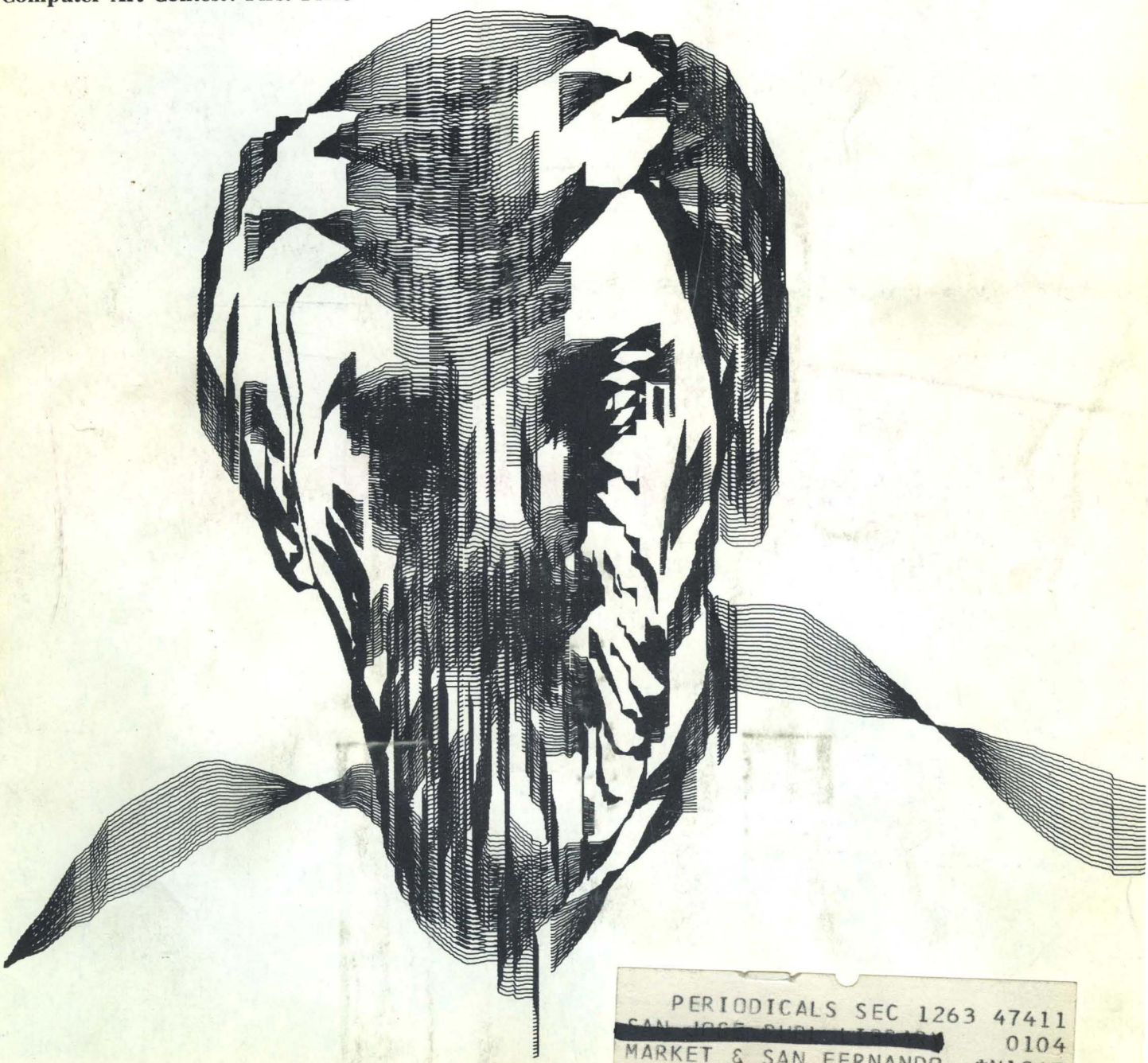
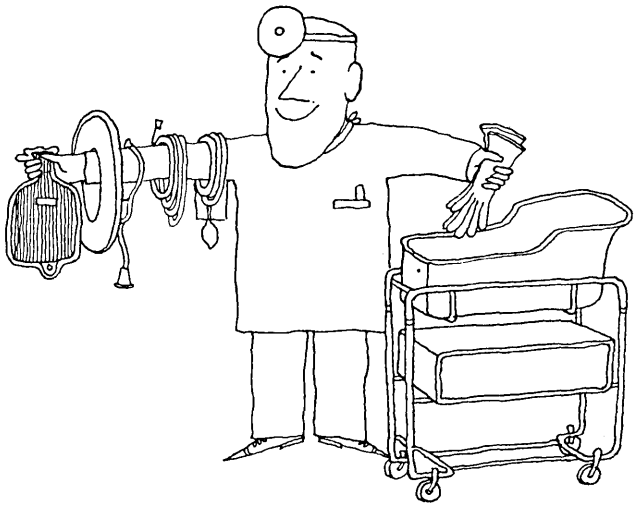
August, 1967

