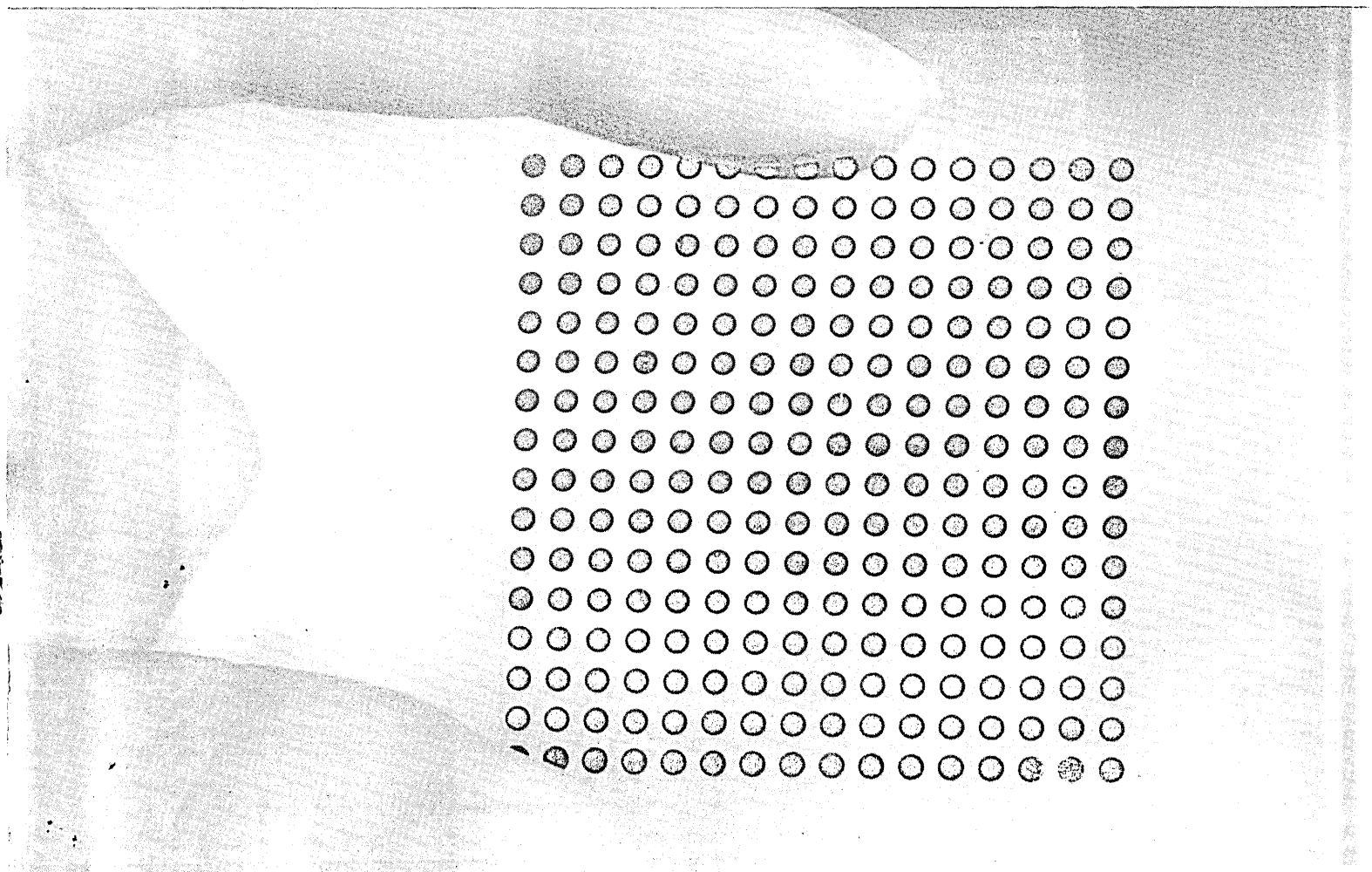

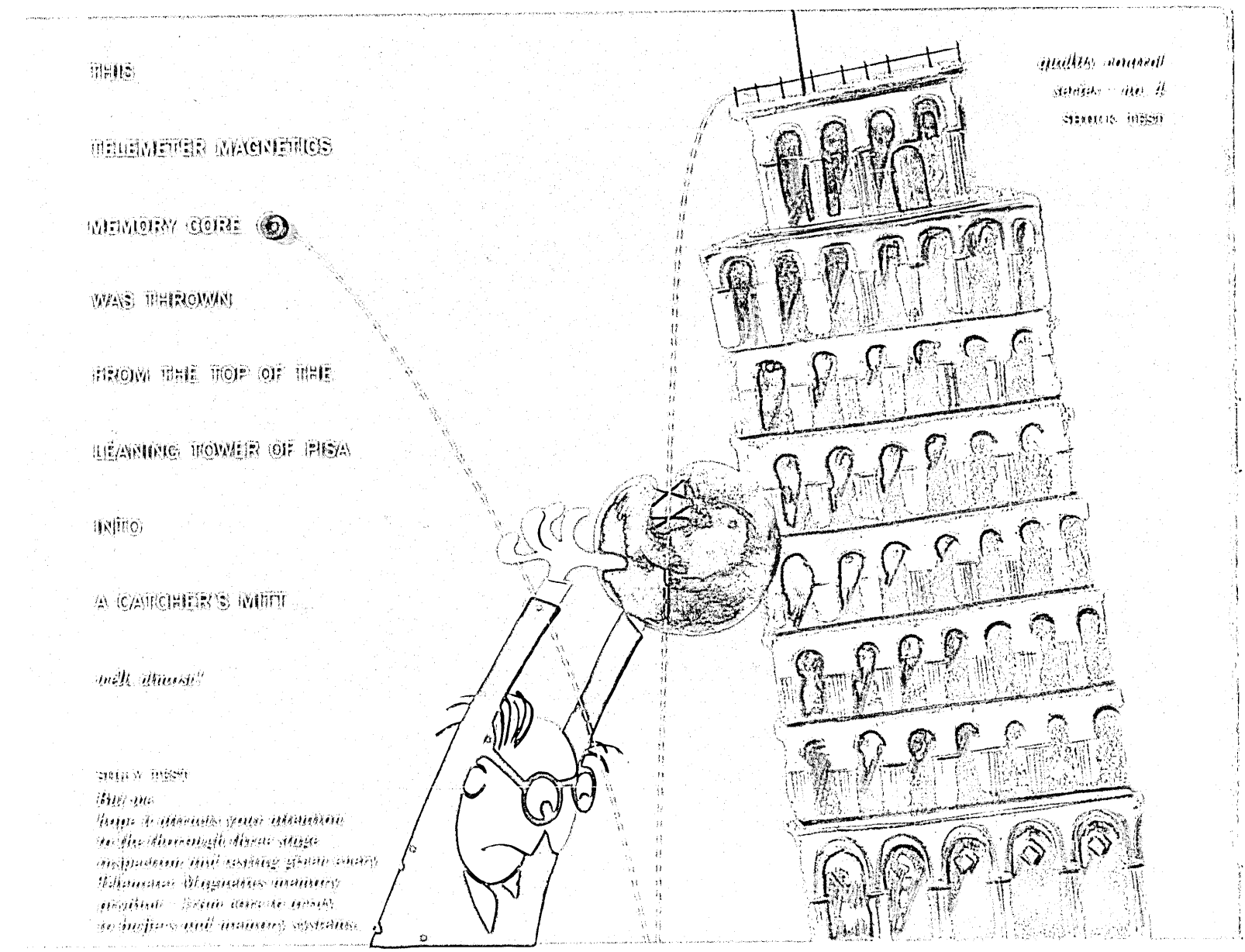

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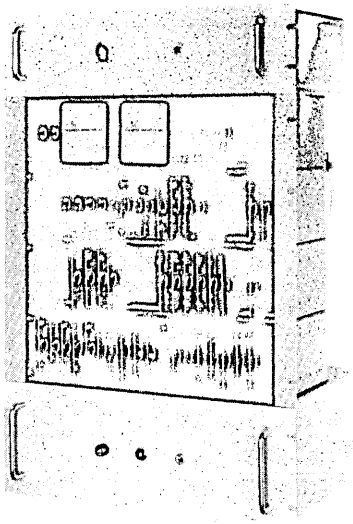

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DATAMATION 59

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the automatic handling of information

volume 5, number **5**

ARTICLES

DEPARTMENTS

A third editorial adviser has been added to the DATAMATION staff. HERBERT R. J. GROSCH, now a private consultant, is a well-known figure in the industry. He is active in many scientific and engineering societies and has presented numerous papers on the organization and operation of large computing facilities. Grosch has been manager of Space Programs (advanced programming) for IBM; manager (applications) of the GE Computer Dept.; and organized the Washington Technical Computing Bureau for IBM in 1951. He was the first employee of and directed computing for Watson Scientific Computing Laboratory from 1945-50. Tentative plans call for Grosch to contribute a regular column to DATAMATION.

ON OUR COVER—Experimental magnetic film memory array of the type installed in the TX-2 computer at M.I.T. Lincoln Laboratory. Memory elements are circular spots of Permalloy film (82 percent nickel, 18 percent iron) 750 Angstroms thick, evaporated on a thin glass substrate. Each element is 1.6 millimeters in diameter; center-to-center spacing is 2.5 millimeters. (See page 11.)

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to the editor...

Sir:

We never thought of DATAMATION as a humor magazine, but after reading the transcript of the panel discussion on the perennial professional society question ("It it Overhaul or Trade-in Time?" July/August 1959 issue), we are beginning to wonder. We haven't laughed so hard in a decade.

Are these guys kidding? Their search for ways in which members of the profession can gain acceptance is the same stumbling block over which countless other organizations have tripped, the N.M.A.A. among them. You won't solve this problem by self-interested conversation about it, nor is it solved by founding another organization.

We can hardly wait for completion of the article in the next issue, though hardly for reasons that the panel would appreciate.

Hilariously yours,
Wolf J. Flywheel
Camden, N.J.

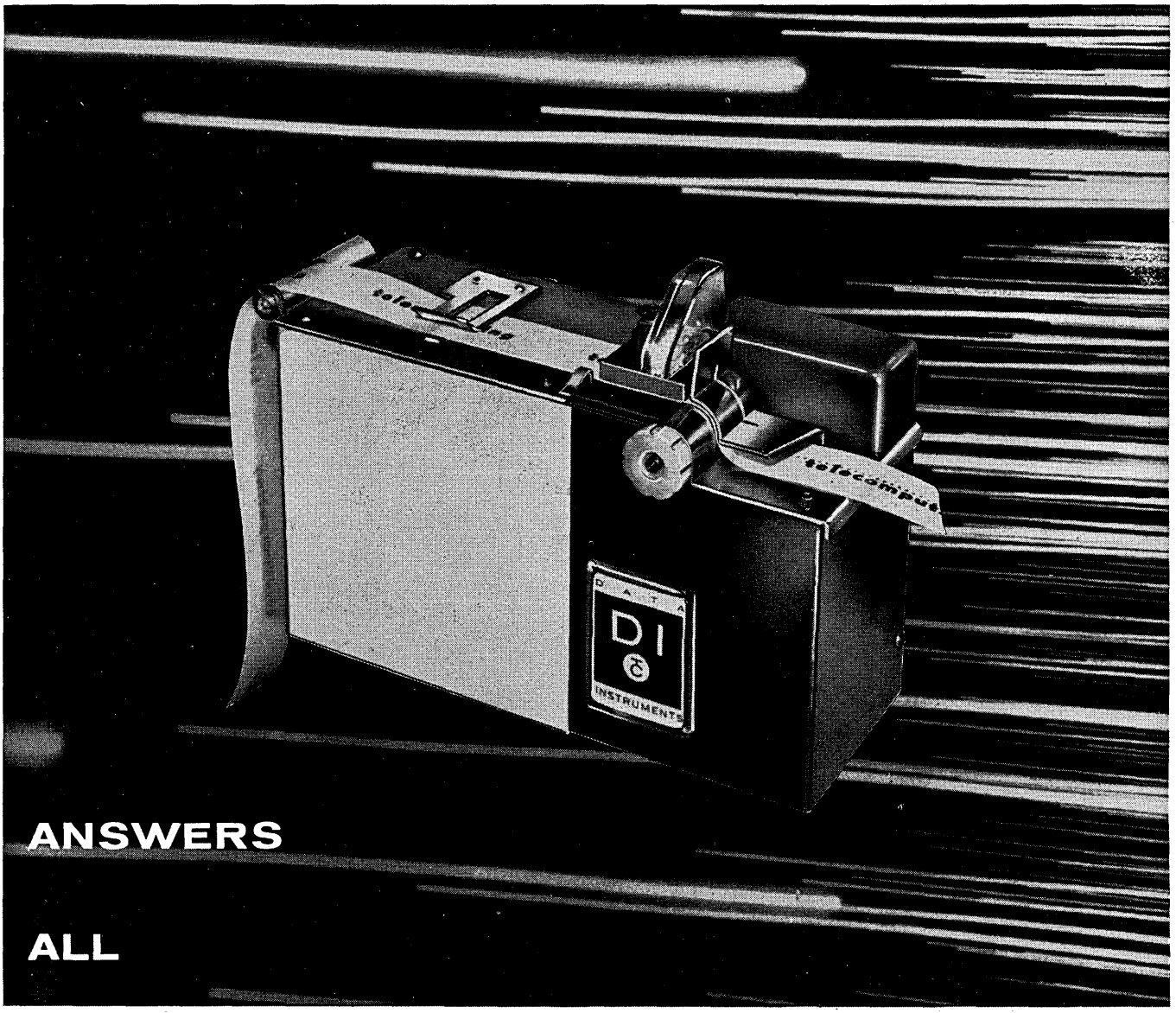
(Pardon us for entering the fray, Mr. Flywheel, but we are forced to point out that yours seems to be a somewhat negative approach to what you admit is a problem. If interested groups, however unofficial, do not discuss these things, how will action of any kind be generated?—Ed.)

Sir:

You are to be commended on the complete coverage and fine treatment given by Mr. Etienne J. Guerin on the International Conference on Information Processing held in Paris, France, from June 15-20, 1959. Thank you also for the splendid coverage of the new International Federation of Information Processing Societies.

Very truly yours,
Isaac L. Auerbach
Past General Chairman
U.S. Committee for the ICIP
Narberth, Pa.

DATAMATION is published bi-monthly on or about the first day of every even-numbered month by F. D Thompson Publications, Inc., Frank D. Thompson, president. Executive, Circulation and Advertising offices, 141 East 44th St., New York 17, N. Y. (MUrray Hill 7-5180). Editorial offices, 10373 West Pico Blvd., Los Angeles 64, Calif. (BRadshaw 2-0817). Published at Chicago, Illinois, application as controlled circulation publication pending at Waseca, Minnesota.



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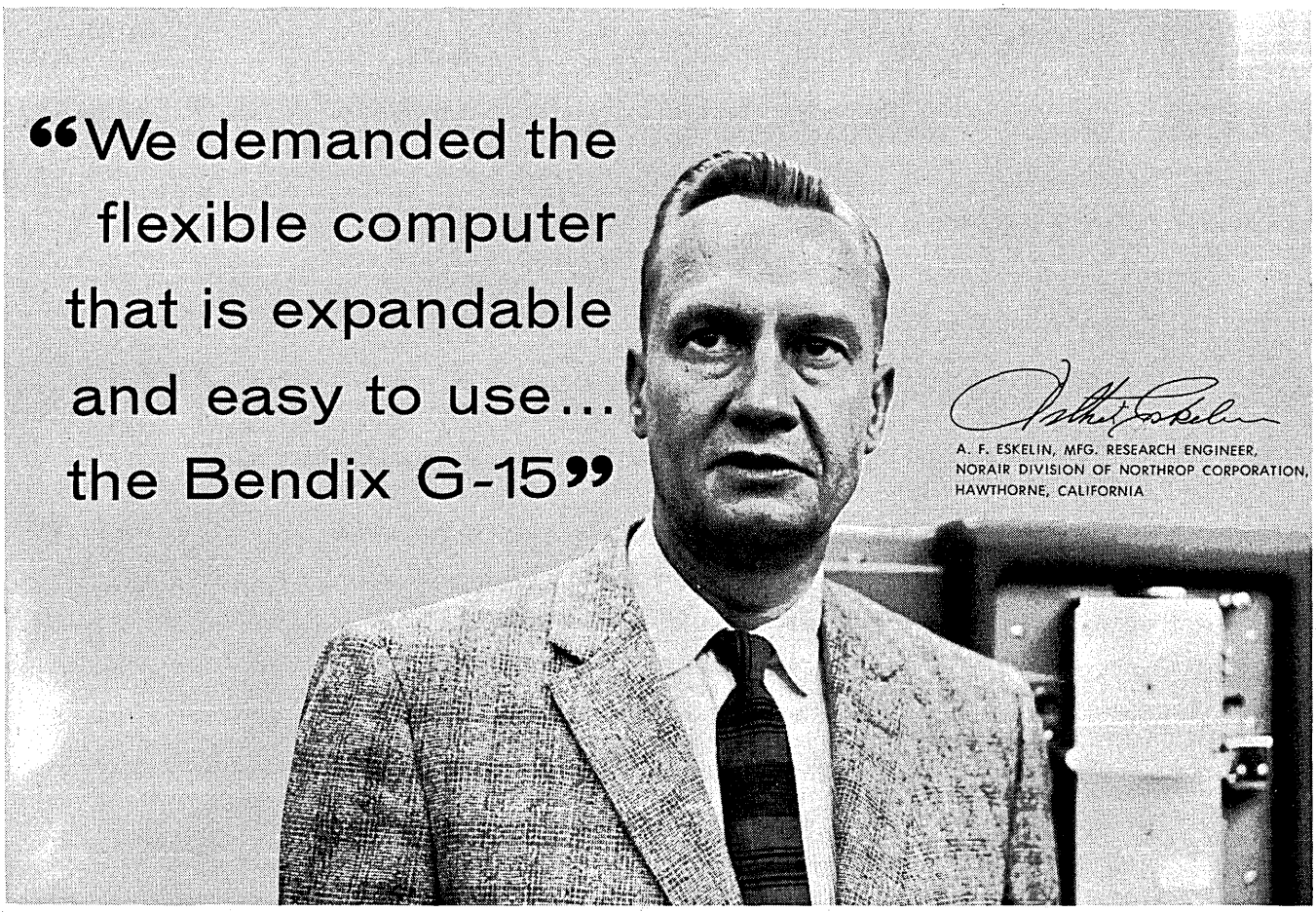

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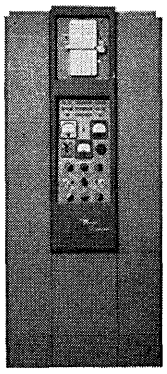

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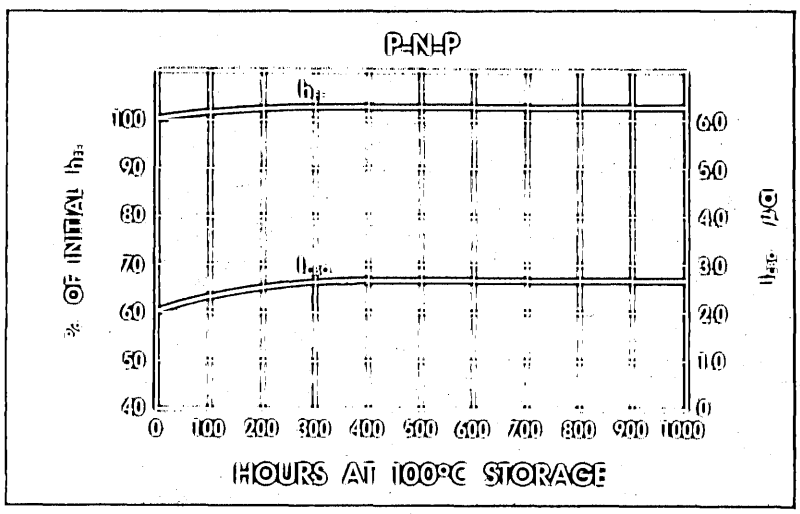

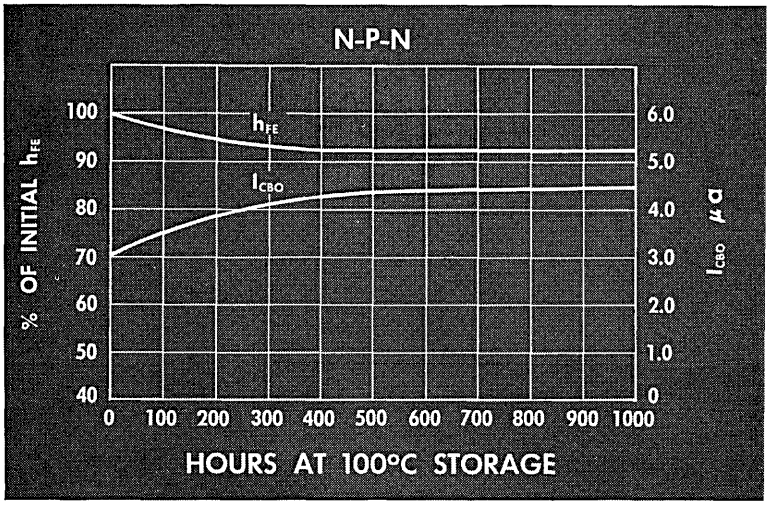

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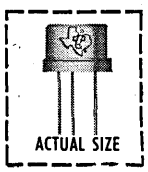

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									V_E=25v, I_C=0		V_C=25v, I_E=0		I_C=10ma, V_{CE}=1v		I_C=200ma, V_{CE}=0.35v		V_{CB}=5v, I_E=−1ma		V_{CB}=5v, f=1mc	
									Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
2N1302	N-P-N	25	25	25	300	−300	↑	↑		6		6	20		10		3			20
2N1303	P-N-P	−25	−30	−25	−300	300				−6		−6	20		10		3			20
2N1304	N-P-N	25	25	20	300	−300				6		6	40	200	15		5			20
2N1305	P-N-P	−25	−30	−20	−300	300	−65 to 100	150		−6		−6	40	200	15		5			20
2N1306	N-P-N	25	25	15	300	−300				6		6	60	300	20		10			20
2N1307	P-N-P	−25	−30	−15	−300	300				−6		−6	60	300	20		10			20
2N1308	N-P-N	25	25	15	300	−300				6		6	80		20		15			20
2N1309	P-N-P	−25	−30	−15	−300	300	↓	↓		−6		−6	80		20		15			20
	Units	v	v	v	ma	ma	°C	mw	μa		μa						mc		μμf	

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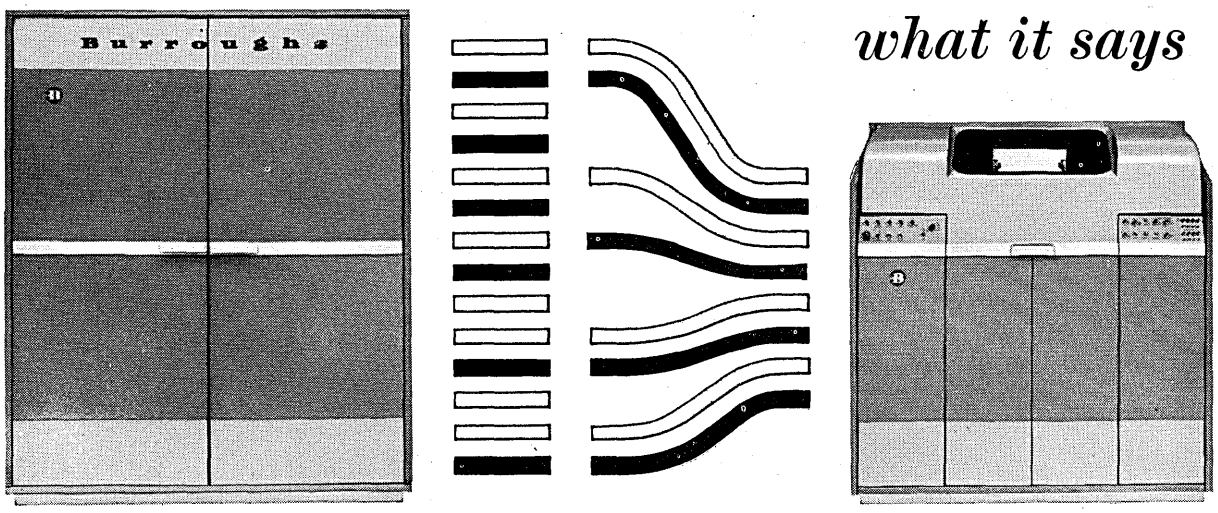

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thin magnetic films for computer applications

by A. J. KOLK, *Project Engineer*
and JOHN T. DOHERTY, *Research Specialist*
THE NATIONAL CASH REGISTER COMPANY, Electronics Division (Solid State)

Throughout the information processing industry, the possibility of using thin magnetic films as elements for storing binary information in digital computers has resulted in a considerable research effort. Extensive development of fabrication techniques for both electrodeposited and evaporated films has produced films in which high speed switching capabilities have been adequately demonstrated. Evolving from this work are devices such as the rod, the twistor and the bit wire which utilize electrodeposited films, and flat thin film memory arrays, as well as magnetic and Curie-point writing, using evaporated films. Further development of such devices will undoubtedly follow current research in these fields.