computers and automation

Computer Art Contest: First Prize



Sine Curve Man, 1967, by Charles Csuri, Artis



[illegible] the doctor ordered

—and he ordered it yesterday, [illegible]
an American Hospital Supply Co[rp]
ration warehouse 300 miles a[way].
He gets same-day service on 25
different supply items, because
System Data-Phone* service
his hospital to the warehouse
regular telephone lines. Prepun[ched]
cards containing order inform[ation]
are fed into card readers conne[cted]
to Data-Phone sets which tran[smit]
the information from the hos[pital]

*Service mark

For more information, call your
ll Telephone Business Office and
k for a talk with one of our Com-
unications Consultants. And don't
sitate to call us early—because
at way we can serve you best.

When you work with data commu-
cations, work with the Bell System.

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new... small... fast! data 620/i systems computer

The DATA/620-I integrated circuit computer is the newest member of the DATA/620 family of system computers. DATA/620-I fills the gap between general purpose and special purpose computers. It belongs in a system, and solves problems previously considered too difficult or expensive for computer solution.

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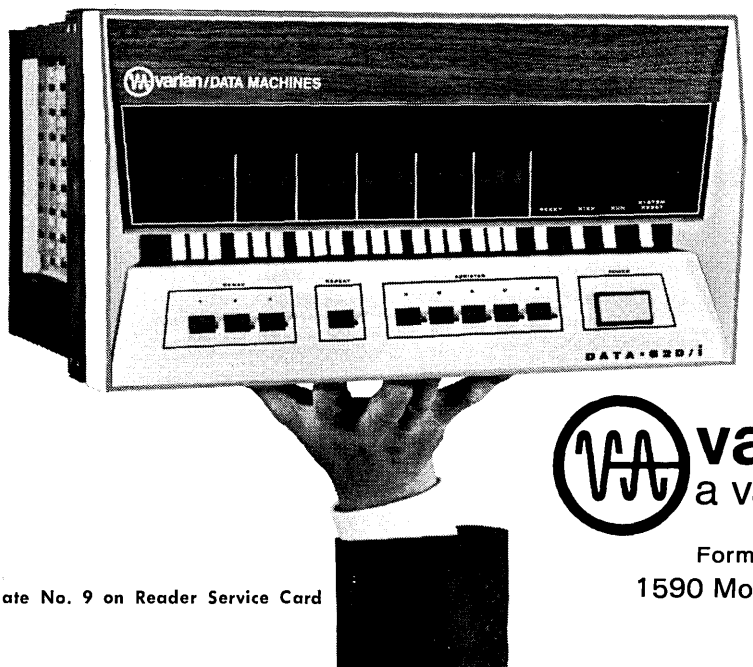

Extremely compact, the DATA/620-I requires only 10″ of 19″ rack space. It's available with memory modules from 1024 to 32,768 words of 16 or 18 bits, and with a selection of control, arithmetic and I/O facilities, including our unique Micro-Exec.

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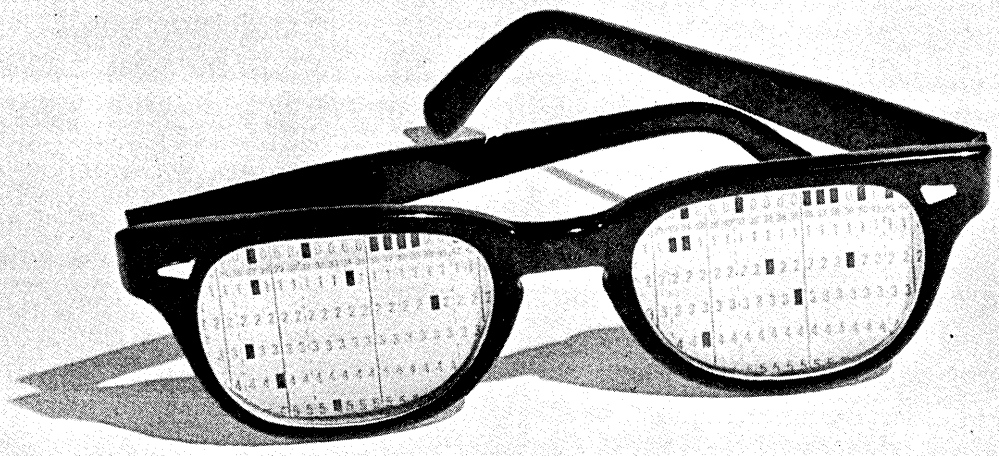

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THE LITTLE HOLES IN PUNCH-CARDS NEEDN'T HIDE MISTAKES ANY LONGER. OUR 915 CHARACTER RECOGNITION SYSTEM USES THE TYPEFACE YOU ARE NOW READING ... AND READS IT JUST AS YOU DO.

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915 reads alphabet characters A to Z; numeric characters 0 through 9; standard punctuation; and special symbols for programmed functions. Takes documents 4 to 12 inches wide, 2½ to 14 inches long, plus continuous fanfold sheets.

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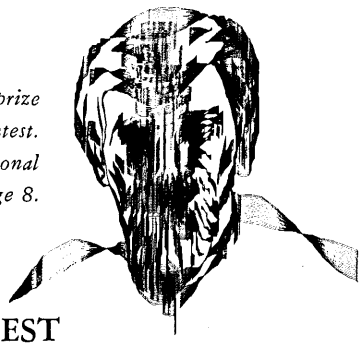
CONTROL DATA
CORPORATION

8100 34th AVE. SOUTH, MINNEAPOLIS, MINNESOTA 55440

Designate No. 8 on Reader Service Card

computers and automation

AUGUST, 1967 Vol. 16, No. 8



The front cover shows the first prize in the 1967 Computer Art Contest. For more information and additional computer art, see page 8.

SPECIAL FEATURE: ANNUAL COMPUTER ART CONTEST

COMPUTERS AND AUTOMATION IS PUBLISHED MONTHLY AT 815 WASHINGTON ST., NEWTONVILLE, MASS. 02160, BY BERKELEY ENTERPRISES, INC. PRINTED IN U.S.A. SUBSCRIPTION RATES: UNITED STATES, $15.00 FOR 1 YEAR, $29.00 FOR 2 YEARS, INCLUDING THE JUNE DIRECTORY ISSUE; CANADA, ADD 50c A YEAR FOR POSTAGE; FOREIGN, ADD $3.50 A YEAR FOR POSTAGE. ADDRESS ALL EDITORIAL AND SUBSCRIPTION MAIL TO BERKELEY ENTERPRISES, INC., 815 WASHINGTON ST., NEWTONVILLE, MASS., 02160. SECOND CLASS POSTAGE PAID AT BOSTON, MASS.

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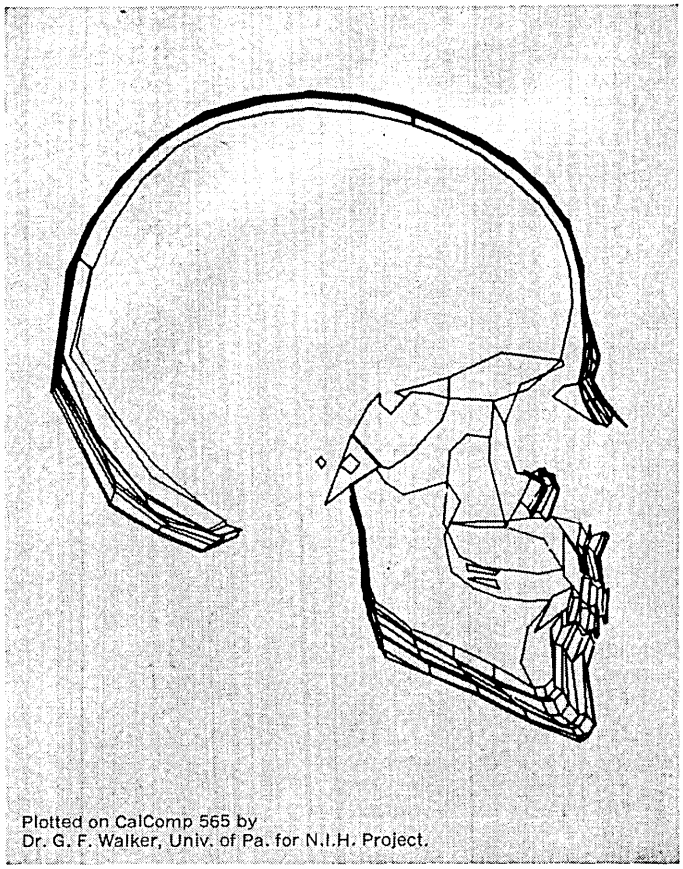

Plotted on CalComp 565 by
Dr. G. F. Walker, Univ. of Pa. for N.I.H. Project.