Thin films of magnetic material show special properties which make them particularly suited for computer applications. These films may be prepared by vacuum evaporation or by electrodeposition.

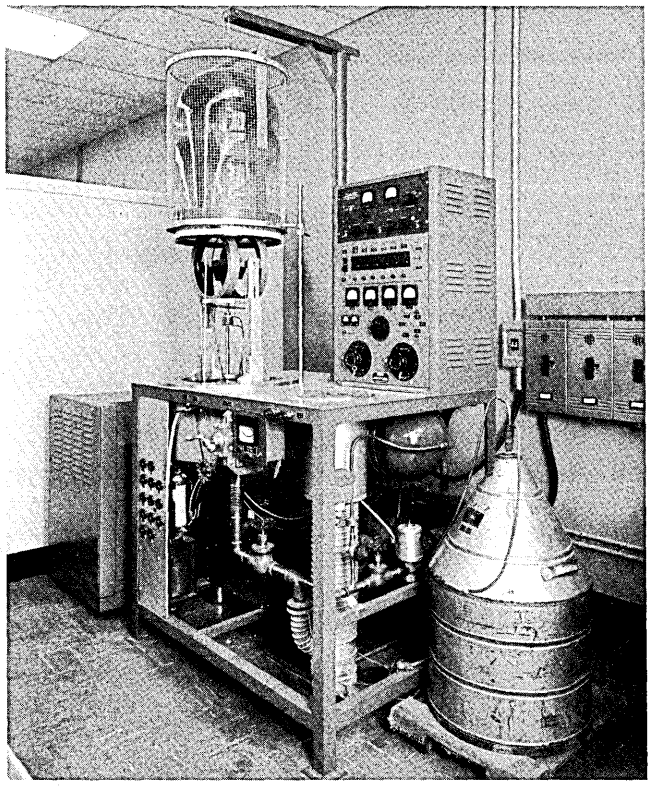


Figure 1—High vacuum equipment

More important applications of thin films to computer technology are described below. The thin film approach promises high speed in some configurations and lower cost and high density in others.

Optical detection of the magnetic state of the thin films show promise for application in high-density magnetic storage devices.

evaporated films

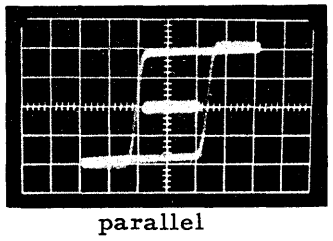
The evaporation process permits fabrication of extremely thin films having electrical characteristics considerably different from bulk properties. This section contains a description of some of the properties and applications of thin evaporated magnetic films.

Figure 1 shows the general arrangement of vacuum equipment used for evaporating magnetic films. In this picture the source is heated by induction heating. However, resistance heating can also be used. The vacuum is ordinarily maintained at 2 to 3 x 10^{-5} mm Hg during evaporation, and the substrates (usually glass microscope slides) are mounted on the underside of a heater in the upper part of the chamber. Desired film patterns are provided by masking over the substrates. Film thicknesses may be monitored by resistance measurements or, in special cases, by optical means. A pair of Helmholtz coils, which are used to produce a DC magnetic field, may also be seen in Figure 1. Following the method outlined by Blois[1] in which it was shown that evaporation in a magnetic field produced films having directional properties, much work has been done on films of approximately 82% nickel and 18% iron.

thin film memory

Magnetic properties of the thin films may be evaluated by measuring a hysteresis loop according to the method outlined by Crittenden[2]. Anisotropy is apparent when hysteresis loop measurements are made on the permalloy film. Figure 2 shows typical loops measured on the same film. The parallel loop was measured in the direction perpendicular to the applied field.

Table I shows some switching characteristics of thin flat films. The switching characteristics of these films may be controlled by application of a transverse field. This permits the switching fields and the switching speeds to be controlled. Figure 3 shows the relationship between transverse and switching field, a relationship which has been experimentally verified[3]. The coordinates are normalized to the anisotropy field, H_K. It may be noted that the type of switching, i.e., either domain rotation or wall motion, can be controlled by application of a transverse field. Figure 4 compares switching speeds of films with curves for ferrite cores and permalloy tape. When transverse fields



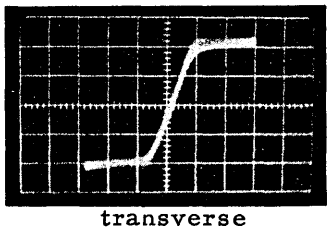


Figure 2—Hysteresis loops of evaporated (80 Ni 20 Fe) films

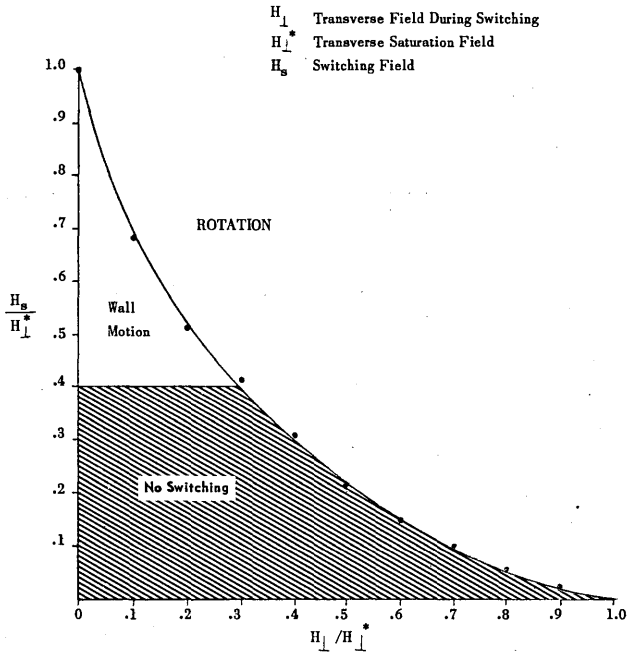


Figure 3—Switching field vs transverse field

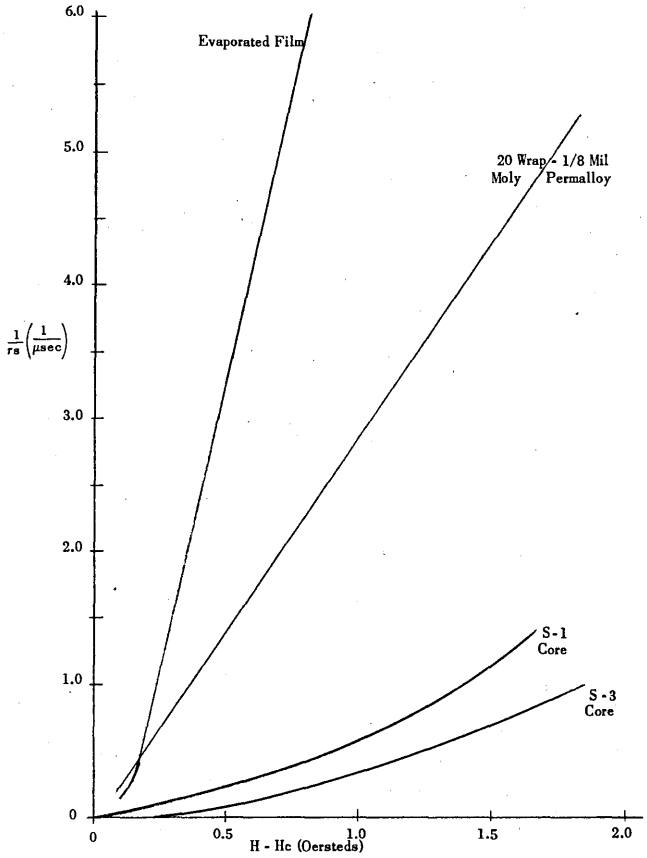


Figure 4—Switching curves

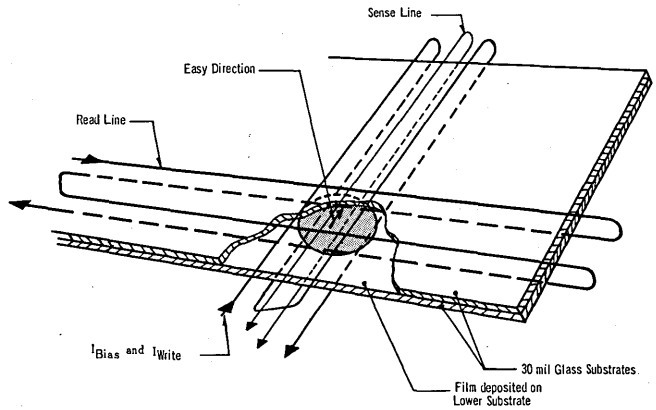


Figure 5—Thin film memory element

TABLE I

Element	*Present Operating Speed in Memory Cycle*	*Potential Operating Speed in Memory Cycle*	*Present Switching Speed*	*Attainable Switching Speed*	*Drive Currents (present)*
Planar Matrix	*0.5 usec[6]*	*0.25 usec[25]*	*0.1 usec*	*0.01 usec*	*400 ma into[25] 5 ohms*
Rod	*0.5 usec[26]*	*0.25 usec*	*0.05 usec*	*0.025 usec*	*250 ma into 40 ohms*
Twistor	*2.0 usec*	*1.0 usec*	*0.6 usec[23]*	*?*	*<100 ma[23]*
Bit Wire	*2.0 usec*	*1.0 usec*	*0.1 usec[24]*	*?*	*

**400 ma into 5 ohms plus 70 ma into a solenoid drive[24]*

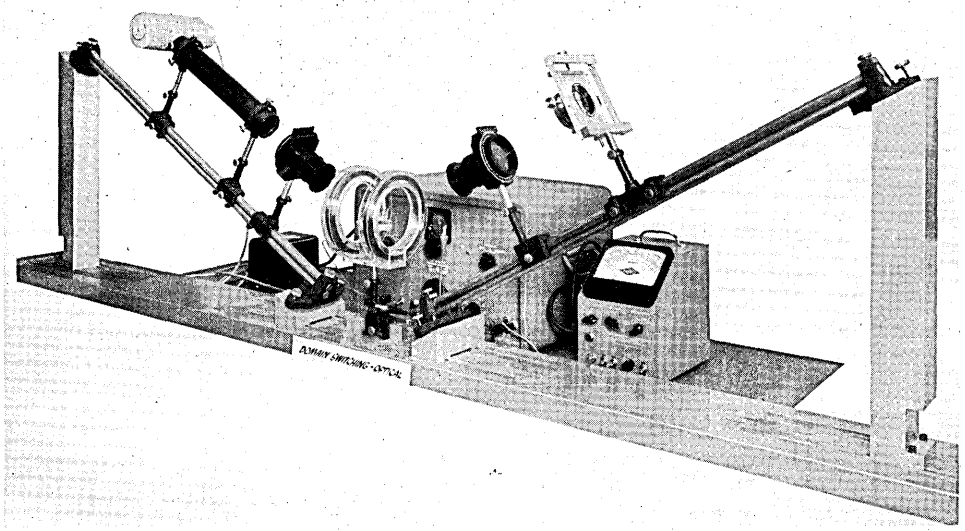


Figure 6—Kerr magneto optic apparatus

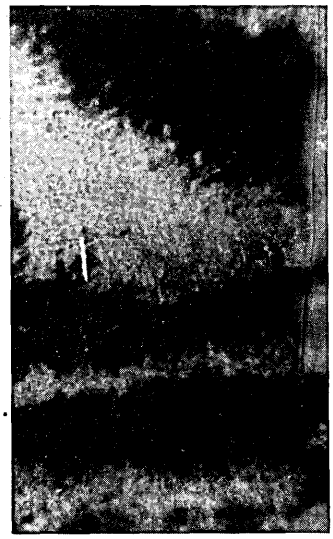


Figure 7—Magnetic domains in thin films

are applied, the switching curves for films are displaced to the left[4] indicating higher speed for a given drive.

These directional properties and transverse field effects have caused workers[5,6] to suggest that films may be used as memory elements for digital computers. Figure 5 shows how films may be used in a memory array.

By utilizing the Kerr magneto-optic effect, optical readouts may also be obtained from thin films. Figure 6 is an illustration of an optical bench.

When plane polarized light is reflected from a magnetic film, the plane of polarization is rotated either clockwise or counter clockwise depending upon the state of magnetization of the film.

By properly adjusting the analyzer in the reflected beam, anti-parallel domains are observed. Figure 7 shows magnetic domains in an evaporated permalloy film. For thin films, transmitted (Faraday effect) instead of reflected light may be used[7]. Figure 7 is a photograph of magnetic domains which were observed using reflected light. Application of magneto-optic effects include magnetic and Curie-point writing.

magnetic and curie-point writing

Magnetic writing is a method which has been proposed for high density storage. In this method either the Kerr or the Faraday effect is used to read out information. Input is accomplished by remagnetizing selected areas of the film by means of a magnetic probe. Williams[8] has suggested that 10^6 bits/cm^2 can be attained by this technique.

Another technique utilizing the Faraday effect is Curie-point writing[9]. Evaporated manganese-bismuth films having a magnetization vector normal to the plane of the film are used. When a film is uniformly magnetized normal to the surface, and a portion of the film is raised above the Curie temperature, this portion will upon cooling have its magnetization vector anti-parallel to the surrounding film. The Kerr magneto-optic effect may then be used to detect this reverse domain. Thus, an electron beam may be used to put information into the system with an optical readout. Information may be erased by providing a DC field strong enough to return the film to the original state of magnetization.

Practical applications of evaporated films require that the films be as uniform as possible. Several factors may contribute to non-uniformity of evaporated films. Behrndt and Maddocks[10] have demonstrated that substrate preparation affects film uniformity, and suggest that proper cleaning including an ammonium bifluoride etch be employed. The coercive force is also dependent upon film thickness. This has been established by Reimer[11] for nickel films and by Tiller and Clark[12] for permalloy films. Surface roughness may be demonstrated either by interferometer measurements or electron micrographs. Chemical composition may also vary within a single film. Chu and Wolfe[13] have reported that 3-4 percent variation in nickel content may be obtained for permalloy films. Inasmuch as angle of incidence of vapor on the substrate and rate of evaporation[14, 15, 16, 17] influence film structure, particularly in thin films, these factors also influence film uniformity.

Much of the current research effort on films is directly related to problems concerning film uniformity. Details vary in accordance with materials being used and the specific application.

electrodeposited thin magnetic films

electrodeposited permalloy films

The difficulties inherent in the vacuum deposition of uniform permalloy films for use in computer memories have led to the consideration of other methods of making thin permalloy films. One obvious alternative method is electrodeposition. There are several reports[18, 19, 20] of the successful deposition of magnetically oriented films. These films show magnetic properties similar to vacuum deposited films of the same composition.

A recent paper by Wolf, Katz and Brain[18] reports the magnetic characteristics of electrodeposited films containing 80% to 87½% nickel, the remainder being iron. The thickness of the films showing best characteristics ranged from 530 A to 600 A; thicker films were reported to be less square.

The electroplating bath was stated to be composed of the sulfates of nickel and iron with some sodium chloride and boric acid added. Sodium lauryl sulfate was used as a surface active agent and saccharin was employed to reduce grain size and stress.

By controlling composition and the plating conditions, the anisotropy field was varied independently of the coer-

cive force in the easy direction. Hysteresis loops were presented to show the various ratios of the anisotropy field (H_k) to the coercive force in the easy direction (H_c). The unusual result was obtained that H_c/H_k could be made greater than unity. Reference to Figure 3 shows that this is not in accord with the simple rotational model for oriented thin magnetic films.

The films were deposited on a conducting layer of gold which was sputtered onto the surface of a microscope slide. The sputtered gold was chosen from a number of conducting substrates because, after plating, it yielded the best magnetic properties. The important factors in choosing a conducting layer were surface smoothness and the absence of an appreciable surface oxide.

Other work on electrodeposited permalloy has been carried out on the surface of metallized Mylar[19]. The surface of the Mylar was metallized with chromium-copper laid down by vacuum deposition. The chromium and copper were laid down in two layers; the first layer was chromium about 2700 A in thickness, and the second layer consisted of about 1000 A of copper. Over the copper, nickel-iron alloys were deposited both with and without an applied magnetic field. It was found that a field of 70 to 100 oersteds applied during plating improved the magnetic properties.

In addition to the flat sheets of Mylar some other forms were tried. Toroids of 1.3 cm outside diameter were reported to have been made by electroplating.

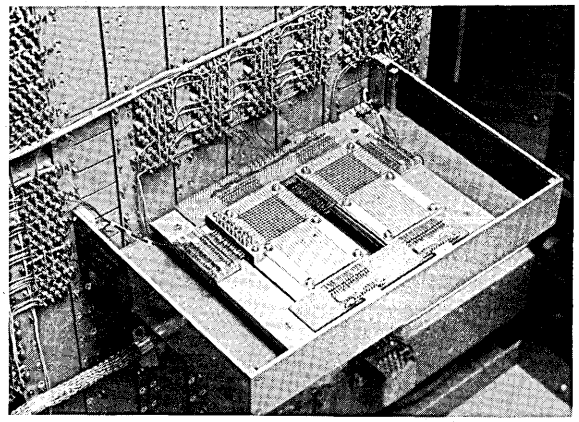
While the process of electroplating offers another route to the preparation of thin permalloy films, there are also difficulties inherent in this technique for the preparation of planar matrices for computer applications. In the first place, the film must be deposited on a conductive substrate, which implies that eddy current damping is present. If the conductive substrate is made very thin in order to minimize eddy current damping, then the resistance of the substrate causes a problem in the production of uniform coatings. The rate of electrochemical reaction is dependent on the voltage, and quite small variations in the voltage may considerably alter the plating current. Thus, in order to deposit uniform layers, the voltage should be the same throughout the surface of the substrate. However, ingenuity in anode construction or cell construction will sometimes permit uniform layers to be deposited onto relatively low conductivity substrates.

In the area of oriented electroplated magnetic films there is also a report by some Russian workers[20] that a uniaxial anisotropy has been produced in an electroplate of pure iron by the application of a magnetic field during the plating process.

the "rod"

Another application of electrodeposited thin magnetic coatings consists of a thin cylindrical configuration termed the "Rod"[21]. The magnetic element called the Rod can be formed by laying down a conductive substrate on a thin piece of glass cane (preferably 15 mils or less), and then electroplating a magnetic coating over the metallized glass. A typical configuration is shown in Figure 8.

In the case of 98% Fe, 2% Ni alloy electroplate, an element possessing good squareness and a coercive force of approximately 14 oersteds is obtained. The switching characteristics of the 98 Fe-2 Ni alloy are fast enough so that one-half-microsecond cycle times have been demon-



First known operating magnetic-film computer memory is pictured at MIT Lincoln Laboratory in Lexington, Massachusetts. With a capacity of 32 ten-bit words and a read-and-write cycle time of 0.8 microseconds, this memory has been in satisfactory routine operation in Lincoln's TX-2 computer since it was first installed in July 1959.

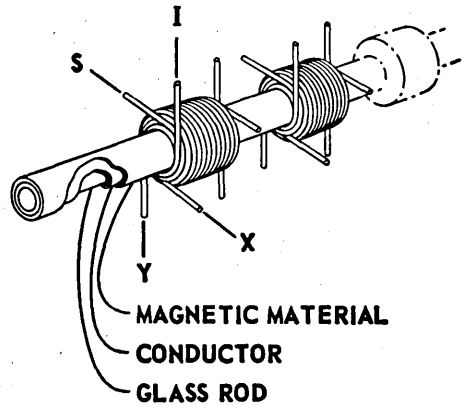
MAGNETIC FILM MEMORY IN OPERATION AT LINCOLN

A high-speed magnetic film memory is now in operation as a part of the TX-2 digital computer at the M.I.T. Lincoln Laboratory. Its performance has been entirely satisfactory since its installation in July 1959. It has a capacity of 32 ten-bit words, suitable for evaluation testing, and serves as an experimental prototype for larger units. This new memory, and the TX-2 computer of which it is a part, were developed by Lincoln Laboratory under Air Force contract, with the joint support of the Army, Navy, and Air Force.

The read-and-write cycle time of 0.8 microseconds is consistent with the speed of the computer itself, although bench tests demonstrated successful operation at a cycle time as short as 0.4 microseconds. Net driving current for writing is 150 milliamperes, and one-millivolt output signals are obtained from individual memory elements.

Each memory element is a circular spot of Permalloy film (82 percent nickel, 18 percent iron) 750 Angstroms thick, 1.6 millimeters in diameter, centered 2.5 millimeters apart. The spots are deposited by evaporation on a flat glass substrate, 0.1 millimeter thick, in 16 x 16 unit arrays. The complete memory unit as installed in TX-2 and one of the experimental arrays are shown in the enclosed photographs. The transistor drive and sense circuits can be seen surrounding the memory.

A thin film memory has several potential advantages over the familiar ferrite toroidal core memory: faster cycle time, lower power dissipation, greater compactness, and simpler fabrication. The unit now in operation confirms these expectations, although none of these factors has been fully exploited in this first developmental model.



I – INHIBIT (FIRST WINDING)
S – SENSE (SECOND WINDING)
Y – Y DRIVE (THIRD WINDING)
X – X DRIVE (FOURTH WINDING)

Figure 8—Magnetic rod with solenoid bundles wound in coincident-current memory mode

strated in a computer memory employing the Rod.

While the Rod appears somewhat slower than flat film matrices (10 vs 25 millimicrosecond) in switching speed, the difficulties in obtaining uniform evaporated or electrodeposited flat films, together with the low signal output, at present limits large scale applications of the flat film. To date, the fastest evaporated flat-film memory reported is intended to operate at a cycle time of 0.5 microseconds, the same as the cycle time already obtained with the Rod.

the twistor and bit wire

The element called the "Twistor" utilizes a preferred helical direction of magnetization produced by a torsional stress around the axis of a wire. The Twistor concept has been used in homogeneous magnetic wires and in wires of nonmagnetic conductor wrapped or coated with a thin layer of magnetic material[22, 23].

The method of preparing the Twistor which has been reported to give the most reproducibility consists of wrapping a permalloy strip measuring 0.25 mil by 2 mils around a 3-mil-diameter insulated copper wire.

A material which operates similarly to the Twistor but is formed by a direct electroplating procedure without externally creating a strain is called the "Bit Wire"[24]. To make this element, a 0.2 mil-layer of a 78 Ni-22 Fe alloy is plated onto the surface of 3-mil beryllium-copper spring wire. Under certain plating conditions a helical easy axis is found to exist in the plated coating.

Although the magnetic "wrapping" or coatings of the Twistor and the Bit Wire are above the thickness region which is usually considered to be thin magnetic films, the elements are described in this review for comparison purposes. (The thickness region generally considered to be a "thin" film is under 10000 A.) A comparison of the Twistor, Bit Wire, the flat film matrix, and the Rod is shown in Table I. Although the strained types are somewhat slower in operating speed than the Rod or flat film, for certain applications where high speed is not a major consideration the Bit Wire or Twistor may offer economic advantages.

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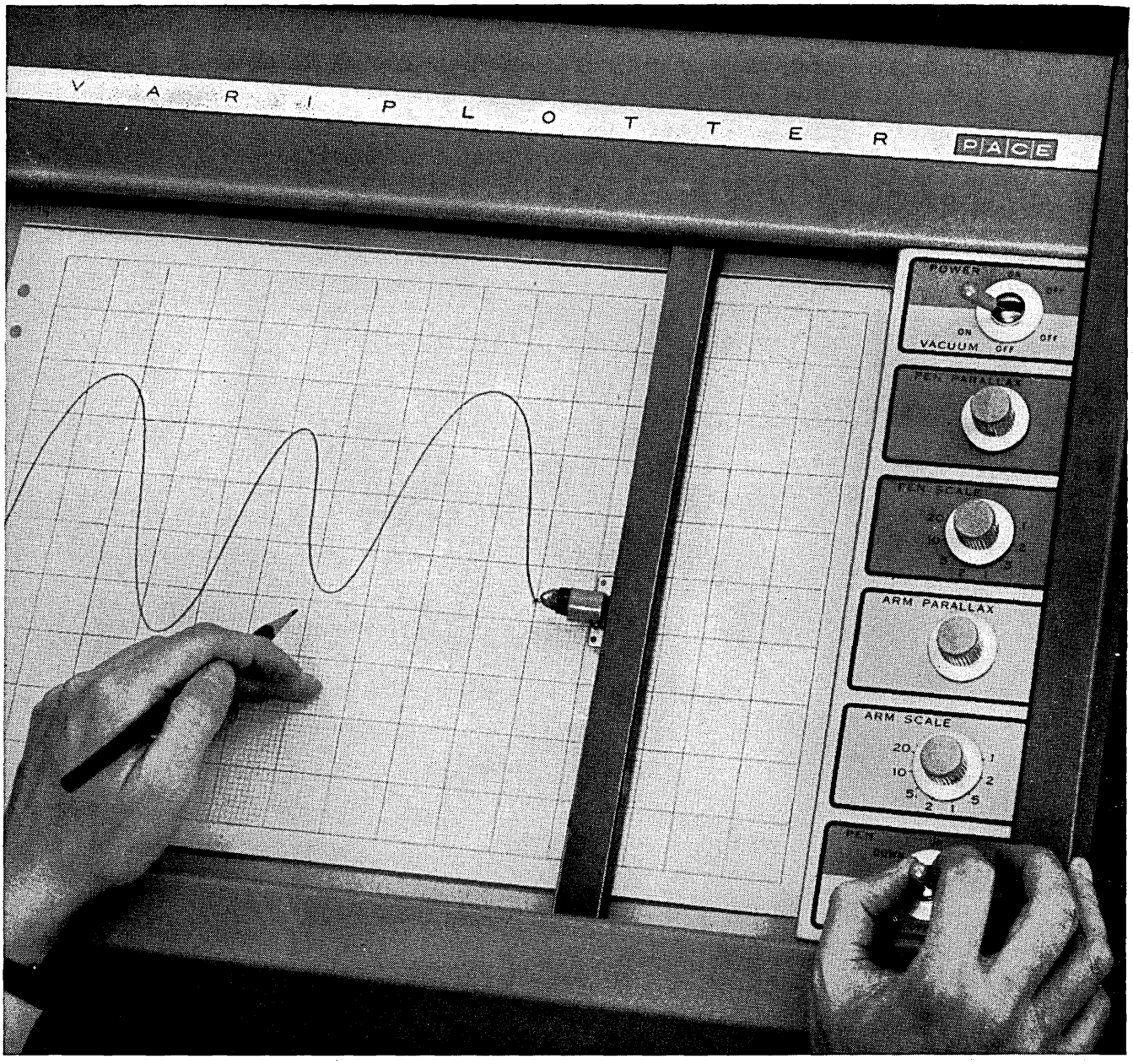

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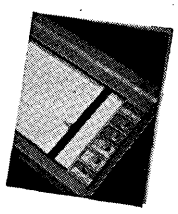

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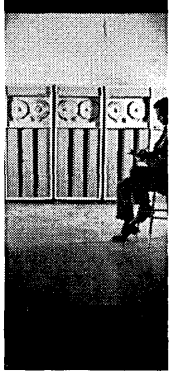

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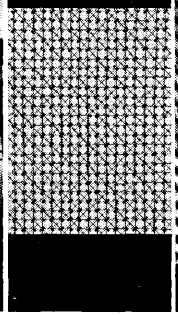

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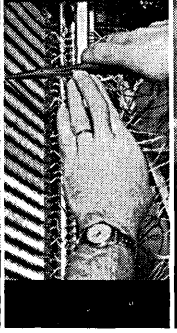

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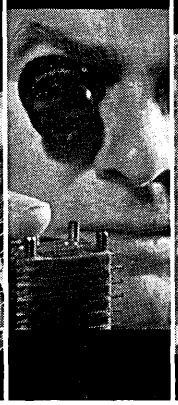

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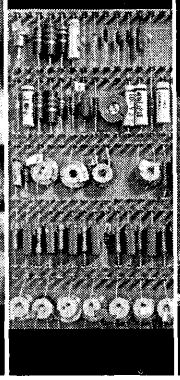

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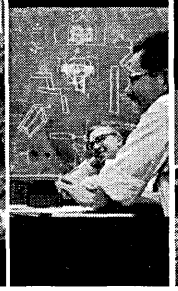

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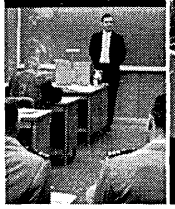

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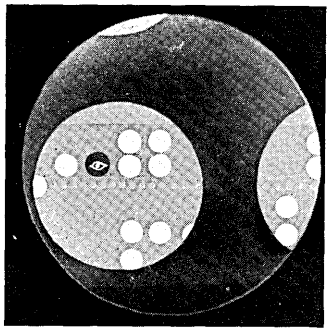
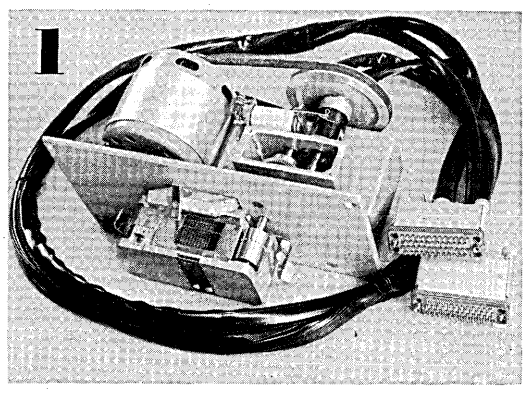
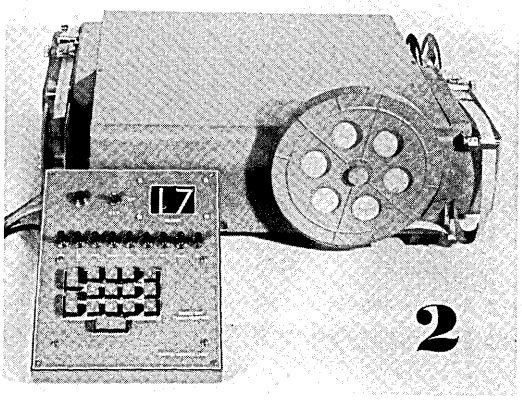


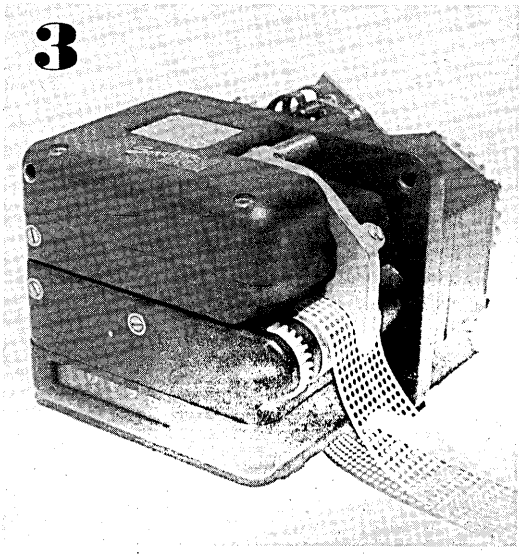
ALL ABOUT PAPER TAPE

a postscript

To accommodate late entries, DATAMATION presents this final installment of a survey article covering paper tape equipment.







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2 Model 244 punch-verifier features 10-key decimal keyboard mounted in separate console for ease of operation and convenience of operator. It has four verification checks: keyboard locks if key depressed and tape in verifier do not agree; key remains depressed as indication of error; if keyboard is correct – override switch permits punching of digit; if incorrect – reset button permits operator to try again. Other features of the 244 – automatic leader between blocks, least significant zeroes may be automatically punched, complete reproducing facilities, and all codes are compatible with Bendix G-15 code.

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SOROBAN ENGINEERING

3 FR-2 tape reader is designed for operation under military environmental conditions. These conditions include operation at −65°F., with shock and vibration forces up to 20 G's. The reader is capable of passing a 50 hour salt spray test. It is explosion proof. The reader is capable of operation at rates up to 60 codes per second. Drive is through a Gilmer timing belt. Reverse reading can be achieved by reversing the drive shaft rotation. The reader's cam drive system and tape transport linkages are immersed in a splash oil bath. The design uses a latch-interlocked cam system for read and feed, thus reliable long life is accommodated whether character-by-character or continuous reading is employed.

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Soroban's GP-2 tape perforator, which is about the same size and weight of a standard press camera, can punch up to 300 coded characters per second in standard communication paper or Mylar tape. This speed is at least five times faster than is provided by other commercially available tape perforators, according to the manufacturer. All internal parts of the punch are lubricated by a splash oil bath system. Manual lubrication intervals are in the order of several months. The basic recording cycle allots one-third of a cycle to tape transport and two-thirds to punch pin penetration of the tape. ●

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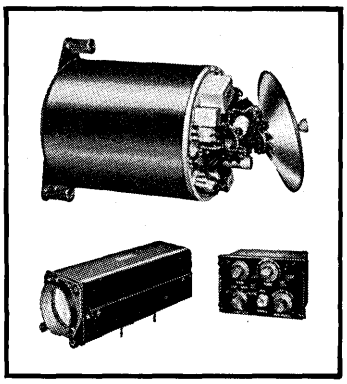

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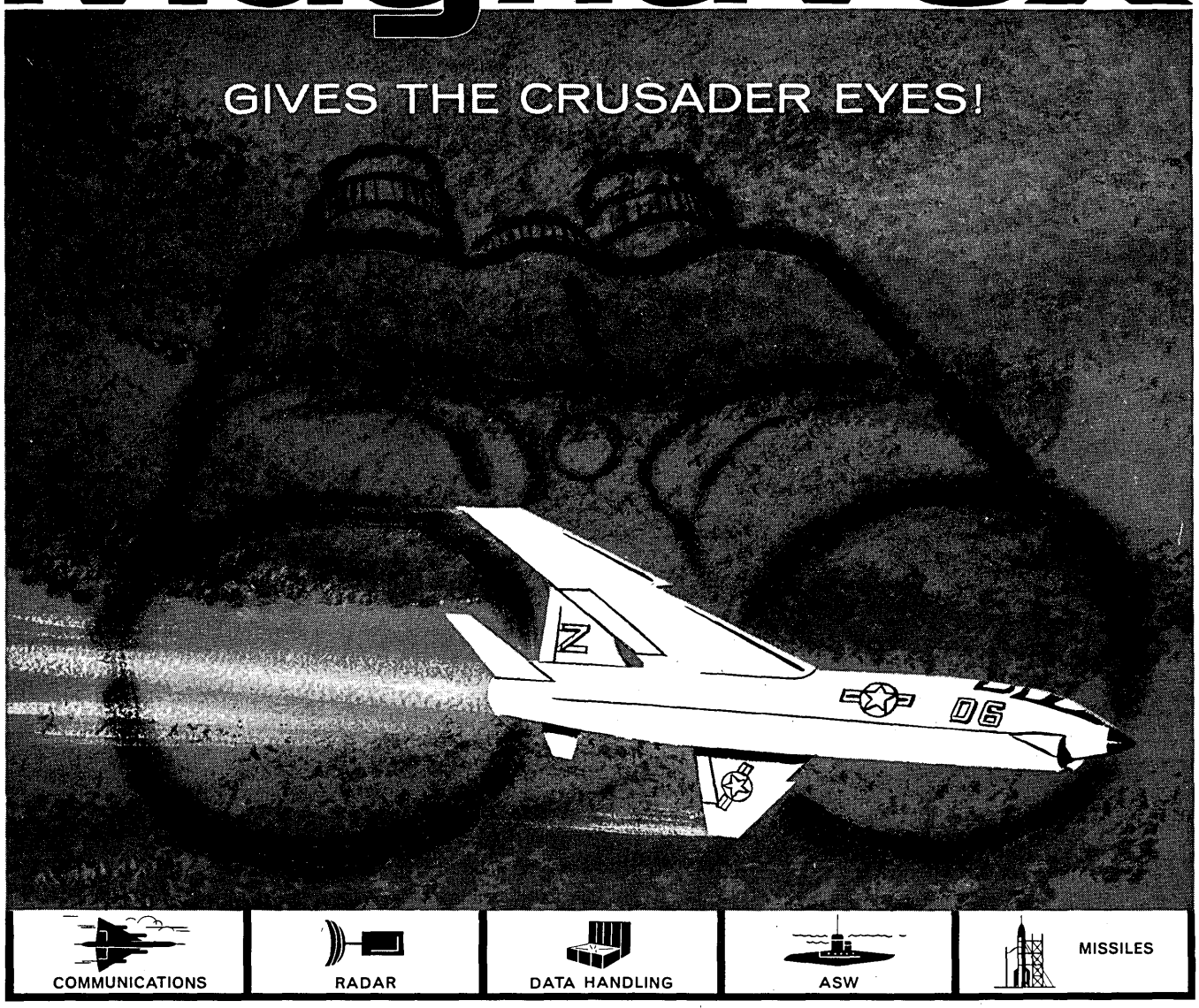

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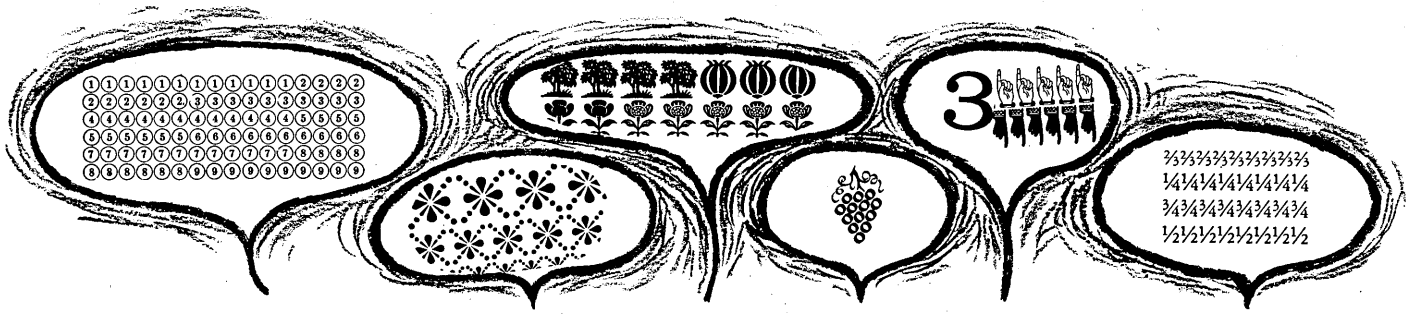


computer specialists conclude discussion of perennial professional society question

On March 2, a day prior to the 1959 WJCC, a group active in computing met at the RAND Corporation to discuss some of the problems plaguing the industry. The discussion was recorded and printed copies were prepared and submitted to each individual for editing of his own remarks.

Among the topics covered was one dealing with what many of those attending felt was a lack of a unifying organization in the information processing industry.

DATAMATION agreed that publication of remarks covering this subject might benefit the industry. In our last issue, we presented approximately half of this section. The remaining half is presented here.

Those attending the 1959 session were Herb Grosch, IBM; Morris Rubinoff, Philco; C. B. Tompkins, UCLA; Charlie Phillips, Dept. of Defense; Herb Bright, Westinghouse; Saul Gorn, Moore School; Al Zipf, Bank of America; E. E. Minett, Remington Rand; Don Madden, System Development Corp.; Ed Cannon, Bureau of Standards; Bill Gunning, Epsco-West; Fred Way III, Case Institute; Walt Bauer, Space Technology Labs.; Oliver Selfridge, Lincoln Laboratories; Jackson Granholm, COMPUTING NEWS; Paul Armer, Fred Gruenberger, and Willis Ware, RAND.

Again we remind our readers that the opinions expressed here are those of the individuals concerned and do not necessarily reflect the views of DATAMATION or any of the organizations and companies mentioned.

Mr. Tompkins has the floor . . .

Tompkins: We have a group here which has some sort of cohesion; it has some sort of opinion which undoubtedly could be sharpened with some thought on the subject, and it has a gallant secretarial staff. If the members of the group have any good ideas, plus any forceful remarks that may have slipped into this record, these could probably be put together and addressed in the form of a letter to a small number of organizations that we've been discussing. The group could say to each of these organizations that it feels that there is a considerable need for expanded activity (joint activities of the type that the JCC was first put together to do) and point out that one needs a little bit more authority to do this and so forth and so forth.

Gorn: Tommy, what is this group's official name?

Tompkins: This is an informal group meeting at RAND and that's all.

Rubinoff: But, that's the point, we came here agreeing to have an informal discussion. Nevertheless, I don't think you have to worry because we have in this room a key man from all four organizations, one from NJCC, one from ACM, one from IRE, and one from AIEE. There is no fear that the spirit of this discussion will not get back to those four organizations. Formally, I don't think we should go on record with anything.

Grosch: I would suggest that the reluctance of this group to take any action be memorialized in a name: Maximum Utilization of Logical Equipment, or Mule for short.

Gorn: Would the host be interested in taking any action on behalf of the group?

Gruenberger: It seems to me the best action we can take is to publish the expurgated transcript.

Grosch: What we need are ideas. There is no lack of action if you have objectives. We could always send Paul out with this banner flying if we only know what the banner should say. He's already told us what the incumbents are planning to do, and it sounds awful.

Gorn: Paul is scarred from several previous excursions.

Grosch: I know, I know!

Gorn: Morris and I and a few others have been making noises within various organizations for some time.

Gorn: One thing that RAND could do immediately is submit an expurgated version of the transcript of this meeting for publication.

Gruenberger: If we wanted to submit a letter it would take us at least until 8 o'clock tonight just to compose the first paragraph.

Grosch: If we really had something that we all wanted to push, any one of us could write an umpteen-page letter which could be published in any number of places. The point is, we don't know what to put in the letter.