Skull practice for creative programmers

This CalComp/Computer portrait of a growing boy is extremely helpful to anthropologists. Drawn from X-rays, it graphically reveals changes in bone structure in a normal child over a period of years.

It's also a handy example of the kind of challenging assignments which creative programmers face week after week at CalComp.

If you are a talented programmer with a large innovational "bump" (we just can't get away from the phrenological), CalComp would like to show you what's ahead (oops) in computer graphics.

Challenges are coming out of our ears.

Telephone, wire or write in confidence to Dept. A-8 California Computer Products, Inc., 305 Muller, Anaheim, California 92803. (714) 774-9141.

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Computer Art: Turning Point

This is the fifth year in which *Computers and Automation* has held a computer art contest, and the fifth August issue in which we have published examples of computer art.

This year we have had far more entries from far more people than ever before; and we think they show wider and more interesting variations. Recently, in fact, there have been a number of meetings and exhibits dealing with computer art. For example, in Montreal at the end of last autumn, an exhibit of computer art was held, under the auspices of the Computer Club of McGill University. What was remarkable was that more than 12,000 persons visited the exhibit; and it drew so much interest, comment, and newspaper notice, that another exhibit of computer art has been planned in Montreal for this autumn. We think a turning point in computer art has been reached.

We think there may be enough evidence now for making a good case for the following proposition:

- Art in the future will be as profoundly influenced by the computer as by any other medium for expression.

Take for example the medium of photography. Many magazines and many museums nowadays are devoted to art and exhibits through the medium of photography — black and white, and color. Just as many of the results of photography by good photographer artists are astonishingly beautiful, so many of the results of the computer applied to art will in the future be astonishingly beautiful.

There are several reasons why the computer will in the future have a profound influence on the production of art. One reason is this:

- If the artist wants to make a small change in some detail of his picture, he will be able to do it by means of the computer.

He may say to himself, "That eye is not turned quite right; I would like to turn it a little bit"; and the computer (on suitably programmed request) will turn it for him. Or he can say, "I wonder if that color would be better if it were a grayer purple"; and the computer will change the color for him. In general, instead of being largely limited to his first choice of color and his first choice of line, the artist will have, from the computer, 10,000 choices of color and line, displaying each revised picture on the "color TV" screen of the future, controlled by computer.

A second reason is this:

- If the artist wants to represent some visual concept in some part of his picture, he will be able to, referring to the computer's memory.

He may say to himself, "I wonder what were costumes in France in the late 1400's"; and the computer (on suitable request) will show him. And he can say, "I should like a suitable costume for a soldier of medium rank in the army of the Duke of Burgundy," and the computer will show him. The artist will be aided in his representation of visual ideas by the resources of an immense computerized library of visual information.

A third reason is this:

- The artist will be able to change the location (both relative and absolute) of any of the elements in his picture.

One of the pictures which we show in this issue of *Computers and Automation* demonstrates exactly this power: the lines that make up a face are distorted, stretched, and inclined, in many gradual successive stages. In the future the artist will have extraordinary power from the computer to move the elements of his picture as he wishes — as if he were drawing on a magic rubber sheet that could stretch or shrink in any way that he desired.

This kind of power is not limited to the visual field. It will apply in music for the musician — giving him variations of tones and melodies as he asks for them. It will apply in sculpture for the sculptor — giving him views of surfaces and forms that he wishes to chisel or mould. The power of the computer to supplement the artist will apply probably to almost every field of art.

Will the human being be superseded? No, for the same reason that the portrait photographer has not superseded the portrait painter. What will happen is that new powers will be given to the human artist, but the selections, the choices, will still be largely in his hands. The computer will provide one more extraordinary motorized instrument and medium for the human being as artist — but the decision about what is beautiful will continue to vary from one human being to another, from one society to another, from one culture to another.

Edmund C. Berkeley

Editor

ANNUAL COMPUTER ART CONTEST

SINE CURVE MAN, 1967
- Charles Csuri
James Shaffer

The first prize in our 1967 Computer Art Contest has been awarded to Charles Csuri, Professor in the School of Art, and James Shaffer, Programmer, Ohio State University, Columbus, Ohio. Their winning entry (which appears on the front cover of this issue) is entitled "Sine Curve Man, 1967".

According to the artists, this drawing was made in the following manner:

> "A picture of a man was placed in the memory of an IBM 7094. Mathematical strategies were then applied to the original data. The X value remained constant, and a sine curve function was placed upon the Y value. Given the X and Y coordinates for each point, the figure was plotted from X' = X, Y' = Y + C * SIN (X) where C is increased for each successive image."

Mr. Csuri and Mr. Shaffer submitted several more entries in the contest which are shown on the following pages.

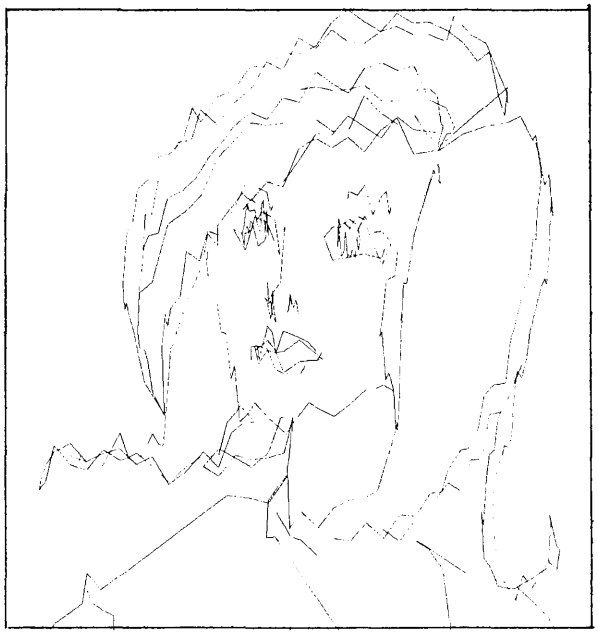
The other computer art shown in this issue receives honorable mention. For some of the drawings, the explanation is obvious or can be inferred easily; for others, explanations are given.

We regret that there was not more space in this issue to publish more of the entries; we hope that some more can be published shortly.

In a number of cases, the computer and the peripheral equipment which produced the computer art have not been specified as we would like, because the information did not reach us by the close of the contest, July 2. We would, of course, like to publish the identification of the equipment that produced the art. Supplementary information of this kind should be sent to us for publication in a future issue of "Computers and Automation".

The responses to our Fifth Annual Computer Art Contest this year have been very great, and give evidence to the growing importance of the role of computers in the arts. For 1968 we plan our Sixth Annual Computer Art Contest, and we cordially invite contributions of computer art from our readers.