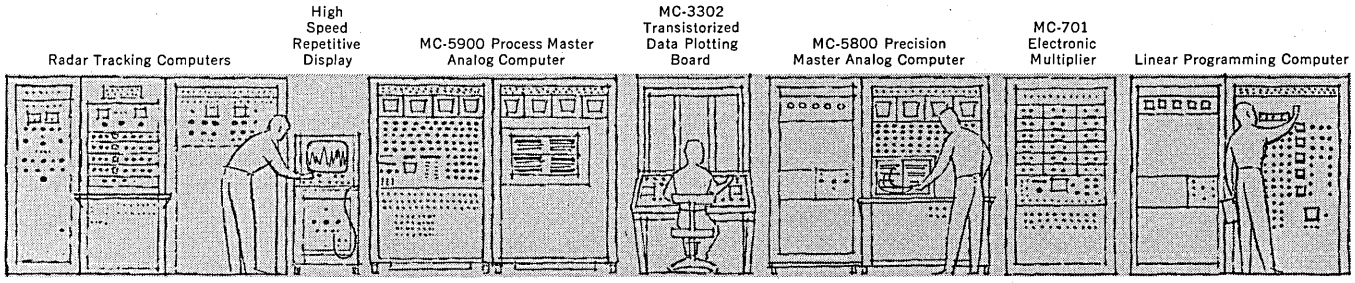
Gorn: I think if we gathered together for the specific purpose of making such plans, that we could.

Grosch: I wish we would then.

Tompkins: I don't think we have to get together to do it.

Zipf: You gentlemen drew an analogy between the association you're talking about and the American Medical Association. It seems to me there's a basic difference. The AMA has a common customer, if you please, since everyone gets sick at some stage in the game. Maybe, collectively we are sick. One thing that has impressed me about all these societies is that none of them has attempted to cultivate representation from users. If this is their intent, then that's fine. But it seems to me that many of the problems we have talked about today are simpler than that (we started out by spending a great deal of time trying to design a more sophisticated computer system this morning) . . . I think we have to start by getting more people to be able to use what we have in order to expand the plan; and get the money from the "money places" to make it interesting to improve upon what we have.

Grosch: Al, I would like to comment on one thing you mentioned—the users not being in the Medical Association.



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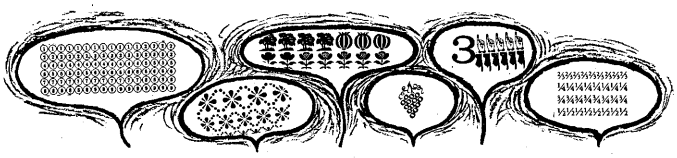

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Gorn: Except give an enema!

Grosch: Instead of customer, I would like to use the term **applier** of this equipment. (To be sure, this applier frequently pays rent to a manufacturer.) To make a computing system work, you have to have some hardware. But, after you have the hardware, you have to adapt it to the problem. And, the people who do that adapting are as valid to our organization as the hardware boys.

Gorn: That's why I think such a society should have an advertising function and a training function, and that's why I thought it should be connected with the universities.

Grosch: As long as your joint operation, whether the JCC or a successor to it, derives its power from other organizations, it's going to be mighty hard to provide such functions as having a front man, pushing for education, and the like. Those things are functions of the member societies too.

Ware: Herb, it's even worse than that because the authority would derive from only a part of the member organizations.

Rubinoff: That's part of Herb's complaint. The ACM is the only organization that can say that that is its only endeavor.

Grosch: Now, ACM would naturally be a member of this new organization. I think NMAA should be, but I doubt if they would.

Gorn: I think you're selling ACM rather short here; I think they could pick up the ball.

Tompkins: I don't think they should.

Rubinoff: (a) they should have; (b) they could have; and (c) they didn't.

Tompkins: There is a local need in the ACM area for a good organization. Whether ACM is a good organization or not is another question. But, if there is to be an overall unifying organization, then I still think it should be an organization of organizations. I don't think it should be a membership organization. If ACM decided to take over this job, then they would have to sub-contract what they regard as their original function.

Gorn: Then, which one of these sub-organizations would have the advertising and training function we were talking about before?

Tompkins: Each of them has these functions to a certain extent in its own field now; to the extent that advertising and training cut across the domains of two or more of the fields, it should be done by the super organization. After all, that was the idea of the super organization.

Gorn: Now you're beginning to write parts of the constitution as well as the preamble.

Tompkins: I think maybe we have to write parts of the constitution.

Minett: If you had this super organization as we've been calling it, composed of member organizations, what would happen if ACM suddenly came alive?

Gorn: All we'd have then is that ACM would be taking a larger part in the activity than we might have expected.

Tompkins: ACM, in this society, should probably have the same role as that of the American Physical Society in the Institute of Physics. It should most likely be the most important single member of the society.

Minett: I wonder though, if this should occur—that you have ACM acting as a member society in a super society—and if ACM's full commitment would be to the super society, whereas the commitment of almost all other member societies would only be partial, then the other societies would readily perceive it. I think the other societies might then be very reluctant to be represented.

Rubinoff: I don't think so. Assuming that the super society is a society of societies, then those who are interested only in the computing aspect of the business as such would join ACM. Those who were interested in hardware would go into AIEE or IRE, which should be merged in any case. If they were interested in business problems and the way computers affect business problems they might join NMAA.

Minett: I'm not the least bit concerned about individual members. As Herb pointed out, an individual can have many interests and many loyalties and doesn't get into conflict with himself because he has joined many organizations. The problem here lies wholly with the entrenched leadership. Also, the inflexibility of the constitutions of the member organizations would cause a lot of trouble here.

Gorn: The problem now is not the complete inflexibility of the ACM constitution, but its complete amorphousness.

Minett: I'd like to make a suggestion about the ACM. If there is any merit to a sort of a bicameral operation, (individual membership and other society participation), perhaps then the present ACM members should be looked on as the nucleus of the individual membership in this new operation.

Bright: Should user's groups get involved in such an operation?

Gorn: You have to be just as sure that there isn't pressure on the part of particular users as you are that there isn't pressure on the part of manufacturers.

Rubinoff: There should be one group that represents all users groups in this national body.

Minett: I should think that each individual user's group would have just as legitimate a claim to representation as AMA, NMAA, SIAM and all the others.

Rubinoff: The undertone of what Paul said was that NJCC is in existence and has a vast vested interest. They have a prior claim. Therefore they will be **the** representative. If other organizations want to come in as second class citizens and affiliate, they can. I personally object to that.

Armer: That's how ACM got into NJCC, isn't it?

Rubinoff: Oh, no.

Armer: Well, I wasn't around to observe it personally, but ACM was essentially a second class citizen for a period of time.

Grosch: It certainly didn't put any money into the early JCC.

That's a pretty good measure of importance.

Rubinoff: Are you implying then that all affiliates after a year or two will be given the privilege of becoming first class members?

Armer: It would be expected that things would go this way, yes. Some may decide to withdraw altogether.

Gorn: It seems like we've been answering question number 4: What Can be Done to Increase the Effectiveness of Our Professional Organizations? and the answer is, "create a new one."

Grosch: Not exactly. I figure if we had this society of societies the JCC would disappear, so essentially we haven't added anything. If we really added a brand new society, it is highly likely that ACM would disappear—at least, I hope it would.

Gorn: But, ACM is in the throes of trying to find out the extent of its own amorphousness and decide what its justification is. Don't we want to try to work within ACM for a while and see what happens?

Armer: I could make the same speech and substitute NJCC for ACM.

Minett: What we're doing here today is in many ways what we should be doing within the framework of ACM.

Gorn: Why do you feel, Paul, that nothing is happening?

Armer: Well, for one thing, there are too many people who are happy with the status quo; they resist all change.

Grosch: How many supposedly warm bodies have a vote in the ACM on a matter as important as this?

Armer: Roughly 20.

Gorn: When I first raised the question in the ACM of a new preamble, apart from a new constitution, with the current president, Hamming, his reaction was to whistle. It was thought that there are all sorts of problems involved, but there are a number of people on the council who are now pushing the idea. Members of the editorial board are going to be pushing a corresponding idea for reasons I indicated

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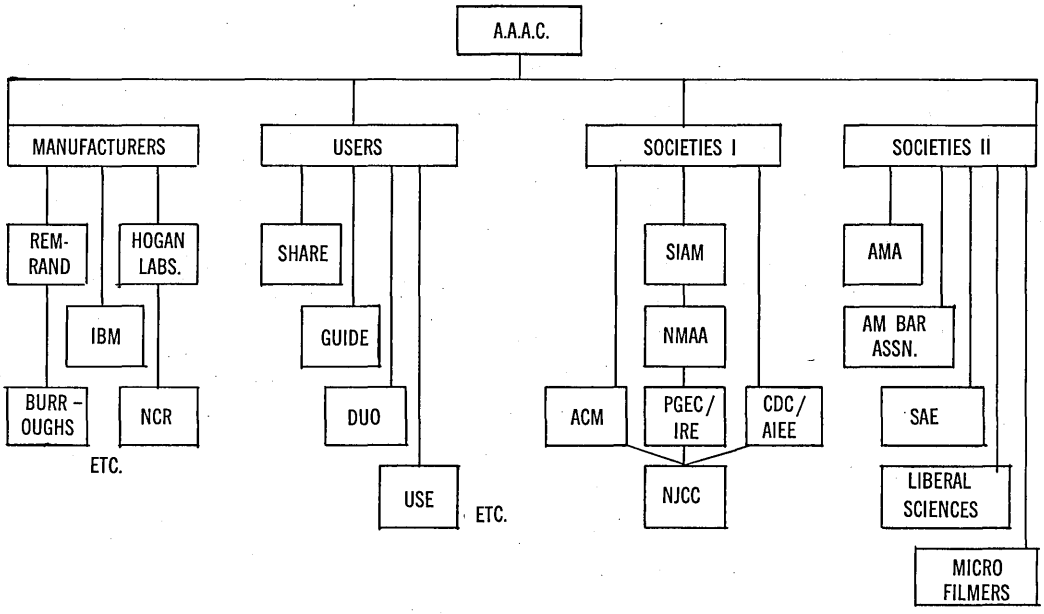

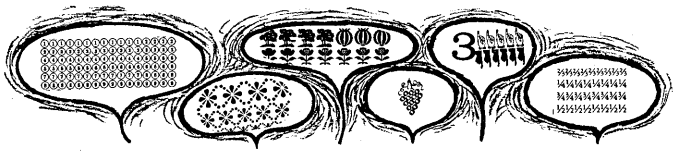

before and they are going to be represented on the council, so the question must come to a head in the council.

Grosch: I'm thinking that for a really radical action you might have to get something like two thirds of 20 people to agree to do something.

Gorn: If it involves any change in the constitution, then it will have to go to the whole membership.

[During the preceding fifteen minutes of discussion, Herb Bright was putting on the blackboard a diagram which eventually looked as illustrated above.]

Rubinoff: What Herb Bright has been putting on the blackboard looks very interesting.

Grosch: Yes, on the right we have one of those citrus trees that grows limes, lemons, and oranges all at once. In the middle we seem to have watermelons and cantaloupes, and on the left we have walnuts!

Gorn: From what we were saying before, almost all scientific societies would have to come into that chart at some time or other.

Grosch: I've never seen them joined together like that before, although it is a challenging possibility. You have, on the left, what used to be called RETMA and in the middle you have the suckers. On the right you have what amounts to the JCC. Boy, what a gaggle that's going to be! You can always take names and draw boxes around them and call it an organization chart. But I don't think it will work that way.

Bright: I'm not advocating it, Herb, I'm just trying to picture what we've been talking about.

Gorn: Let's take one example from that chart. The SHARE organization, in its own peculiar way, has that kind of structure; there's one section in SHARE that's worried about research and things like UNCOL . . .

Grosch: Saul, I'm glad you brought that up. I'd love to find a way to separate these conflicting operations in SHARE. The cooperative programming venture is one thing, pressure on the manufacturer is another, and things like research into UNCOL are again different.

Gorn: That's just about what I was going to say about this structure here. It would have the same problems that SHARE has.

Grosch: There is a certain log-rolling aspect to everything it does. No member ever says no to anything, and SHARE just inflates and inflates and inflates. This must not be for the organization we're discussing here. After all, we're complaining about unsound organizations. We don't want to create another one.

(The group deviated from the subject briefly to discuss how and when the entire transcript, or parts thereof, would or would not be published.)

Cannon: I've had no experience in the formation of societies or councils but I think the more difficult course is the desirable one to pursue. I think the more difficult course is that of trying to form a society of societies, but I think there is a real advantage in forcing the IRE, for example, to realize that they have an interest here. To be sure, the society as a whole has other interests, but a large segment of the membership has an interest in information processing and that interest is likely to grow.

Minett: NJCC was chartered by these three organizations and it has a rather narrow charter from our point of view. It can't be changed by NJCC trying to change it; the organizations that chartered NJCC have got to do it. That means going to three organizations, or at least two out of the three, and asking, "Are you willing to recharter it?" At the same time you have to allow room for other people to get in and allow their agendas to change.

Grosch: If you would let interested parties (and I'm speaking now of individuals rather than organizations) read the unexpurgated version of this transcript, I think two out of the three organizations would immediately vote no. I think the IRE might say yes, but ACM and AIEE would certainly say no.

Rubinoff: I think you're guessing wrong.

Ware: It takes three out of three.

Grosch: Our legal advisor here says it takes three out of three and I **know** that ACM would vote against it.

Rubinoff: NJCC is a structure which is definitely very difficult to manipulate. For one thing, it takes a long time to do anything and for another it requires unanimous agreement among the three groups. It's like the CIO was when it started off; it's just a committee. It's quite different from what we're talking about now; that is, an organization to represent societies.

Minett: What you want is a majority rule operation.

Rubinoff: But you want to give this organization some authority so that it can take action in a reasonable amount of time, not in a year or so.The NJCC has very little power to do the kind of things that Herb was talking about, like disseminating literature and to make known to people what is going on in the computing world. Its major activity is the running of the Eastern and Western Joint Computer Conferences.

Ware: The details of which it hasn't done too much about.

Rubinoff: That's right. All it really does is elect a local chairman and let him worry about the conference.

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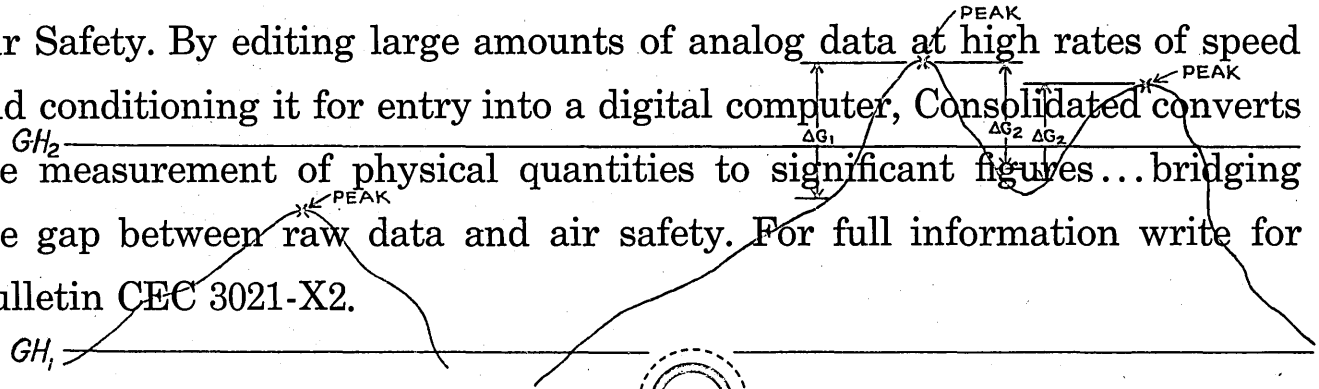

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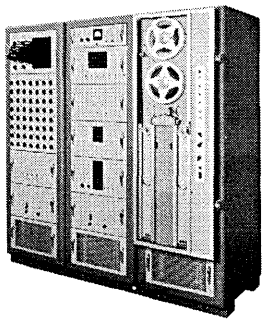

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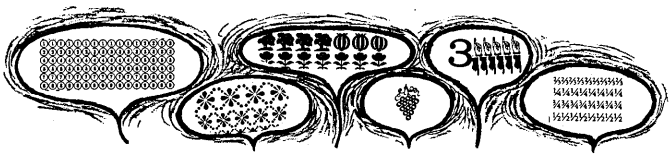

Bright: And it could continue under this new arrangment as a working committee.

Grosch: There are three alternatives we have discussed. One alternative is for the JCC to change its structure. We seem to think that this won't work because even if the JCC had the willingness to do it they don't have the power. A second alternative is to reformulate the objectives of the ACM and its council. We ruled this one out on the grounds that the ACM has the power to do it but not the willingness. And the third alternative is to form a brand new society that would presumably have the power **and** the willingness but doesn't even exist. So it looks like we can't move.

Bright: How about a show of hands, right now, for those who would honestly favor something like an Institute of Societies?

Gorn: I don't vote either way, because I want to think about it. My tendency is to try to reformulate the ACM.

* I see nine hands.

* There are three who want to reformulate the ACM.

Grosch: And, I'd like to start something new; that makes one.

Bright: It wouldn't hurt to improve any organization that is a member of such a council. If any of them have rats in the basement it would be well to set a few traps.

Grosch: I can't see the ACM setting any traps.

* Why do you say that the ACM has rats in its basement?

Grosch: The rulers of the ACM have made it what it is today, so you can hardly expect them to change. The ACM Council could sit down and rebuild itself if it wanted to, and do everything we've talked about. But I remember year after year the excitement about whether the ACM should accept advertising so we could get money and do bigger and better things, and the answer was always, "who needs money?" And it was true: for what they wanted they didn't need money, and they didn't need advertising. And now they want to raise money for of all things, a Review Journal!

Gorn: When they asked me to start the committee rolling to start the Communications, they told me that the society could afford it. And, a year later, they said, "this is losing money; we've got to do something about it." Actually, they were not projecting the increasing income from advertising.

Grosch: When I was president of the American Rocket Society in 1951, we were trying to get off the dime. It was perfectly clear to the board of directors that first you got a good technical journal and with that, you would draw membership. Then with a substantial circulation you could solicit advertising, which would raise money. You could then afford to have a good executive secretary, who could do some decent planning. After that, you start a news journal running, and then build working technical groups and student chapters. I got the technical journal going in 1951, and in 1958 they had a budget ten times the one I had in 1951.

* How big is it?

Grosch: When I was president, the ARS had about 1500 members. Now it has 20,000. I'm not talking about the money that went directly to the publications; I'm talking about the working budget for salaries, office expenses and the like. The whole thing went just like clockwork. And they haven't had the growth that we have. You think of Sputnik as starting a boom, but actually there was a lot of dough being spent in rockets and missiles in 1951.

Madden: I don't really believe that we're so far from accomplishing this. I ask you to look at the last election. The margin was pretty small. Paul, here, might have been president of this organization. If he were, he'd be pushing pretty hard, and this kind of enthusiasm gets you support. If that had come about we'd be a long step toward going where we'd like to go. All except for this small margin.

Bright: Let me make one observation about the ACM Council. It seems to me that as long as I can remember there has been one guiding philosophy; namely, that they hate the name of this society.

Grosch: How do the engineers here feel about the ACM expanding to become a great new society? I'm surprised we haven't heard from them.

Rubinoff: Whom, here, are you calling engineers?

Gunning: Well, I'm one, and I can't see that it would make much difference. It's going to be such a big and general thing anyway.

Grosch: I would think the engineers would say, "We're not going to have any votes, with all these gosh-durned programmers around the place."

Rubinoff: That one I'll subscribe to.

Minett: Since 1948 I've disliked the name of this thing. It seems to me it's too hardware-minded.

Gorn: Remember two years ago it was mighty hard to get programming information into the journal. And that has changed.

Grosch: The name sounds like hardware, and the membership interest seems to be mainly applications.

Rubinoff: And scientific applications, at that.

Ware: There seems to be a gentlemen's agreement between the ACM and the PGEC to keep the division that way.

Bright: Maybe if we changed the name from the Association **for** to the Association **against** Computing Machinery, it would wash better.

Grosch: I think all you would have to do is add one word and make it the Association for Computing Machinery **Users.** That was what we (the 30 or 40 guys who originally met at Columbia) originally intended.

Rubinoff: But, the session at Aberdeen had designers and hardware implications in it.

Tompkins: There wasn't really that. I was there too. You have to remember that there weren't any machines at that time. There were three or four little ones and a lot of punched-card machines and that's about all.

Grosch: We solved partial differential equations on 601's, which was a pretty good trick.

Tompkins: I know, but that's all we had and the users were clamoring for some machines that they could use. The potential users at that time were trying to get their finger in the design of the forthcoming machines.

Gorn: I think we agreed this morning that we did not want to separate the designers from the programmers.

Grosch: I don't want to separate them. I was describing a name change to describe the present society more accurately. It's much healthier to have them working together. But I want them in a position where they can function effectively. I don't think they do right now; at most they clash, and usually they don't interact at all.

[The discussion went off at this point to the question of working hours for programmers (pregnant or otherwise).]

Bright: Do you people really want to let this question of a super society just fade away?

Rubinoff: It won't fade away, Herb, don't worry. There are a number of people here who will carry the ball to several organizations.

Armer: I'd like to hear more discussion about it. In particular, a few people said that they were going to object to my committee's report and Ruby said he was going to vote against it. But, in all this discussion, I didn't hear of another single proposal that anyone was willing to argue for. Why do you object?

Gorn: Too little, too late.

Armer: Too late, we can't do anything about. But, maybe we can do more. What would you like us to do?

Grosch: We have existing forces in the field that will not retire. This includes not only human beings but organizations made up of human beings. I think there's a need for us to do something different, but maybe it isn't possible.

Gorn: It seems to me that some of those forces you're talking about recognize that they should have done something earlier, and are now retiring.

Grosch: There is no question that, on an absolute scale, things are getting better all the time. Paul's position, his committee, the interest that senior people are taking in these problems, all these things are good. I'm just afraid

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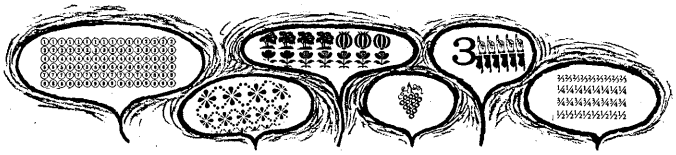


that the absolute improvement is less than the growing need and hence our **relative** position is getting worse. The opportunity to do good is so much greater than it used to be, and this makes the situation worse when we only do a little. I realize that this is just a polemic, and it's rather vague.

Gorn: Actually, the main objection within ACM to such an idea is that it might alienate the rank and file who are not interested in such academic questions.

Grosch: We don't know what the gross population of our field really thinks about this. There is no single organization of all those listed on the board, that speaks for all of these people, or even asks good questions.

Let me give you a case in point. I get three national rosters that come around. I get one from the Institute of Physics; one from some mathematics outfit; one from an engineering group.

None of these three does anything like justice to the computer business. The mathematics one is getting there, but it has nowhere near the detailed breakdown of skills and abilities that we should have. One of those rosters ought to come out of **this** outfit.

Gorn: And, what about the people who design the national roster of scientific personnel? They have to be made aware of the skills in computing.

Grosch: Much information is available to us if we would go out and collect it. We could talk to the directors of institutes, professional societies, government agencies, people who run these rosters, the National Academy of Sciences . . .

Now there's another problem. Since we are not a united discipline it is extremely difficult to get our members into one of the fancy groups. How would we get a computer man into the National Academy of Science, for example? In the Academy there will be an outstanding physicist, an outstanding psychologist, and so on. But a man wouldn't have a chance just because he's a hot shot in the computer racket. So we don't get proper representation.

Gorn: We can still use the method of getting him in under one of those other disciplines.

Grosch: Well, of course. And this has been a problem with all new disciplines. On the other hand, we're going up awfully fast.

Selfridge: With the improvement in status going up so fast, you must be happy with the first derivative, and not with the absolute position. How is the increase in recognition going? Is this really unsatisfactory?

Grosch: I think it is.

Way: I think part of the problem is that we don't have a catch-all title for people in this kind of work.

Gruenberger: So, we need a name.

Armer: Herb, I'd be interested in knowing how you reached your figure of 50,000 people in this field.

Grosch: It was largely intuitive. A considerable portion of the people who are interested attend the major conventions. If you add up the attendance at our major conventions, some 20 thousand different people attend who represent some 50,000 people who are interested but can't come that year. Remember, I'm including information theory people, the business guys, the component men and so on.

Phillips: How many people are there on your joint mailing list these days?

Ware: About 22,000.

Phillips: The bureau of the budget made a survey recently of the Government people in this field (figuring that the Department of Defense had about 80% of the computers) and they came up with a figure of between 5,000 and 10,000. This includes both scientific and business type operations, and both operating and managerial people, with a primary computer occupation specialty.

Grosch: Well, IBM alone has close to 10,000 interested in this racket, including professional and quasi-professional people.

Rubinoff: It would seem clear that if you take in such fields as automatic control using computers, rocket guidance, . . .

* You can get the 50,000 real easy.

Grosch: And, if we wanted to get real wild, we could put in all the librarians, all the microfilm operators . . .

Armer: The first derivative out in this area is tremendous!

Rubinoff: It seems to me that when we were discussing this before lunch, we were looking at it through very narrow eyes. The influence of data processing on our society is very large and going off in all directions. Consider for example the people in psychology, linguistics, economics, and even medicine, who are now beginning to think of the impact of data processing on their fields. It is for this reason that now is the time to act before we have fifteen new splinter groups.

Rubinoff: We don't want to have many organizations. And if we do have many such, we want to have one organization to provide unifying professional status to them. If we don't do it now, then ten years from now we will regret it.

Bright: Morris, are you thinking about separating the sheep from the goats, in this institute?

Rubinoff: First tell me whether I'm a sheep or a goat.

Bright: I think we have to remember that there are two kinds of societies here, as regards loyalties. One is the kind whose primary interest is in machines as such; parts of IRE and certainly all of ACM, SIAM, and NMAA are in this category. Then there are others, of which I think SAE is a prime example, who have a sort of secondary interest but would want a voice, perhaps not the same kind of voice, maybe a different color voice.

Armer: I agree with this dichotomy. The primary group consists of those who are interested in information processing for the sake of information processing.

Grosch: There were five hundred civil engineers who came to a meeting in Kansas City because of their interest in bridge calculations, cut-and-fill calculations, and so forth. I was never more surprised in my life. There was a whole hotel full of them. I thought there'd be about eight guys and one Bendix salesman.

Bright: There could be a place for such people in an umbrella-type organization, with perhaps a newsletter devoted to just their interests. We might even get to the point where the organization could afford a 407 to check program decks before they go out, which I understand IBM can't in New York.

Grosch: Our machines are in such demand that it's getting very difficult to afford one for our own use.

Bright: This wasn't the story I heard.

Grosch: Let's not look on the black side of things!

Armer: They could afford it, they were just too cheap.

Gorn: Well, Herb, what do you think we ought to do?

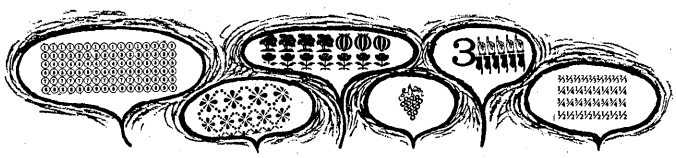
Grosch: I'm beginning to think maybe I ought to take back the remarks I made about the chart that Herb is putting on the blackboard. Maybe he has created a new kind of organization by simply tying together these widely disparate groups. Just think what an empire he is creating for someone.

Bright: You'll notice that although we have some sort of name for the organization at the top [pointing to the initials AAAC (representing American Association for the Advancement of Computation)] we've left out the important point; namely, to whom this organization reports.

[At this point Bright lettered on the blackboard at the top, the initials HRJG.]

Grosch: Seriously, it seems to me that the flow of information, the flow of authority and the flow of money on that chart, are all mixed up. Generally, an important thing about an organizational chart is to have all the things that flow, flow in the same direction.

Rubinoff: You mentioned a problem before; namely, that not everyone has the same amount of interest in the computer field. Normally, I think in terms of things like automatic control and their use of computers, but we have in this room a man from the Bank of America. You could hardly say that the Bank of America's primary interest is in computers. On the other hand, this is getting to be a very important aspect of their work. Similarly, it is important in a lot of other fields, from missile guidance, to automatic con-



trol, to accounting, to industrial process control. All such people should have a representation, somehow. In this sense, it's different from automobiles.

Grosch: There are two kinds of representation. One way is to have a committee or an elected representative of something like the American Banking Association participating in a society of societies. The other way is to make known to those individuals in the Bank of America, say, that there is a home for them up yonder at 10 dollars a head. Which route do we want to follow? The problem of getting worthwhile action from as disparate groups as we have on the blackboard would make it impossible for someone to go down and testify when ERMA blows up and the entire economy of the state of California grinds to a halt.

Tompkins: Of course, they said the same thing about the United States of America when the proposal was first made to weld together disparate groups like the New England states and the central states.

Gorn: Herb's objection is quite valid. On the one hand you have those who are interested in communicating controls and on the other hand those who are interested in controlling communications. These are very different people.

Way: How do you tell when a professional is a professional, Herb—when he kicks in the ten bucks?

Grosch: Roughly speaking, yes. There has to be some feedback in the loop; especially in the early days, he has to have some say in what the organization gives him for his 10 dollars. The trouble here is that the interest of any one of those constituent outfits is so different from the interest of every one of the others. In that situation, how could they ever get any action?

Way: I'm tempted to go with you on individual membership, for just that reason. But, are you going to get enough people?

Grosch: I think that many outfits would wind up by sending observers, so to speak, and that isn't out of the question at all. The Standards Association has worked that way for a long time. Don't get me wrong; I'm not implying that this will become a Standards group.

Suppose someone in the American Bar Association develops a deep interest in information retrieval as related to legal procedures. I'm sure he would try to form a committee for that purpose, and either have the committee send a representative, or have the members themselves join.

Someone could knock on the door and say, "Gee, there should be a committee to look into the problems of the legal profession in relation to information retrieval." Then any lawyers within our own ranks would be an obvious nucleus of such a committee. If there weren't enough, then the outsider would have to say, "Look, I'll provide some lawyers and you provide information retrievers, and they can work together."

You notice that this list of interested groups can get longer and longer. We're going to eventually interact with nearly every professional society in the world.

Tompkins: But, they should no more be members here than they should be members of the statistical society.

Grosch: When you get right down to it, the key trouble is that we have two warring hardware groups and one poor moribund user's group, all trying to work together in this JCC farce. And what we have to do is sweep it all aside: we just have to start over!

Rubinoff: Let's look at the other suggestion that was made earlier. The ACM should have some new blood injected intravenously; the IRE and the AIEE should recognize that they are primarily electrical engineers with a side interest in computers as such, just as the American Banking Association has a side interest in computers as such. The ABA should participate in the construction of instruction catalogs just like the designers have to participate in the design of the hardware to implement those instruction catalogs. This all means that there should be ACM in the top box and all computer activities should filter through the ACM. All other groups should then affiliate with the ACM. A lot of people are going to feel that they have had the rug pulled out from under them. But it is a solution. Historically, I agree with Herb. The ACM didn't even pick up the ball, much less have the chance to drop it.

Bright: You keep saying that this is virtually impossible, but yet I think this is just what has been done in the AAAS with most of the societies concerned. There are even some non-scientific organizations in it.

Gorn: If that is the case, then what you're saying is that the AAAS is that organization.

Bright: Not really; there could, though, be some staff connection.

Grosch: It should be pointed out that for years after its formation the AAAS never took a stand on anything. All it did was hold an annual meeting and publish a very innocuous journal. When they needed a Voice of Science to appear in Washington, it would be almost anybody except the permanent secretary of the AAAS. They are changing now, but only after the formation of the Federation of American Scientists and outfits like that.

This, of course, was a shameful gap. If there was any association of scientists that should have been able to step up and say, "This is wrong," to McCarthyism, it should have been the AAAS.

Bright: Then, you're saying that they're beginning to be the sort of organization that we're talking about here. They now say things in print, signed by an officer of the organization, and thus take an editorial stand.

Grosch: There are absolute gains in the ACM every year, but I think the urgency is growing faster; the relative situation is deteriorating.

Bright: A lot of the people here have some sort of executive connection with various of the societies that we have maligned. Suppose that we were to agree on some sort of joint pronunciamento. How would it be if such individuals here were to take it back to the SHARE executive board and other nocuous bodies and try to peddle it? Assuming that we could come to a meeting of the minds, perhaps the proper place to peddle it would be in the steering committees of the various organizations that would be affected.

Grosch: Would the RAND Corporation furnish the services of Paul Armer for a year, having him sever all other connections during that time? I'd sure like to see someone have a try at really planning this thing out.

Armer: Leaving personalities out of your last comment, you have an important point there, Herb. To do the job right would take a lot of planning and a lot of hard work. It could not be done by a committee which meets only periodically. A working group which holed up in some isolated spot for several weeks might get the job done, but a committee, in the usual sense, would never get any place.

Grosch: One way to float this new society, assuming that it's a society of individuals would be to launch it with a manifesto signed by the outstanding names of all the people who are interested in this. That means someone would have to go out and find out who the outstanding names are in the NMAA, for instance. I doubt if any of us know the leading lights in the NMAA or the Automatic Control group or many of the others. And you'd have to convince them, too, because they'd be signing this thing.

Rubinoff: The trouble with the Automatic Control people is that they would want us to sign **their** manifesto first.

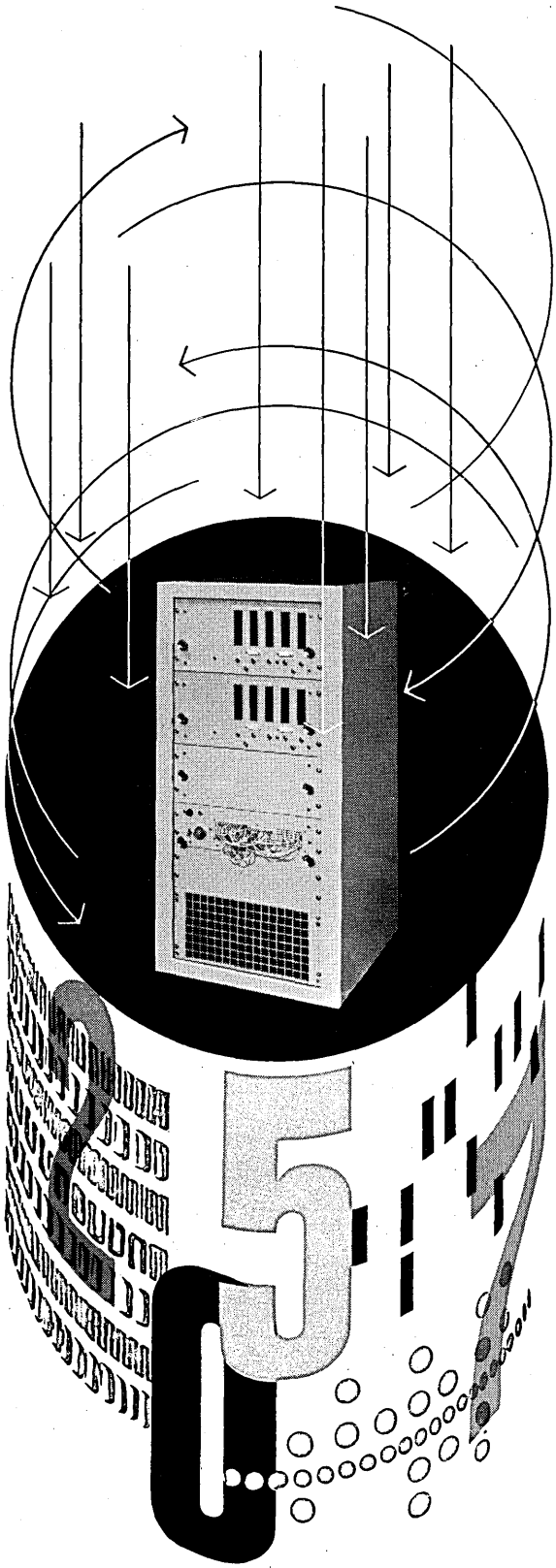
Way: As far as forming a society of members is concerned, my experience in Cleveland indicates that I could go out and sell the idea to individuals in large numbers, but I'd have trouble in selling it to the local ACM chapters and it would be completely impossible to sell it to the AIEE.

Rubinoff: That's not true.

Way: In Cleveland it is. We happen to have the largest discussion group in town now, as a matter of fact.

Gorn: Look at the beginning of the Information and Control Magazine. This is a magazine that seems to be interested in the area as a whole. We should consider how they got started. They did not think in terms of starting a new so-

(Continued on page 44)



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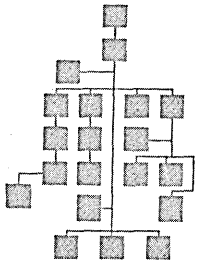

people moving up in DATAMATION

Mrs. Ida Rhodes, Applied Mathematics Div., National Bureau of Standards, has been awarded the U.S. Dept. of Commerce Gold Medal for Exceptional Service. The citation – "significant pioneering leadership and outstanding contribution to the scientific programs of the Nation in the functional design and application of electronic digital computing equipment." Mrs. Rhodes was a featured speaker at the recent ICIP in Paris . . . Burroughs Electro-Data Div., named **Walter B. Claus** staff assist. to the director of manufacturing. **Brad McKenzie** is appointed manager of the dp center . . . Newly formed Computer Sciences Corp., has engaged **Dr. Charles Swift** (ex Convair) as a computer consultant . . . IBM Vanguard Computing Center has named **Dr. James H. Turnock, Jr.,** project manager for Project Mercury. Other IBM appointments: **Kenneth N. Davis, Jr.,** controller; **George F. Kennard,** manager of r and e dept; and **Thomas R. Horton** manager of the systems analysis dept. – all at Federal Systems Div., N.Y.

Dr. Finn J. Larsen was appointed to the newly-created post of vp in charge of research for Minneapolis-Honeywell. Larsen, who joined M-H in 1948, continues to direct activities of the central research labs in Minneapolis. **Thomas H. Armstrong** has been named vp in charge of marketing for M-H's Datamatic div. Armstrong's edp background spans 20 years . . . Aeronutronic's Computer Operations has promoted **Joseph K. Slap** to manager of product planning; **George D. Talbot,** to the dp staff; **Daniel F. Morrill** to the auxiliary equipment dept. Three key marketing appointments are: **Dr. S. Dean Wanlass,** marketing manager; **Steig Gavelin,** western representative; **Robert G. Evans,** special representative.

Epsco has engaged **Roy H. Callahan,** Rear Admiral, U.S. Naval Reserve, Retired, as director of operations. He will be directly responsible to the president for operation of company engineering, production activities. **Eugene S. Goebel,** former vp for market relations of Motorola, joined Epsco as vp in charge of marketing. Other appointments: **Bruce K. Smith,** asst. to the president, advanced product technology; **Elton Sherman,** manager; **Philip Hood,** production manager; and **Jack Haughey,** asst. manager of the newly-formed standard systems dept. **Howard Carter** joined Epsco-West as project manager . . . Tally register named **Frank C. Partin** sales manager – formerly asst. chief engineer. . . . Telex, Inc., systems & special products div., engaged **A. Jallen,** specialist in transistor circuitry design.

Promotion of **Norman O. Bender, Jr.,** to newly created position of operations manager for Transac computers, was announced by Philco's government & industrial div. **Robert E. Steele,** is named manager of product planning; **Robert A. Cohen** appointed to new position of manager-customer information services . . . Bendix Computer Div., named **Ronald Compton** senior engineer for computer design; **Stetson Avery** was made manager of the new district office in Detroit; **Herbert H. Jones** is now programming instructor . . . RCA's edp div., elected **John E. Johnson** vp and marketing manager. Johnson was marketing vp of M-H Datamatic Div., before joining RCA last year.

James D. Bowles heads Ampex Corp's newly formed Computer Products Organization (providing specialized engineering and marketing services) . . . **Robert D. Schmidt** is now sales manager for TMI's data equipment div. . . . General Petroleum Corp., moved **Arch B. Johnston** to the Socony Mobil Oil Co., methods research dept., in N.Y. Johnston is supervisor of data processing operations and research . . . **Colonel John C. Pitchford,** USA, retired, joined Benson-Lehner Corp., as project manager to study future developments of company's product line.

Appointment of **I. S. Lerner** as applied research director was announced by Royal McBee Corp. He directed business machines research at the instrument development labs. for past three years . . . Universal Oil Products Co., appointed **Dr. L. G. Massey** head of the computer dept. . . . **Harold Weiss,** now manager of applications engineering at GE's computer dept., will organize and staff an applications-engineering group.

S. IDA RHODES
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F. J. LARSEN
VP of Research,
Minneapolis-
Honeywell

R. H. CALLAHAN
Director of
Operations,
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D. BENDER, JR.
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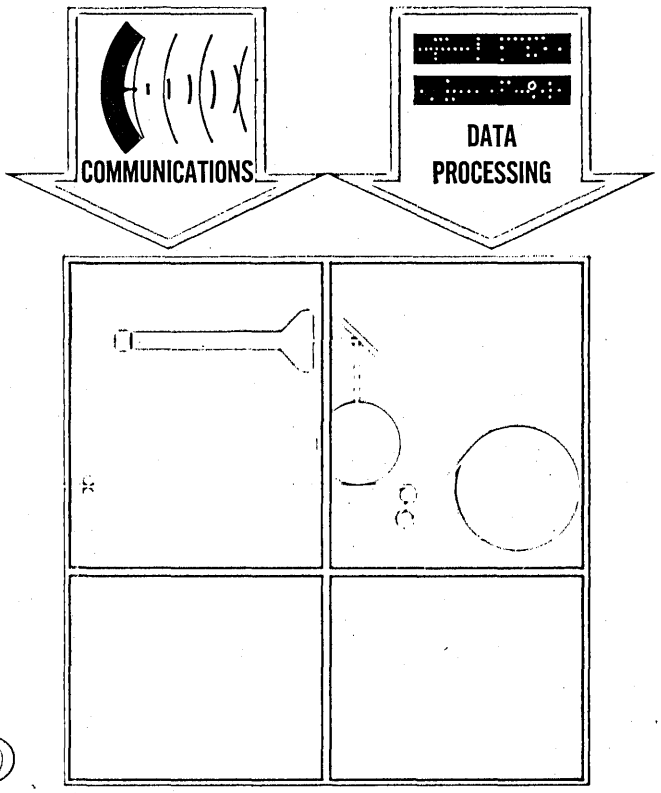

S-C 3000

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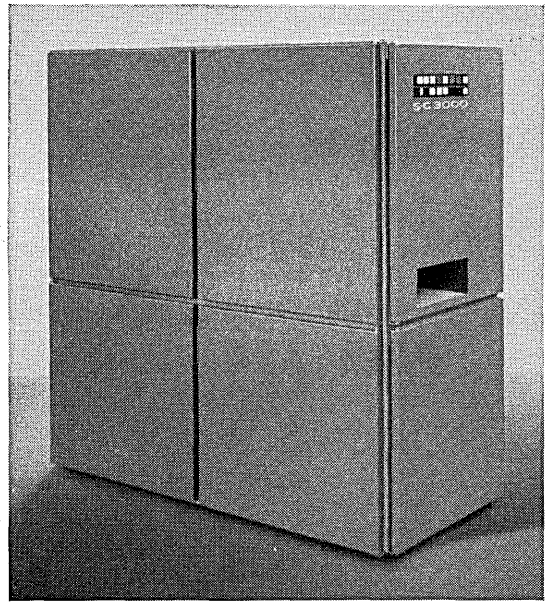

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RCA ON MOVE; ANNOUNCES 502, 503, 504

RCA, formerly a somewhat silent member of the Solid State Computer Manufacturers Association, began stirring around early this summer by announcing a series of 501 computer service centers (first now operating in Camden, a second to open on Wall St. early next year) and then really joined the publicity party by unveiling, the day after Labor Day, three solid state machines in the 501 series. Some specs for the 502, 503 and 504 were released in newspaper ads and we add these comments . . . The 502 is a stripped down system designed for firms with about 5000 points of EAM equipment. The 503 is the medium size model. Two 501 production systems (503 configuration) are now operating and a reliable source states that three a month will be coming off the line during the last quarter. This same source claims that 36 firm orders for the 503 have been received. The 504 will be in production in approximately 18 months. It is the largest of the series. While RCA was announcing little in the way of new information (modular design has always been a strong 501 selling point) they have definitely started an aggressive marketing campaign.