GIRL — AND GIRL SHOOK UP

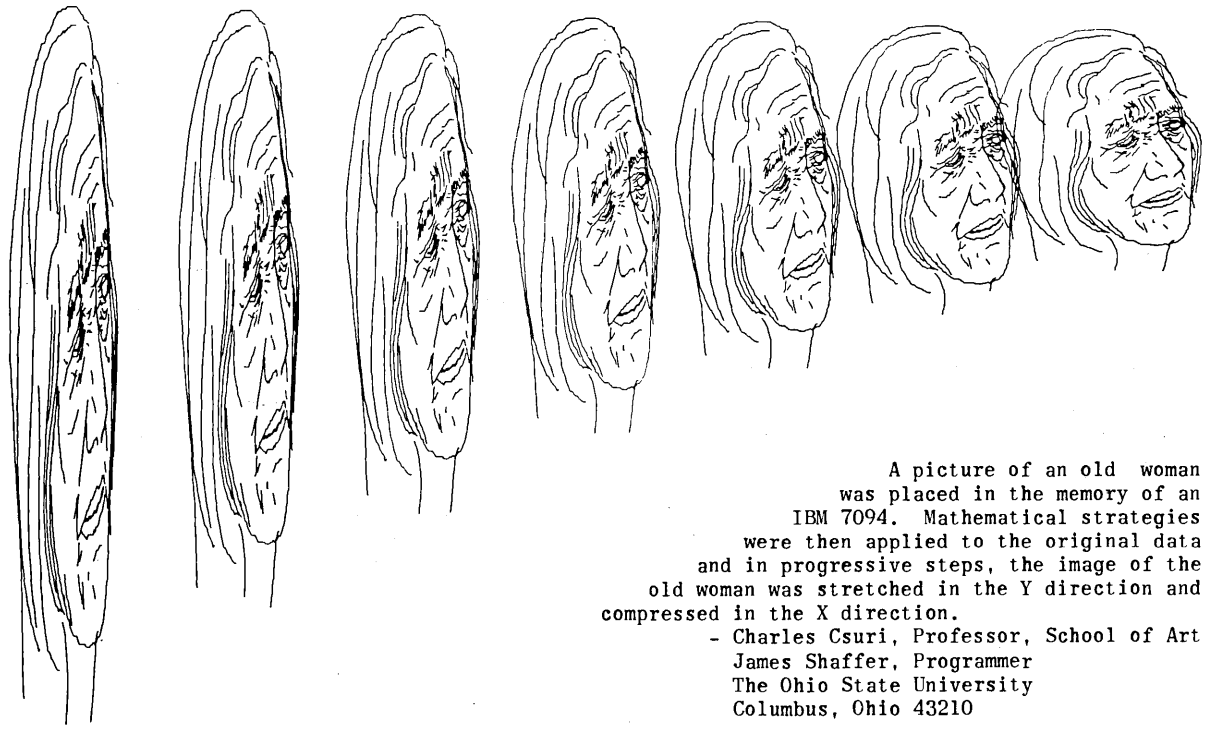


A package of subroutines for manipulating arbitrary line drawings was used in preparing these drawings. They were plotted by a CalComp 565 plotter, offline from an IBM 7094/II.

"Girl" was programmed as 700 points by Gordon Deecker. In "Girl Shook Up", each of the 700 points making up the picture was randomly displaced in the vertical direction. The displacement is normally distributed with mean of 0 inches, standard deviation of .3 inch, maximum displacement .3 inch up or down. Programmed by Michael Wharton.

- L. Mezei, Associate Professor of Computer Science
University of Toronto
Toronto, Ontario, Canada