IBM PLANNING MACHINE ANNOUNCEMENTS

Meanwhile, back at IBM, the world's largest computer manufacturer is not resting on its record. Word has it that due to necessary final product testing, the September traditional announcement of new machines has been delayed until early October. What will be featured? Probably a solid state machine called the 1401 (said to be somewhere in the spectrum of the 7070 class) and a desk size job called "Cadet." "Space" is the tag on a small business data processor which may be announced. Neither of these names is definite and in fact, according to IBM form, neither is likely to appear on the final equipment. In terms of size and price, "Cadet" is said to be somewhere in the range between the G-15 and Recomp II. There is at least a possibility that IBM might announce a solid state 705 (the 7050?). RCA seems to have caught IBM with its guard down by announcing the Wall St. computer service center (see above). About a month after RCA's move, IBM disclosed plans for setting up 25 to 30 datacenters in major cities. They will be stocked with 7070's. An IBM Wall St. center will be opened in March, 1960. And to put things back in perspective, a 705 III was moved into Bache and Co. in August. This was the first big machine on the Big Street.

REMRAND RUMORS CONCERN NEWER UNIVAC

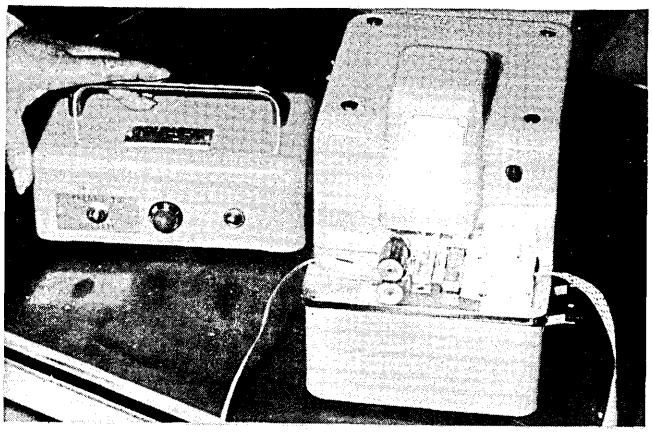
RemRand men are talking quietly about some new machines of their own. Current rumors concern a solid state Univac III (to be announced in 1960) and the fact that Larc will soon be commercially available (at half the cost but half as fast as Stretch). Due to mistaken information received by DATAMATION, three index registers for the SS-80 were listed in a July/August article as standard equipment. This is not correct. The register package leases for $150 a month.

AUTO MATH '59

its exhibits and exhibitors

Exhibited at AUTO MATH 59 were three Ampex tape units—the FR 300, FR 400 and FR 200A. Also on display were read-heads, amplifiers and other components.

Creed's Model 1000 printer, billed as one of the world's fastest, is presently in prototype form. It can be used for direct online computer output or as an offline printer controlled by paper or magnetic tape. Provision has been made for automatic tabulation and form feeding at speeds up to 200 character spaces and 20 line spaces per second respectively.



Shown at the NCR booth was this new British-made Elliot high speed tape reader which is designed to read standard 5, 6, 7, and 8 hole punched paper tape at any speed up to 1,000 characters per second. It can stop within a character. The characters are sensed by OCP71 phototransistors illuminated by perspex light guides.

Firms from all over the world displayed information processing units at AUTO MATH 59, the equipment exhibit for the International Conference on Information Processing held in Paris in June. DATAMATION presents briefs of some of these companies and their equipment.

Standard Elektrik Lorenz of Stuttgart, Germany, displayed their ER 56 transistorized computer.
Circle 104 on Reader Service Card.

Zuse Co., Bad Hersfeld, Germany, showed their range of computers: Model Z-11, program-controlled relay computer – binary, with 27 binary digits word length; Model Z-22 program-controlled binary – 38 binary digits, using a drum storage of 8,192 words rotating at 6,000 rpm.
Circle 105 on Reader Service Card.

Standard Telephones & Cables Ltd., Newport, England, presented the StanTec Zebra computer: serial, binary, 33 digits including 1 sign digit model; 8,192 words magnetic drum storage. Rotates at 6,000 rpm with average access time of 5 ms. A 5-channel photoelectric tape reader, max. 200 char/sec, can be used as input.
Circle 106 on Reader Service Card.

Creed & Co., Ltd., Croydon, England, exhibited an output tape punch and output printer. Model 3000 punch records computer output data in 5/8 track tape at 300 char/sec., with capacity of 120,000 char/reel. Model 1000 (experimental) serial printer operates from a 5 or 6 wire parallel input at 100 char/sec. Circle 107 on Reader Service Card.

Bell Telephone Manufacturing Co., Antwerpen, Belgium, presented an Endless Loop Magnetic Tape Storage developed exclusively in Belgium, which can be exported to the U.S. but must not be manufactured here. Unit has capacity for 5 containers, 10-million character memory.
Circle 108 on Reader Service Card.

Facit Electronics, Sweden, displayed an ECM-64 Carrousel memory; the Facit ETR 500 transistorized electronic tape reader; and the new ETP 150 high-speed tape punch with punching speed of 150 lines/sec., on 5 to 8-channel tape with 10 lines per inch. Feed and punching mechanisms are electromagnetic-mechanical.
Circle 109 on Reader Service Card.

Olivetti of Italy showed the Audit type accounting machine and typewriter, with numerical and/or alphanumerical perforator, a tape to card converter, a paper tape to magnetic tape converter. Circle 110 on Reader Service Card.

Bull Machines Co., of France, displayed various logical elements, and a Gamma 60. Circle 111 on Reader Service Card.

Societe Nouvelle d'Electronique, Paris, France, showed the KL 901 universal computer (arithmetic, parallel): word length is 30 binary digits, floating point, microprogramming by magnetic cores. Input is by paper tape reader operating at 1,000 char/sec., output on tape punch.
Circle 112 on Reader Service Card.

SEA (Societe d'Electronique et d'Automatisme), France, displayed their SEA 1080 high-speed punched tape photoelectric reader; CAB 500 universal binary computer, with word length of 32 binary digits plus sign. Memory storage consists of magnetic drum with 16,384 locations for 30 binary figures (8,192 immediately available).
Circle 113 on Reader Service Card

Benson-France, affiliate of Benson-Lehner, exhibited electroplotters, oscillograph trace readers, decimal con-

(Continued on page 34)

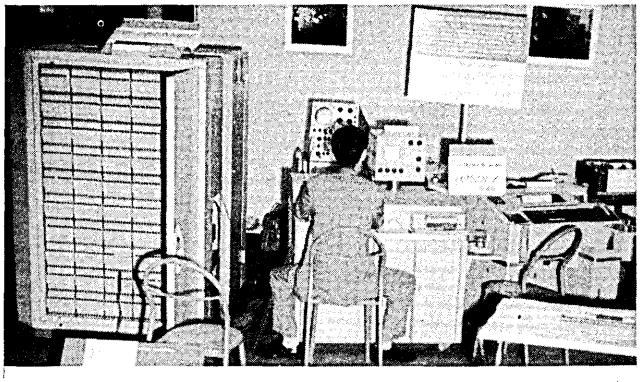
ICIP

JAPAN

comes to the party

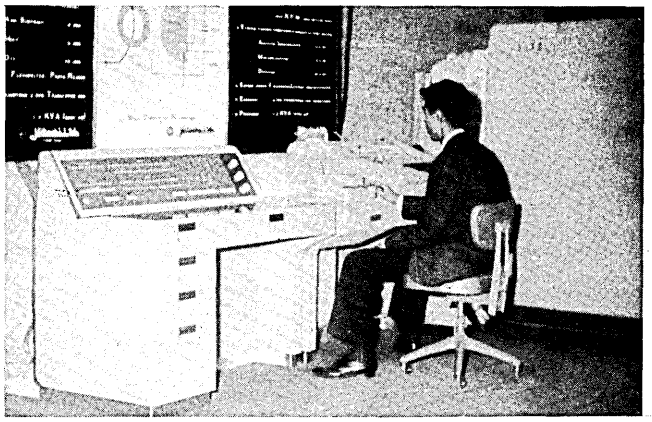
Delegates attending the International Conference on Information Processing were not surprised that the Japanese were present. The delegates were mildly surprised that Japan's computer manufacturers and users were in Paris in force and they were quite surprised at the fine quality and assortment of equipment made in Japan. "Very representative" and "clever" were the words heard most often to describe this equipment. DATAMATION presents some samples of machinery manufactured by three of Japan's largest computer firms.

NIPPON ELECTRIC



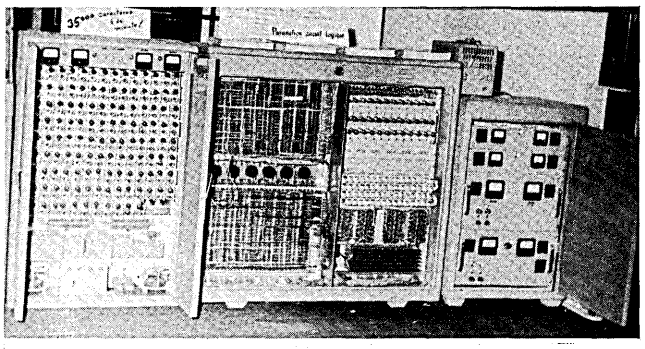
An operator sits at the control console of the NEAC2201 computer. The mainframe is pictured on the left and the input/output unit is on the right. The machine uses a 200 kc clock pulse and features internal programming. Operation code is 1½ address system and there are two index registers. Paper tape reader operates at 200 characters per second and the tape punch at 8 characters per second. There is no magnetic tape or external memory.

HITACHI

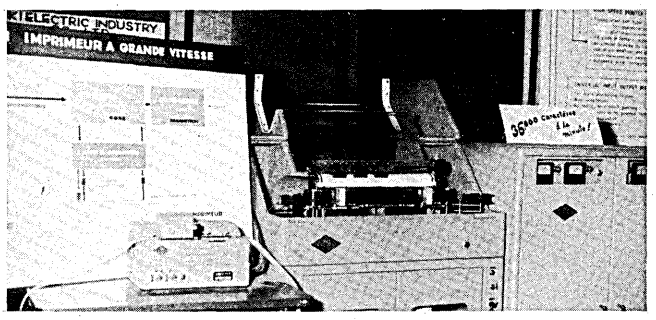


HIPAC 101 (HItachi Parametron Automatic Computer) is a scientific machine made by Hitachi Ltd., of Tokyo. It is a medium-size, stored program computer using approximately 4500 parametrons, highly stable logical elements. To supplement the low clock frequency of the parametron, a parallel mode of operation is used providing comparatively high speed operation. Since two cycle counters (which modify addresses and count the number of repeat operations) are used, calculations can be carried out with few program steps. The 101 features decimal to binary conversion and is a fixed point machine. Punched tape is used for input and the machine contains both a phototape reader and a teleprinter-type tape reader but input can be accomplished through a special control code. Word length is varied—long words are 39 bits and sign and short words are 19 bits and sign. There are 44 types of instructions. Drum revolution is 9000 rpm and storage is 1,024 long words. The machine contains 500 junction transistors, 300 germanium diodes and 50 vacuum tubes.

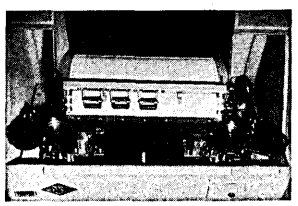
OKI ELECTRIC



Left is the OKI model 58 photo tape reader which operates at speeds of 12,000 or 24,000 characters per minute. It reads photoelectrically 5 to 8 track punched paper tape. The printing unit (center) uses an endless motion steel belt mechanism which provides printing rates of 300 lpm. This can be increased to 600 lpm by using a special type driving belt which allows double line printing. There are 120 or 180 characters per line spaced at 10 characters per inch.



Opened panels of the OKI high-speed printer units show the driver unit containing as many drivers as there are type hammers (with power transistors and vacuum tubes) used as electronic circuit elements; and the memory control unit using as circuit elements parametrons and dual frequency memory cores.



Close-up of the printer mechanism shows the endless motion steel belt mechanism and memory control circuits.

ICIP *special icip technical report*

ERRATA—Page eight, July/August issue, covered the formation of the International Federation of Information Processing Societies (IFIPS). Please note that the vice chairman from the USSR is Anatole A. Dorodnicyn—not Mr. Bazilievsky. Correct address of coordinating chairman, Isaac L. Auerbach, is Auerbach Electronics Corp., 109 N. Essex Ave., Narbeth, Pa.,—not Philadelphia.

by ETIENNE J. GUERIN

TREATMENT OF PARTIAL DIFFERENTIAL EQUATIONS IN THE U.S.S.R.

In the paper "The Use of High-Speed Digital Computers for the Solution of Partial Differential Equations," presented at ICIP by Mr. A. A. Dorodnicyn, Chief of the Computing Center of the Academy of Sciences of the USSR, the author commented that in the solution of hyperbolical systems of partial differential equations two methods were successfully used — the method of characteristics and the method of finite differences. In the latter case special attention must be paid to the stability of calculations. For the elliptical, parabolical and mixed systems as the experience showed, the methods of reducing from partial differential equations to systems of ordinary differential equations (method of straight-lines, method of integral relations) are very convenient because they do not require too large computer memories.

Interviewed in Paris, Mr. Dorodnicyn supplied from memory a list of Russion bibliography (not listed on his paper) on the treatment of partial differential equations which DATAMATION presents here both transliterated from the Cyrillic alphabet and translated, with guiding notes for researchers.

(1) — G. V. Marchuk.
Chislennye metody rascheta atomikh reactorov.
Book, 1958 (Note: State publishing organization unknown, but suggest contact Mezhrunarodnaja Kniga, Moscow G-200)
Numerical method for the computation of atomic reactors.

(2) — S. K. Godunov.
Raznostnyi metod chislennogo rascheta razryvnkh reschenni uravenenii gidrodinamiki.
Matematicheskii Sbornik Bo. 3, 1959 —
Difference method of numerical calculation of discontinuous solutions of hydrodynamical equations.
Mathematics Articles, No. 3, 1959 (Note: This is a magazine).

(3) — P. I. Chuskin.
Obetkanie ellipsov i ellipsoidov dozvukovym potokom gaza.
Prikladnaia matematika i mekhanika, 1957.
The subsonic flow about ellipses and ellipsoids.
Applied Mathematics and Mechanics, 1957.
(Note: This is a monthly magazine and issue apparently is unknown.)

(4) — O. M. Belotserkovskii.
Obtekanie tel sverkhzvukovym potokon s otosshedshei udarnoi voldnoi.
Prikladnaia matematika i mekhanika, 1958.
Supersonic flow about bodies with detached shock waves.
Applied Mathematics and Mechanics, 1958. (As the month is not specified, it should be remembered that AMM is a monthly).
For this subject, see also the works of Belotserkovskii, Chushkin, Katskova, Shmyglevskii in the magazine Vychislitel'naia Matematika (Computing Mathematics) Nos. 2 and 3.

(5) — The series of papers of
A. N. Tikhonov and A. A. Samarskii in Doklady Akademiia Nauk SSSR (Reports of the Academy of Sciences of the USSR) for 1957, 1958. (Note: Doklady AN SSSR is a monthly).

METHODS OF SPEEDING UP THE OPERATION OF DIGITAL COMPUTERS

"Methods of Speeding-Up the Operation of Digital Computers" was a paper presented at the ICIP by I. Y. Akushsky, L. B. Emelianov-Yaroslavsky, E. A. Klyamko, V. S. Linsky and G. D. Monakhov of the Institute of Scientific Research of Electronic Mathematical Machines in Moscow. As an aid to researchers, DATAMATION supplies the following information with reference to the bibliography referenced under No. 2 of that paper, reading:

(3) — G. D. Monakhov and E. I. Klyamko.
Method of speeding binary division in digital computers.
Priborostroenie No. 2, 1957.

PRIBOROSTROENIE, which means "instrument making," is a monthly magazine published since 1956 and it is the organ of Min. mashinostroeniia i priborostroenniia SSSR (Ministry of Mechanical Engineering and Instrument Making of the USSR). ●

(Continued from page 32)

verters, semi-automatic digital machines designed for reading and analyzing film-type records, etc.
Circle 114 on Reader Service Card.

Bendix Aviation Corp., displayed their G-15 general purpose digital computer. Circle 115 on Reader Service Card.

National Cash Register, showed: Model 304, 490 and 480 printing units; the Post Tronic document sorter and the National-Elliott 405 tape punch.
Circle 116 on Reader Serivce Card.

Thompson-Ramo-Wooldridge, through their affiliate **Intertechnique,** showed the RW-300 industrial computer.
Circle 117 on Reader Service Card.

IBM through **IBM France,** had a cryogenics stand. The display included an IBM 9202 paper tape to card converter; IBM 9900 Special Index analyzer; and an IBM 9310 Universal card scanner. Circle 118 on Reader Service Card.

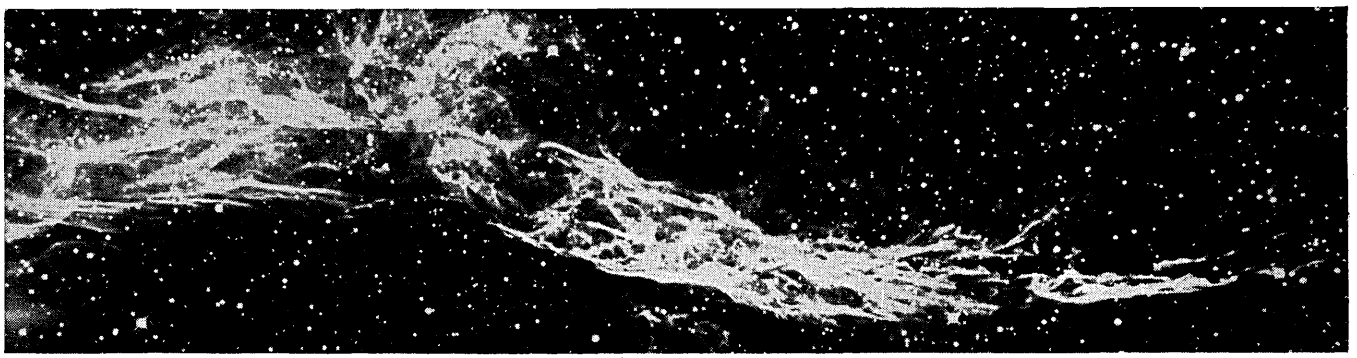
Royal McBee Corp., exhibited the LGP-30 computer.
Circle 119 on Reader Service Card.

Friden, had a wide display including the Model C Computyper, Friden Punch, the Flexowriter Programmatic.
Circle 120 on Reader Service Card.

Ampex, displayed tape transports and tape units.
Circle 121 on Reader Service Card.

Minnesota Mining & Manufacturing Co., exhibited general purpose and special tapes.
Circle 122 on Reader Service Card.

Burroughs, showed the Datafile 560, the Model 440 perforated tape photoelectric reader, Model 544 tape transport, and the E101 computer. ●
Circle 123 on Reader Service Card.



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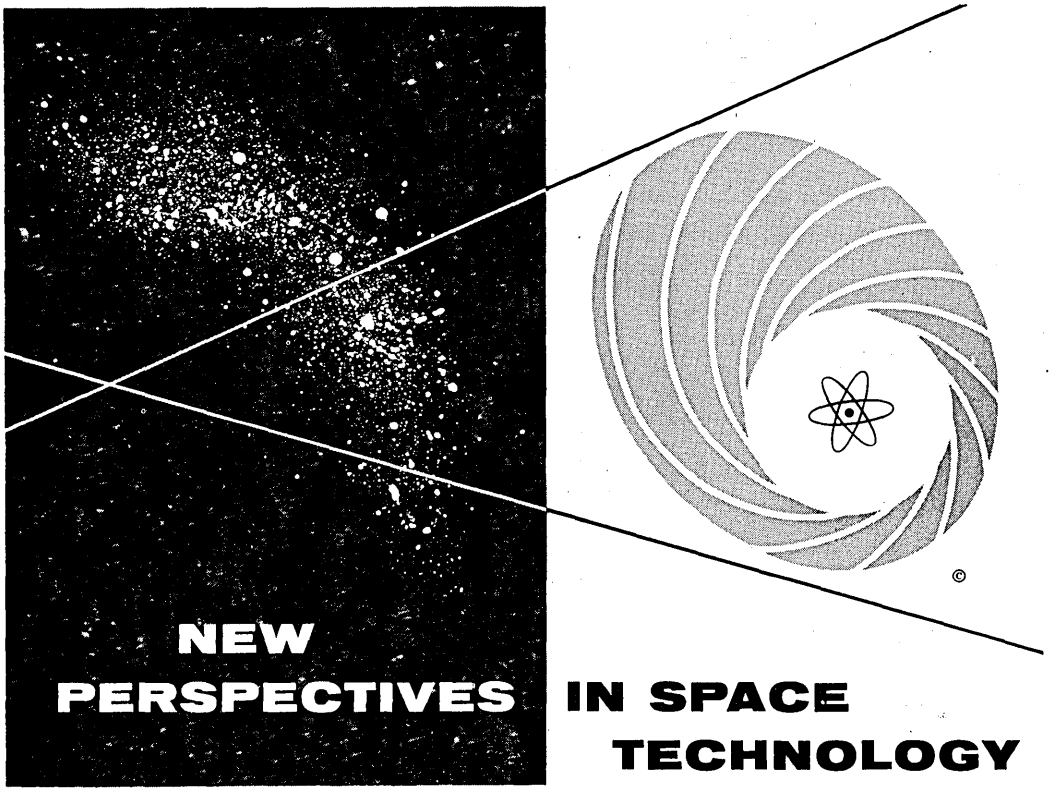

NEW PERSPECTIVES IN SPACE TECHNOLOGY

at RCA's new Astro-Electronic Products Division, Princeton, N. J.

Continued research and investigation into new areas of electronics and space technology has opened up a number of challenging opportunities for creative scientists and engineers at this rapidly growing division of RCA.

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For a personal interview, communicate with Mr. D. D. Brodhead.
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RADIO CORPORATION OF AMERICA
Astro-Electronic Products Division, Princeton, N. J.

EQUAL JOB OPPORTUNITY For All Qualified Applicants

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new products in DATAMATION

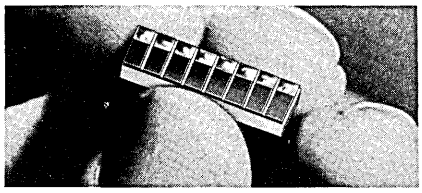
npn transistors

Seven new NPN transistors permit practical complementary circuitry up to 100 mc and feature low collector capacitance. Their applications include low-level, high speed computers. The new family includes the 2N1199, which is intended for high-speed, high temperature saturated switching circuits at frequencies up to 5 mc and feature a typical f_T of 125 mc. Types 2N1267, 2N1268 and 2N1269 represent beta ranges of 6-18, 11-36 and 28-90, respectively, intended for 4.3 mc amplifier applications, and feature typical power gain of 25 db at 4.3 mc. The 2N1270, 2N1271 and 2N1272 transistors for 12.5 mc amplifier applications have the same three specific beta ranges. Twenty db minimum power gain is specified at 12.5 mc. For information write PHILCO CORP., Lansdale Tube Company Div., Philadelphia, Pa., or use reader service card.