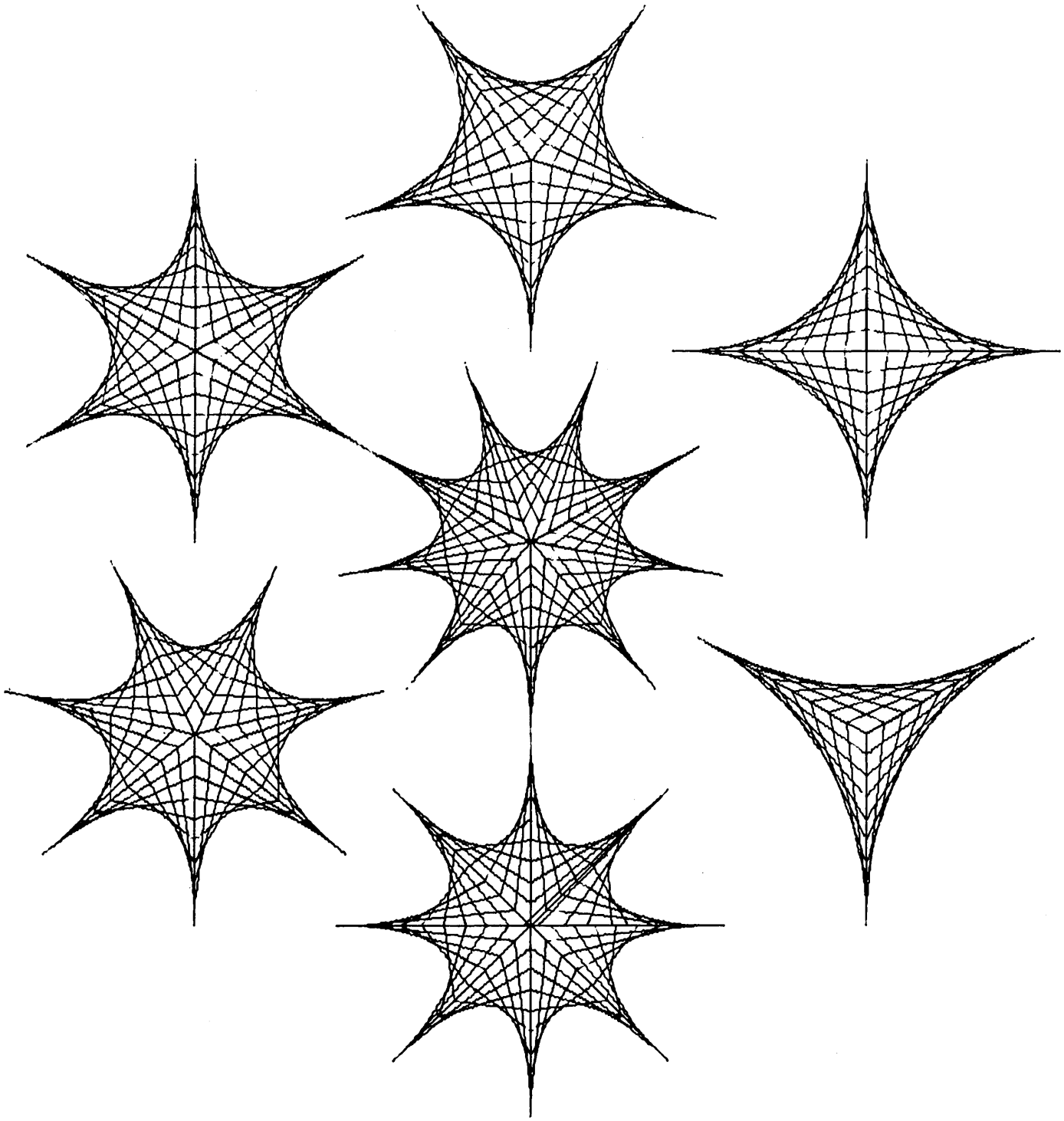
PICTURE OF AN OLD WOMAN



A picture of an old woman was placed in the memory of an IBM 7094. Mathematical strategies were then applied to the original data and in progressive steps, the image of the old woman was stretched in the Y direction and compressed in the X direction.

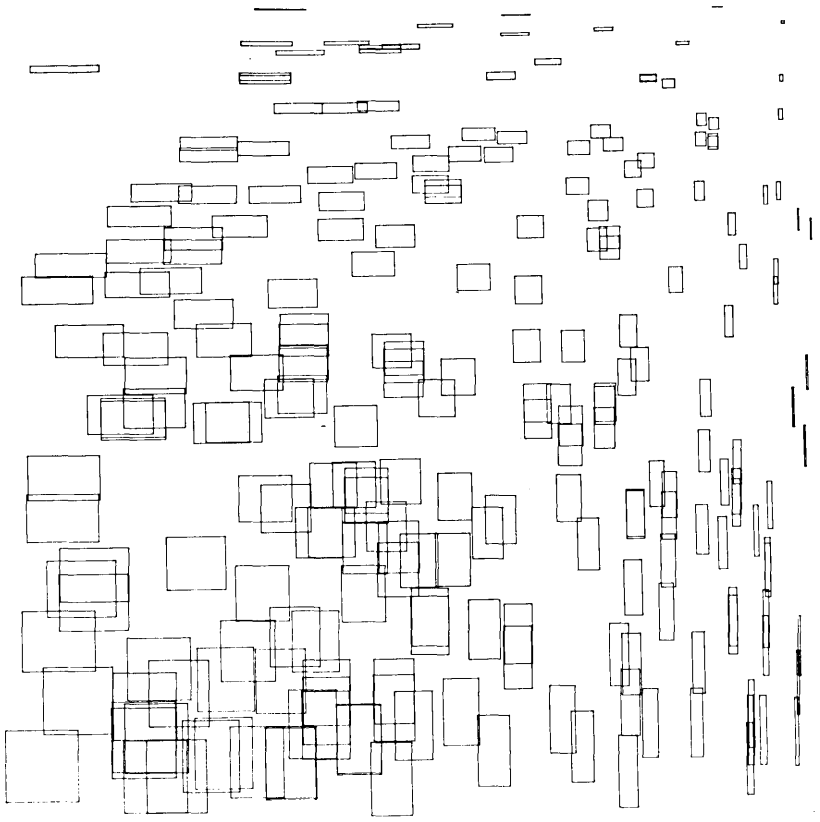
- Charles Csuri, Professor, School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

SEEING STARS



"The most important element in this drawing is direction. Positioning is only predetermined with maximum and minimum sizes." Stars grow from the three-pointed star in the lower righthand corner to the nine-pointed star in the center of the picture.

- Petar Milojevic
McGill University
Montreal, Quebec, Canada



BOXES

The corner of each rectangle was generated by random numbers. The X dimension of the box was determined as 1.09 times the X coordinate. The Y demension is 1.09 times the Y coordinate. This resulted in a random spacing of the rectangles with a random pattern to their size.