Circle 200 on Reader Service Card.

readout photocells

Designed specifically for computer and data processing equipment where rapid detection of light passing



through punched cards or tape is required, these silicon photovoltaic readout matrices feature extremely fast response time in the order of 10 microseconds. The self-generating devices convert light energy directly into electricity, with no need for external power supplies. Each matrix is made up of a multiple array of individually segmented silicon cells. Light energy striking a particular segment will cause power to flow from that segment only. For information write INTERNATIONAL RECTIFIER CORP., 1521 E. Grand Ave., El Segundo, Calif., or use reader card.

Circle 201 on Reader Service Card.

computer tape

A new magnetic tape, C-1, specially designed for computer use, makes use of the exclusive Ferrosheen process to provide the lowest coefficient of friction of any magnetic tape, according to the manufacturer. Tests show a wearing quality for C-1 ten times greater than any tape of comparable magnetic properties, the manufacturer

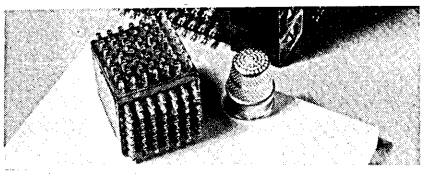
NEW PRODUCTS

states. Supplied on an all-magnesium reel, this tape comes in two thicknesses of Mylar backing. A 1.0-mil backing provides lengths of 3600 feet. As such, the tape is identified as C-1. Shorter lengths are available as C-2 with 1.5-mil backing. For information write AMPEX MAGNETIC TAPE, 934 Charter St., Redwood City, Calif.

Circle 202 on Reader Service Card.

memory stack

A new miniaturized memory stack for coincident current systems, whose physical volume is 1/50th of the con-

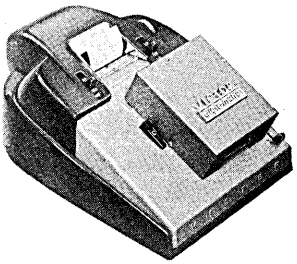


ventional stack, has been developed. The manufacturer's design and assembly techniques make possible the wiring of ferrite memory cores at a density rate of about 3.5 million per cubic foot and have produced prototype stacks consisting of 2,048 cores in a unit measuring 1 x 1.4 x 1.4 inches. This compares with a conventional stack measuring 3½ x 3½ x 4 inches. In each case the device consists of eight 16 x 16 arrays. Production models will be available in September. For information write GENERAL CERAMICS CORP., Applied Logics Div., Keasbey, N. J., or use card.

Circle 203 on Reader Service Card.

monitor

A monitor for verifying wire transmitted numerical data has as its basic component a solenoid-operated add-



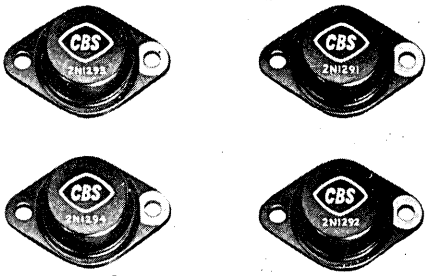
ing machine. This Data Transmission Control System is cable-connected at the transmitting and receiving points where they automatically accumulate figures and print batch totals. These totals are compared at the receiving point (or central processing center) to verify the accuracy of the trans-

mitted data. For information write VICTOR ADDING MACHINE CO., 3900 N. Rockwell St., Chicago 18, Ill.

Circle 204 on Reader Service Card.

npn-pnp transistors

A series of complementary NPN-PNP transistors, in the diamond package, eliminate input and output transform-



ers in push-pull circuits to save money and space while at the same time providing improved frequency response, according to the manufacturer. Negative feedback can be more easily applied using them. All types in the line have a maximum collector current of three amps, a minimum large-signal current gain of 30 (for a collector current of 0.5 amp), and a maximum thermal resistance of 3° C/W. For information write CBS ELECTRONICS, 100 Endicott St., Danvers, Mass.

Circle 205 on Reader Service Card.

transistors

Two new Mesa transistors (RCA-2N1300 and 2N1301) for highspeed switching in computers offer several technical features. The new units have high-speed switching in saturation-type circuits, maximum power dissipation of 150 milliwatts at 25° C, minimum collector-to-base breakdown voltage of −13 volts, typical gain-bandwidth product (figure of merit): 40 Mc for 2N1300 and 60 Mc for 2N1301, and hermetically sealed in a JEDEC TO-5 case. For information write RADIO CORPORATION OF AMERICA, 30 Rockefeller Plaza, New York 20, N.Y., or use card.

Circle 206 on Reader Service Card.

character generator

A new method of generating alpha numeric characters for electronic display purposes has been developed. This new generator can be used for continuous display of tabular information and/or insertion of written data into pictorial-type displays by means of time-sharing techniques.

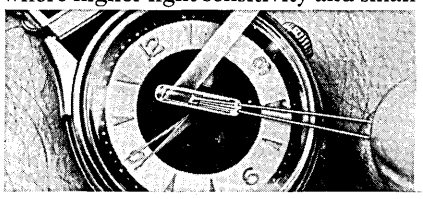
NEW PRODUCTS

Electronic character generation can be used in a wide variety of situations, such as high-speed computer readout functions. This new centrally located on-command system produces characters from a minimum amount of equipment. For information write PHILCO CORP., Government and Industrial Div., 4700 Wissahickon Ave., Philadelphia 44, Penna.

Circle 207 on Reader Service Card.

detector capsule

Type EA7 photo-voltaic detection device is designed for use in applications where higher light sensitivity and small

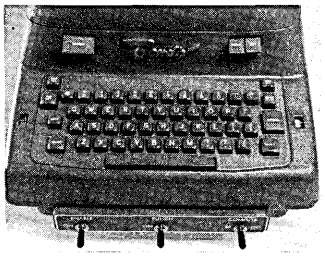


size are of prime importance. Primary application of the new device will be in computers as a punched card or tape readout. The unit will generate a minimum of 300 microamperes into a 1,000 ohm load at an illumination level of 1,250 foot-candles of tungsten light at 2,800 degrees K, color temperature. The detector cell has a response time of about 20 microseconds, the exact speed depending on the load impedance. For information write HOFFMAN ELECTRONICS CORP., Semiconductor Div., 930 Pitner Ave., Evanston, Illinois, or use reader card.

Circle 208 on Reader Service Card.

computer typewriter

A fully alphanumeric typewriter is now available with the G-15 digital computer. Data entering and leaving



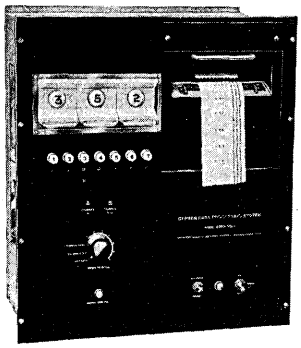
the computer via the typewriter can now be identified with alphabetic information and a variety of special symbols. Headings for columnar typeout, as well as complete format control, can be programmed. All information is typed into the computer in

the normal typing manner. Upper and lower case letters, numbers and special symbols are entered and typed out directly, without the necessity for manual encoding of alphabetic data, conversion subroutines or programmed carriage shifts. For information write BENDIX COMPUTER DIVISION, 5630 Arbor Vitae St., Los Angeles 45, Calif., or use reader service card.

Circle 209 on Reader Service Card.

dp system

Model 821-N is designed to sample analogue voltage information, digitize, and print seven channels. Simple



modifications permit any number of channels to be handled. The analogue to digital conversion is fully electronic. Sampling, digital conversion, and printing occur at the rate of three channels per second. Visual output is by means of Nixie lamp banks indicating the value of the analogue voltages corrected by the proper scale factors. In addition to the visual output, printed paper tape is produced for permanently recording the data. For information write THE GERBER SCIENTIFIC INSTRUMENT CO., 89 Spruce St., Hartford, Connecticut.

Circle 210 on Reader Service Card.

digital data link

Designed for the transmission of digital data over standard communication channels at rates up to 33,000 bits per second, the DA-100 Digital Data Link is an integrated transmit-receive unit, capable of sending or receiving over 20,000 pages of printed matter in one eight-hour shift. The output magnetic tape is usable directly in computer format for the entry and solution of problems or may be printed out in report form for local distribution. Coupled with present or contemplated computers and associated peripheral equipment—management reports, sales reports, billing, shipping and receiving reports, together with scientific

NEW PRODUCTS

computations can be made immediately available at branch or field offices. For information write EPSCO, INC., 275 Massachusetts Ave., Cambridge, Mass., or use reader card.

Circle 211 on Reader Service Card.

paper tape unit

A "piggy back" paper tape unit which allows the E101 to accept data and instructions from either one of two readers is available. Coupled with the standard Model A531 input unit, it provides the programmer with completely automatic control of two separate tapes. Control of the new unit – officially titled the Duplex Tape Input Unit – is provided by the E101 pinboard programming unit. For information write BURROUGHS CORP., ElectroData Div., 460 Sierra Madre Villa, Pasadena, Calif., or use card.

Circle 212 on Reader Service Card.

current drivers

Two new current drivers designed to provide a source of current pulses for testing computer components requir-

ing significant drive currents. The Negative Current Driver Model 50 and Positive Current Driver Model 60 can be used independently or they can be used in conjunction to provide both polarities of pulses. Width and pattern of current pulses is determined by external logic carried out with DEC Digital Test Equipment or equivalent circuits. For information write DIGITAL EQUIPMENT CORP., Maynard, Mass., or use card.

Circle 213 on Reader Service Card.

tape splicer

This tape splicer measures, cuts, and seals nylon-coded glass fibre tape in endless loops within precise length tolerances of plus or minus one thousandth of an inch. This unit can cut at the exact spot on the tape, seal the ends in precise lateral alignment, produce minimum ridge at the splice and meet rigid length tolerances. For information write PRESTOSEAL

MANUFACTURING CORP., Long Island City, N.Y., or use reader card.
Circle 214 on Reader Service Card.

alpha numeric readout

An in-line, in-plane alpha numeric display unit using only one input per character has been developed. In

Model SGS-401, no external segment switching devices are required. Featuring the Selective Group Switching principle, the standard model displays 26 letters and 10 digits. Other combinations or additional characters, including standard or special symbols are available at slight extra cost. For information write I.D.E.A., INC., 7900 Pendleton Pike, Indianapolis 26, Indiana, or use reader service card.
Circle 215 on Reader Service Card.

silicon junction diode

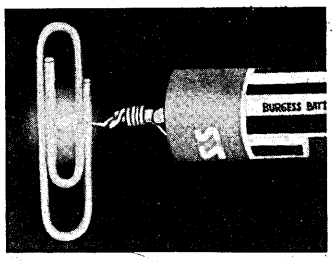
A miniature, silicon junction computer diode features exceptionally fast recovery time. When switched from the forward bias with 10 milliamps current flowing to reverse bias of −5 volts, the MA-4223 complete recovery time is four millimicroseconds maximum. Essential electrical data is: forward current (steady-state DC), 50 mAdc; peak surge current (1 sec), 100 mAdc; reverse voltage (steady-state DC), 30 Vdc; power dissipation, 100 mW. For information write MICRO-WAVE ASSOCIATES, South Avenue, Burlington, Mass., or use reader card.
Circle 216 on Reader Service Card.

tape input to plotters

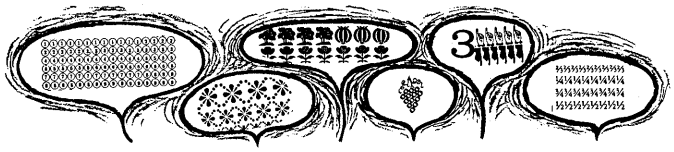
A new converter, which makes possible the direct use of digital magnetic tape as input to automatic graph plotters and similar voltage devices, eliminates the necessity for transferring data from magnetic tape to punched cards, and more than doubles plotting speeds even for existing plotters, according to the manufacturer. The unit has solid state switching circuitry and can be adapted to magnetic tape from any digital computer. Selection of data by patchboard makes special programming unnecessary. For information write BENSON-LEHNER CORP., 11930 W. Olympic Blvd., Los Angeles 64, Calif., or use reader card.
Circle 217 on Reader Service Card.

indicator lamp

Newly designed microminiature incandescent indicator lamp which operates directly from the output of a



transistor without amplification is now in production. The lamp operates at less than 1.5 volts and draws less than 50 milliamperes, according to the manufacturer. It is tailored for transistor circuits; housed in a vial one hundred and ten thousandths of an inch long and fifty thousandths of an inch in diameter with two platinum leads extending from one end. For information write MINITRON COMPONENTS CORP., 67 Illinois Ave., Paterson, N.J., or use reader card.
Circle 218 on Reader Service Card.



(Continued from page 26)

ciety. They simply went out and started a new magazine.

Selfridge: They probably did think in terms of a new society, but felt that they didn't have time for it. But there is a new institute now at MIT in communications sciences, for which his magazine is one of its voices.

Gorn: Maybe what we seek already exists, gentlemen: an Institute for Communication Sciences.

Grosch: I think I'd prefer the word information, rather than Communication. Communication implies transmission; information includes standing still and still processing. I don't think of a library as a communication device, for instance, except in a very broad sense, and yet I think of it as part of an information system.

* Then how about the Institute for Information Systems as a title?

Rubinoff: No, it's already been pointed out that information processing is the phrase coming into acceptance.

Selfridge: Yes, that's the name of the new division at the Lincoln Labs.

Gorn: What's the name of the new group at Princeton?

* FOCUS.

Gorn: It looks as if universities or offshoots thereof are beginning to start institutes.

Grosch: Saul, I don't want to get back to the earlier topic, universities themselves, but it seems to me that it isn't university faculties which are starting these institutes, but rather business groups who are servicing industry and the government. We've been using the word university around here in the old-fashioned sense of a group of scholars who are interested in teaching and research. What you're talking about is just another corporation without incorporation, set up to spend defense funds.

Gorn: If you want to have a professional society, and you want it to grow, I don't see how you can do it without having the universities involved.

Rubinoff: Well, the university people are members of these societies.

Grosch: Let me cite the case of the Institute for Aeronautical Sciences. There are many wonderful universities and many of them have fine aeronautical sciences departments, but the IAS is not primarily university oriented. It has a lot of university members but the universities do not guide the IAS by a long shot.

Gorn: I wasn't thinking of its guiding but as a source of the expanding professional membership.

Grosch: But even so, would you find that all the IAS members have come from aeronautical sciences departments in the universities? The organization has grown so that a large share of their membership today consists of mechanical engineers and others.

The point is that if the IAS can be a real strong organization, the computer world can be too, and not be any more university oriented than they are. Note also that the IAS is not just an offshoot of the Aircraft Industries Association.

Armer: But, it's the presidents of some of these companies that are still behind that organization. We still have that problem.

Grosch: I have the impression, Paul, that they have left it relatively pure. They're willing to support it financially, without trying to steer it.

I think that the manufacturers in our industry would give financial support to our new society without trying to dominate it.

Rubinoff: Let's face it, the manufacturers are providing the financial help right now. They send their people to the meetings, provide secretarial help, take care of all the arrangements and generally pay all the hidden costs.

Armer: They hide them, that's the thing. What we need is

a paid professional staff out in the open for which you need cash from these companies.

Grosch: A decent budget for the professional staff of the American Association for the Advancement of Computing would be a couple hundred thousand bucks a year. Now that's a lot of money, but take a look at the American Rocket Society. They have a whole hive of fairly expert people. They have full time editors, and I don't mean professional rocket people who sit around and review articles; and these are editors who actually write with pencils in their grubby little fists. They have an executive director, they have a secretary type, they have all sorts of little girls in mail rooms and people running madly around; they even have public relations men. And all this is coming off the top.

Gorn: With the number of members that we've been talking about and support from the manufacturers, this amount of money wouldn't be too much.

Grosch: Right. I'm sure the budget for the IAS is much greater. But my point is that the Rocket Society did this in six years.

Bright: I took this matter of corporate contributions up one time with our legal department when I wanted to find out the company's policy in case SHARE became an organization of corporate memberships. He told me then that there is ample precedent within our company for furnishing financial aid to professional groups, both as donations and for corporate memberships.

Our costs for participation in SHARE alone (and remember that SHARE is not even a formally organized professional society) have run to thousands of dollars per year, considering personnel participation, expenses to attend the meetings and the like.

I would imagine that SDC has set some kind of world's record along these lines and I don't imagine it is because SDC figures that these men just need a vacation from their desks. It seems to be clear that corporations must get solid value from the professional societies and are willing to put up costs for value.

Grosch: They want to do it carefully so that it doesn't appear as some sort of bribe or controlling interest. It's quite obvious that there is considerable support in the form of advertising, corporate memberships and lots of individual memberships. They're quite willing to do it if they see some evidence of a return on their money.

[It being nearly five o'clock, chairman Ware declared the meeting officially adjourned.] ●

DATAMATION NEWS BRIEFS

✓Plans to construct a transistor plant at Lewiston, Me., for the manufacture of transistors, diodes and rectifiers for computers, radars and missiles, etc., has been announced by Raytheon. Circle 126 on Reader Service Card.

✓FAST, short for FIELDATA Applications, Systems and Techniques, is a new user group activated in April. Members use MOBIDIC (Sylvania) BASICPAC and COMPAC (Philco) and IMPAC (IBM). Third FAST meeting is scheduled for Nov. 3, 4, 5 at Fort Monmouth, N.J.

✓Halex, Inc., of El Segundo, Calif., is specializing in the process of depositing thin films of conductive, semi-conductive and resistive substances to form electronic circuits. Halex engineers utilize high vacuum techniques (see page 8). Circle 127 on Reader Service Card.

✓A patent covering two new approaches to character recognition problems has been issued by the U.S. Patent Office. Patent No. 2,897,481 was issued to David H. Shepard of Farrington Mfg. Co., Needham Heights, Mass., who is assigned to Intelligent Machines Research Corp., Alexandria, Va. Circle 128 on Reader Service Card.

✓May 3, 4 and 5 are the dates for the 1960 Western Joint Computer Conference – to be held in San Francisco next year. For information contact WJCC, Box 214, Station A, Palo Alto, California.

THE BIAX MAGNETIC ELEMENT

new aeronutronic development features ferrite bar

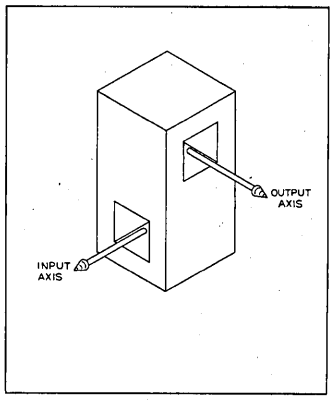
by EDWARD O. BOUTWELL and RALPH B. CONN
Aeronutronic, Division of Ford Motor Company

BIAX, a small (50 x 50 x 80 mils) magnetic device which has been devised for digital applications, has been announced by Aeronutronic, a Ford Motor Company division. The basic element, shown in Figure 1, is a short ferrite bar which contains two orthogonal holes. Binary information may be stored magnetically in the material which surrounds one of the two 20 mil square holes. This stored information may be read-out at some later time by establishing a magnetic flux around the second hole. The resultant interaction of the two magnetic fields generates an output pulse on the storage-axis sense winding. This interrogation or read-out operation, may be performed in either a destructive or non-destructive manner. These two modes are used in the logic and memory applications respectively.

A more complete description of the principles which are involved in the BIAX concept has been presented elsewhere.[1] It is important to this discussion, however, to note that both the operating speed and the power requirements of all magnetic computer elements is directly related to the size of the basic device. The extremely small size of the BIAX element thus permits high-speed minimal power applications. Furthermore, simplified fabrication techniques permit it to compete favorably on a cost basis with other memory and logic elements.

logic element

In its logic role the BIAX magnetic element of Figure 1 is operated in a destructive mode. It accepts up to 15 windings, each representing a logic variable. Several such "product-gates" may be summed, as in Figure 2, by passing the sense winding through each required gate. The familiar and-or proposition which results is a basic building block of computer logic.

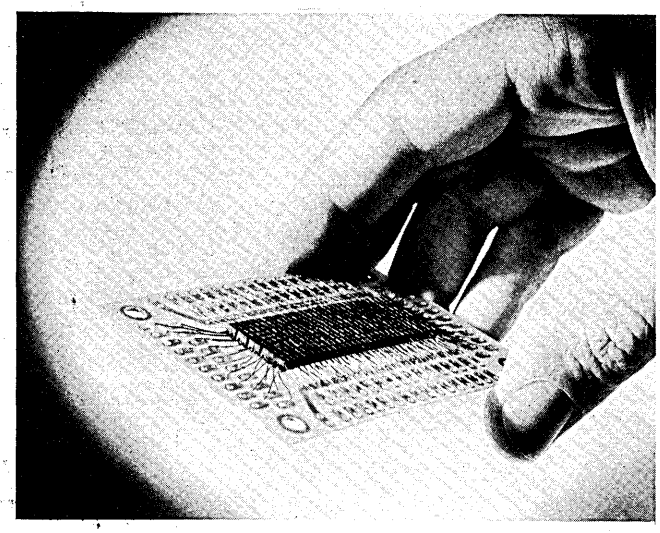


BASIC BIAX ELEMENT
FIGURE 1

Before assessing the advantages of the BIAX logic element, it will be helpful to review the relationships which exist between logic element capabilities and desirable computer characteristics. That is, what logic element properties are important in the mechanization of high performance computers? In general, the factors of speed, reliability, size and power are of paramount consideration. Speed of operation refers not only to the repetition rate of the logic cycle, but also implies the ability to do as much logical work as possible during each cycle. Reliability must be interpreted as the reliability of both the basic elements and any connections which are required to mate the element with the system. Certainly the size of the logic element must be small so that a computer of reasonable complexity may be contained in an ever decreasing volume. Finally, the power required to operate a logic element must be maintained at a low level. This requirement for minimum power consumption is related to the problems of power generation and removal of dissipated power. In this last respect, it is desirable for the logic elements to possess such environmental characteristics that they are relatively insensitive to heat that is generated within the system.

Present logic usage of the BIAX element is in the range of one to two million decision cycles per second. The BIAX logic principle, however, has been demonstrated at higher frequencies. Synchronous operation can thus be effected in a frequency range which was previously dominated by expensive semiconductor methods. In addition to its favorable frequency characteristics, the BIAX element has been found to be useful in advanced logic techniques which permit the accomplishment of four-level logic (and-or-and-or) at each clock period.

The high reliability of BIAX mechanized logic results in part from the fact that the logic elements themselves are passive devices. This should be contrasted with transistors whose active element characteristics may deteriorate with age. Furthermore, semiconductors are subject to damage by transients of both an electrical and environmental nature. The absence of thousands of connections



A TYPICAL BIAX ARRAY for an electronic digital computer memory unit, this printed circuit card contains more than 300 BIAX elements. Multiples of such printed circuit cards, containing BIAX, are mounted adjacent to one another in a computer to provide large memory capability. BIAX is a development of Aeronutronic, a Division of Ford Motor Company, Newport Beach, California.

[1]Wanlass, C. D. & S. D., "BIAX High Speed Magnetic Computer Element," WESCON Convention Record, 1959.

in BIAX mechanized logic also contributes materially to its reliability. In a BIAX logic system, connections are required only at the input and output terminals of the system flip-flops. By way of comparison, two or more connections are required for each element in a system of semiconductor logic.

The size advantage of the BIAX element has already been emphasized. The magnetic element size-power relationship, which was discussed above, is responsible for the minimum power requirement of BIAX logic when compared with other magnetic element mechanizations.

use in memory arrays

Important characteristics of computer memories are their physical size, storage capacity, access time, access mode (random or sequential) and the nature of their readout. A memory made of BIAX elements offers desirable features in all these areas.

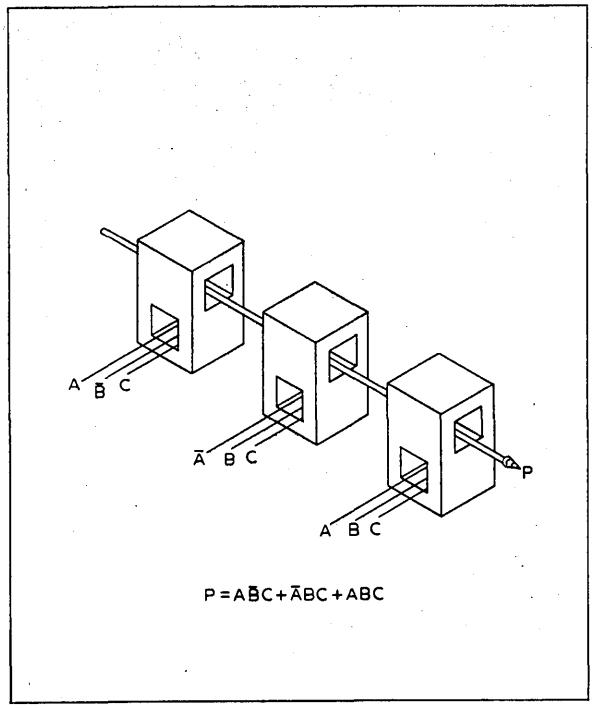
A complete BIAX memory system of 21,500 bits with full read and write capabilities can be packaged in 0.8 cubic feet for airborne applications. This memory would have parallel non-destructive readout at a 2 Mcps rate, and operate in the random access mode. In addition to this mode of memory operation which permits reading and writing under program control, there are two other types of memory operation possible with BIAX elements.

The first type is a memory that has one BIAX element per memory bit and can be altered under operator control, but not under program control. This type of memory is particularly useful during the system development phase of a control computer application. It cannot be altered inadvertantly by program malfunction, but can be changed easily as the system design evolves.

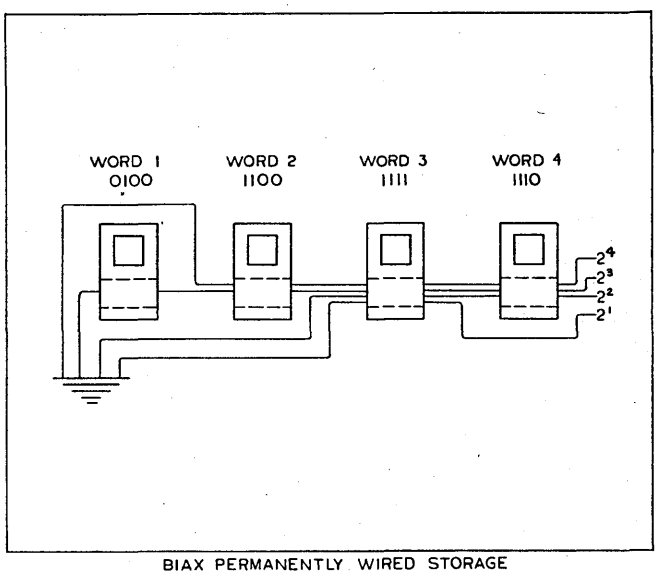
The second memory type is one that is well suited to permanent storage, allowing anything from a subroutine to a complete control system program to be stored. This is made possible by using the position of a wire to indicate the value of a particular bit in a word. Thus, if there are twenty bits in a computer word, twenty wires will be used to represent these bits. The wires will be threaded through or around the memory BIAX element depending upon whether in the word in question this bit is a one or a zero. In principle only one element per stored word is needed, but the necessary engineering compromises dictate the use of one per seven bits. Figure 3 shows how a simple memory of this type would be constructed.

RALPH B. CONN is a senior staff member in Aeronutronic's Computer operation. He is project engineer on a military control computer. He was previously employed by the Ramo-Wooldridge Corporation and before that, the California Institute of Technology Jet Propulsion Laboratory. His work at both these organizations was concerned with the design and development of control system computers. He joined Aeronutronic in March, 1959.

EDWARD O. BOUTWELL, JR. has been at Aeronutronic since July, 1958. He is a staff member in the Digital Computer Engineering Laboratory and is currently engaged in the system and logical design of high speed computers. He was formerly employed by the National Cash Register Electronic Division where he contributed to the logical design of data processing systems.



BIAX AND-OR LOGIC
FIGURE 2



BIAX PERMANENTLY WIRED STORAGE
FIGURE 3

applications

The features mentioned above make the BIAX magnetic element particularly adapted for use in computers in certain areas. The first of these is the field of high-speed information retrieval. When it is necessary to interrogate a large file, using an involved interrogation plan, it is mandatory that each interrogation be performed as fast as possible. The high speed of BIAX logic and memory makes it possible to actually process file information as it is read from the primary file. In addition to raising the file processing speed, this approach allows the file access control to be simplified.

Another application for BIAX elements is the field of airborne digital control computers. Present day machines

are not fast enough to handle all necessary computations aboard combat aircraft. Using BIAX memory and BIAX logic it will be possible to achieve a multiply time as short as 5 usec. and correspondingly short times for other operations. Thus, one BIAX computer could handle data processing, navigation, weapon delivery and cruise control.

Another approach to the airborne control problem is that used for space vehicles. Here the computations are not as numerous nor the speed requirements as great. However, reliability is of the utmost importance. A computer design using BIAX logic and storage will result in a machine with substantially fewer semiconductors, but still maintaining the necessary computation speed. Thus, with fewer semiconductors, the reliability is increased.

The last field of application follows naturally. This is the field of industrial control. Here, as in the space vehicle situation, reliability is of paramount importance and the speed requirements are not too great. Thus, it will be possible to build industrial control computers that operate at speeds faster than those of present day machines and yet have significantly fewer semiconductors. This will be a big step toward the 24-hour per day, seven day per week operation demanded by industry. ●

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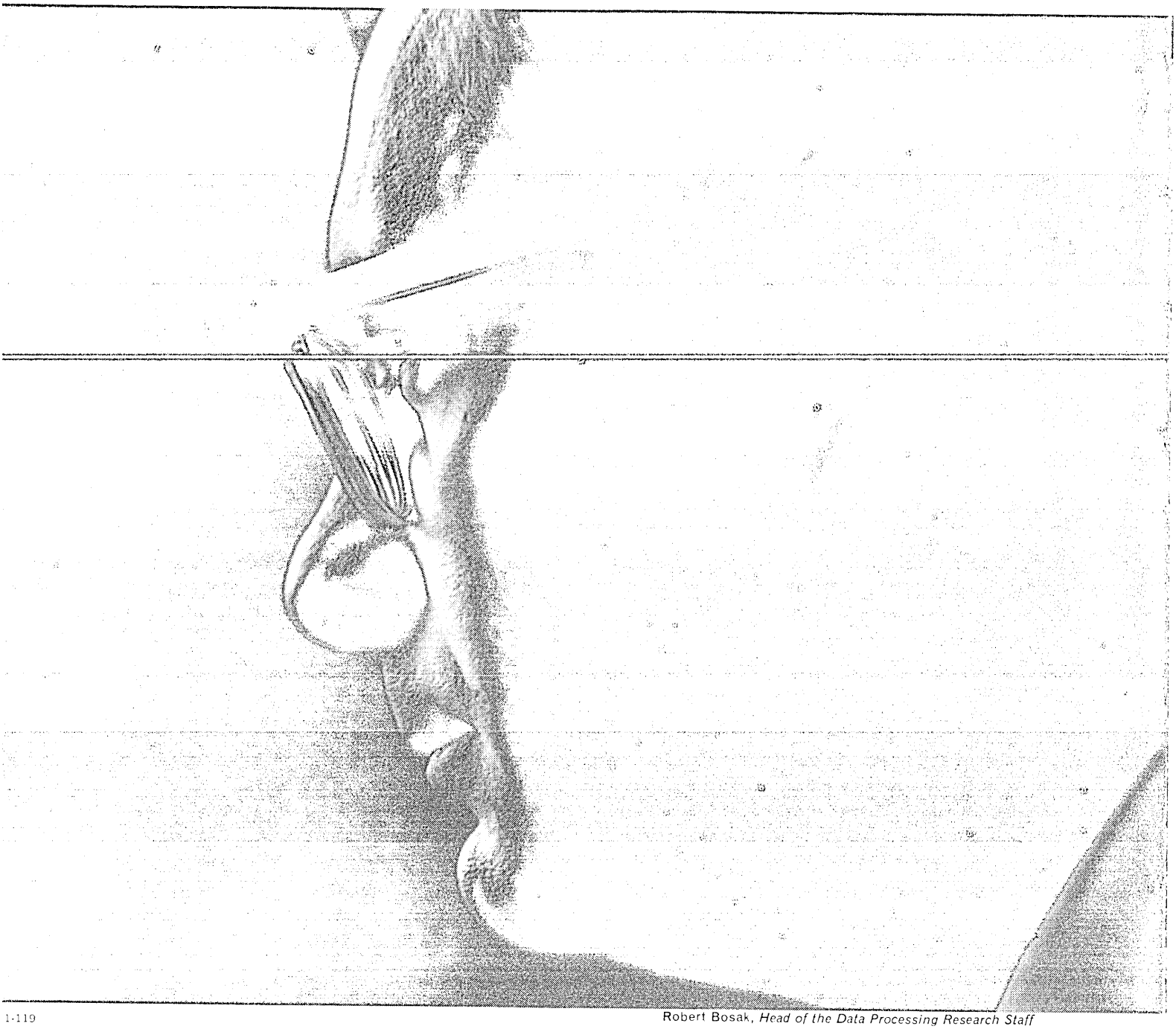

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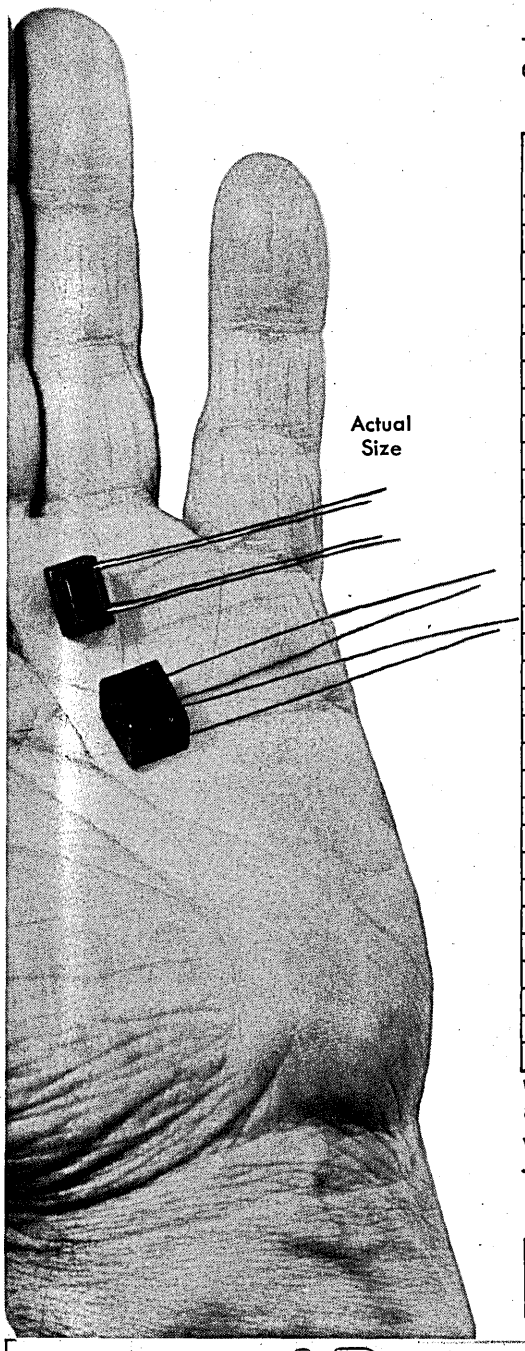

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JB3	INTERSTAGE	2.56:1	10,000 CT	1,500 CT	1,150	110
JB4	OUTPUT	2.83:1	500	50	115	12
JB5	OUTPUT	2.82:1	400	50	70	10
JB6	INPUT	14.1:1	200,000	1,000	6,500	245
JB7	OUTPUT	4.00:1	1,000	50	240	16
JB8	INPUT	14.0:1	200,000 CT	1,000 CT	6,500	245
JB9	OUTPUT	1.54:1	1,500 CT	600	210	120
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JB11	REACTOR		1 HY. @ 2ma		200	
JB12	REACTOR		6 HYS. @ 2ma		2,600	
JB13	OUTPUT	13.5:1	600	3.2	90	0.8
JB14	OUTPUT	18.0:1	1,200	3.2	190	0.8
JB15	OUTPUT	53.2:1	10,000	3.2	1,500	0.8
JB16	DRIVER	4.44:1	10,000 CT	500 CT	1,160	45
JB17	DRIVER	3.03:1	10,000	1,200 CT	1,160	100
JB18	DRIVER	2.22:1	10,000	2,000 CT	1,380	170
JB19	OUTPUT	1.23:1	900 CT	600	105	110
JB20	OUTPUT	1:1.10	500 CT	600	60	105
JB21	OUTPUT	1:1.42	300 CT	600	40	110
JB22	OUTPUT	3.30:1	150 CT	12	25	3
JB23	OUTPUT	4.85:1	300 CT	12	40	2
JB24	OUTPUT	6.98:1	600 CT	12	85	2
JB25	OUTPUT	8.14:1	800 CT	12	100	2
JB26	OUTPUT	9.07:1	1,000 CT	12	150	2
JB27	OUTPUT	10.0:1	1,500 CT	12	230	2
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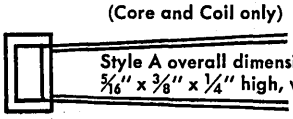

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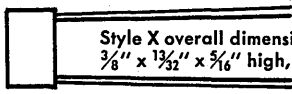

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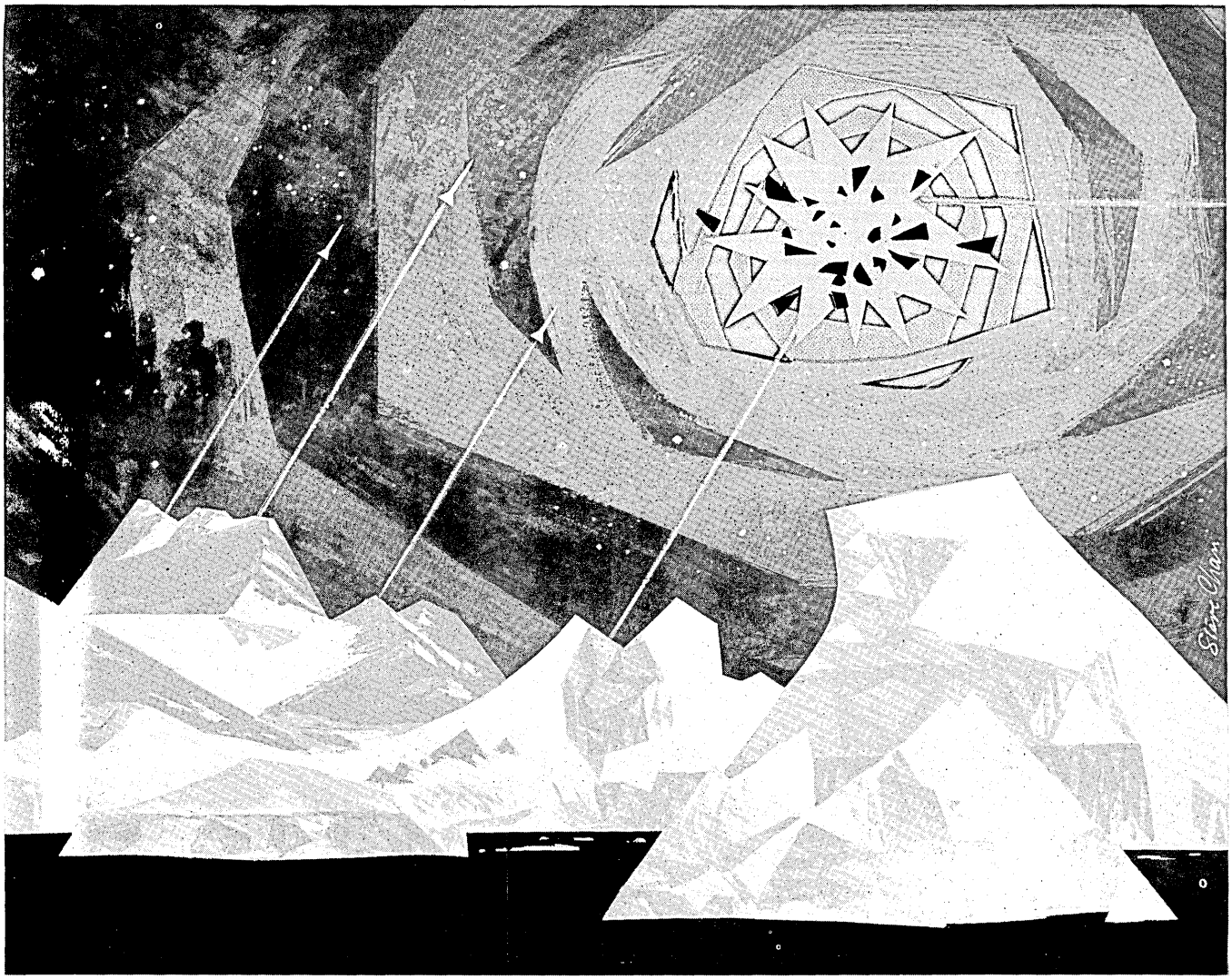

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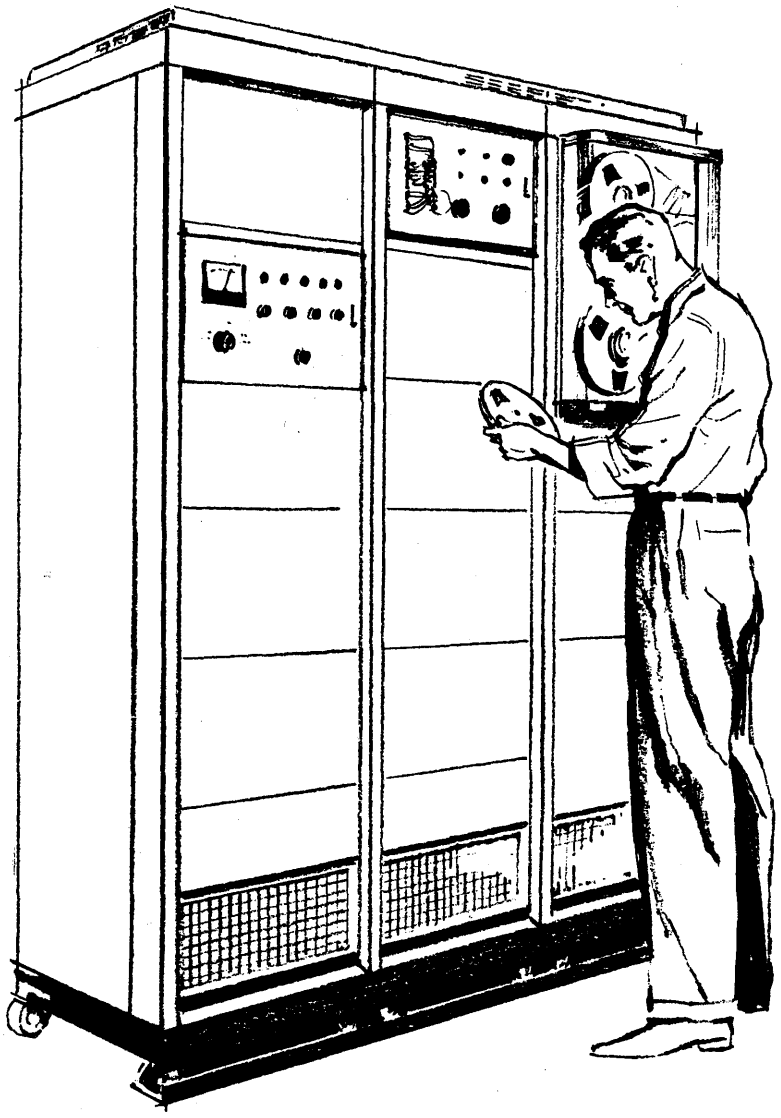

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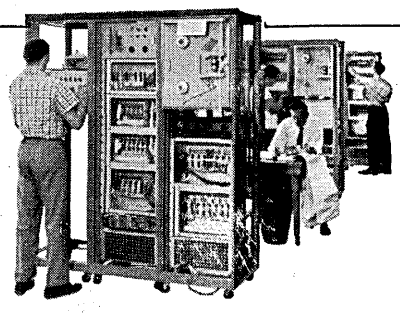

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