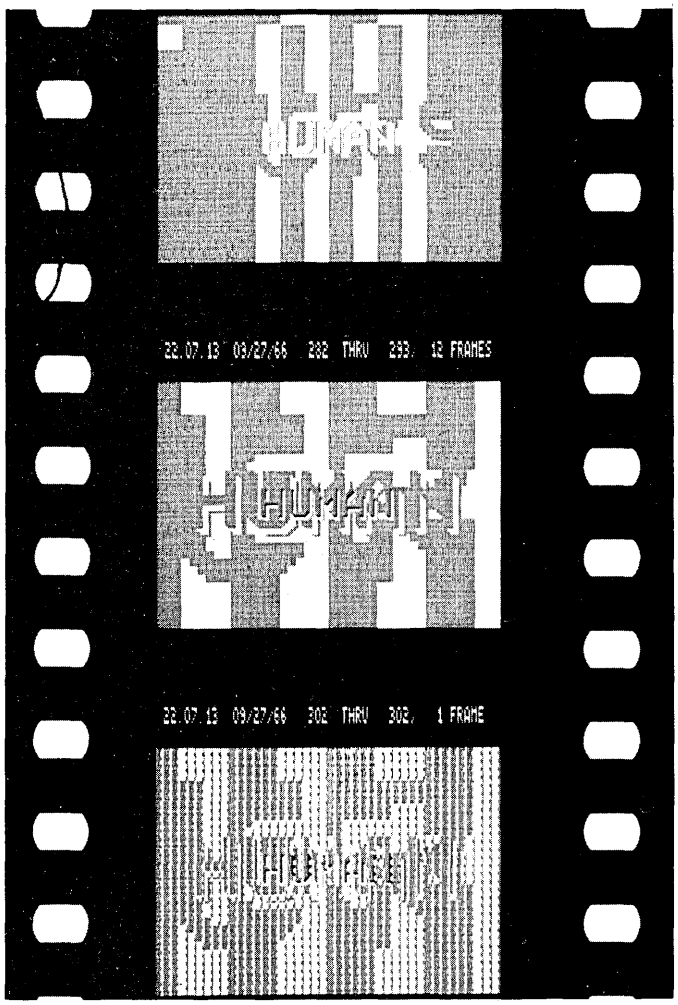
The design was made on an IBM 1620 with a 1627 plotter, and was programmed in FORTRAN

- Darel Eschbach, Jr.
The University of Toledo
Toledo, Ohio 43606

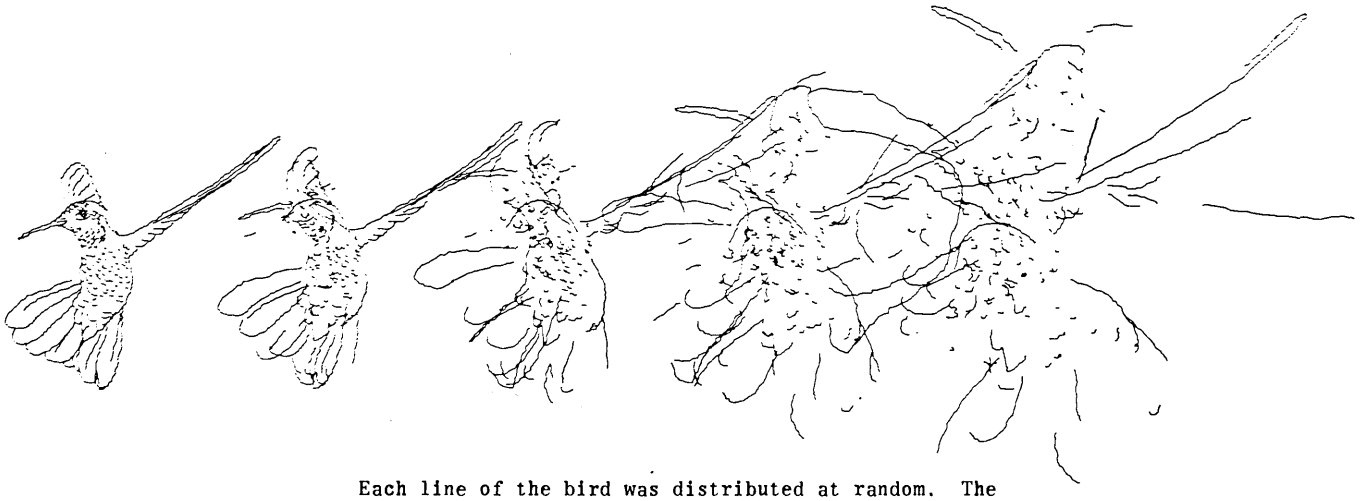
MAN AND HIS WORLD

Shown here are frames from a 16mm film entitled "Man and His World" made in connection with Expo 67. The film was produced by programming in a special macro-extended version of the BELFIX language (which in turn is written in macro FAP). The output in each instance is a 252-by-184 array of Charactron characters produced by the Stromberg-Carlson 4020. The resulting black-and-white film was subsequently printed through sequences and combinations of colored filters and a sound track added by traditional methods.

- Stanley Vanderbeek
Kenneth Knowlton
Bell Telephone Laboratories
Murray Hill, N.J. 07971



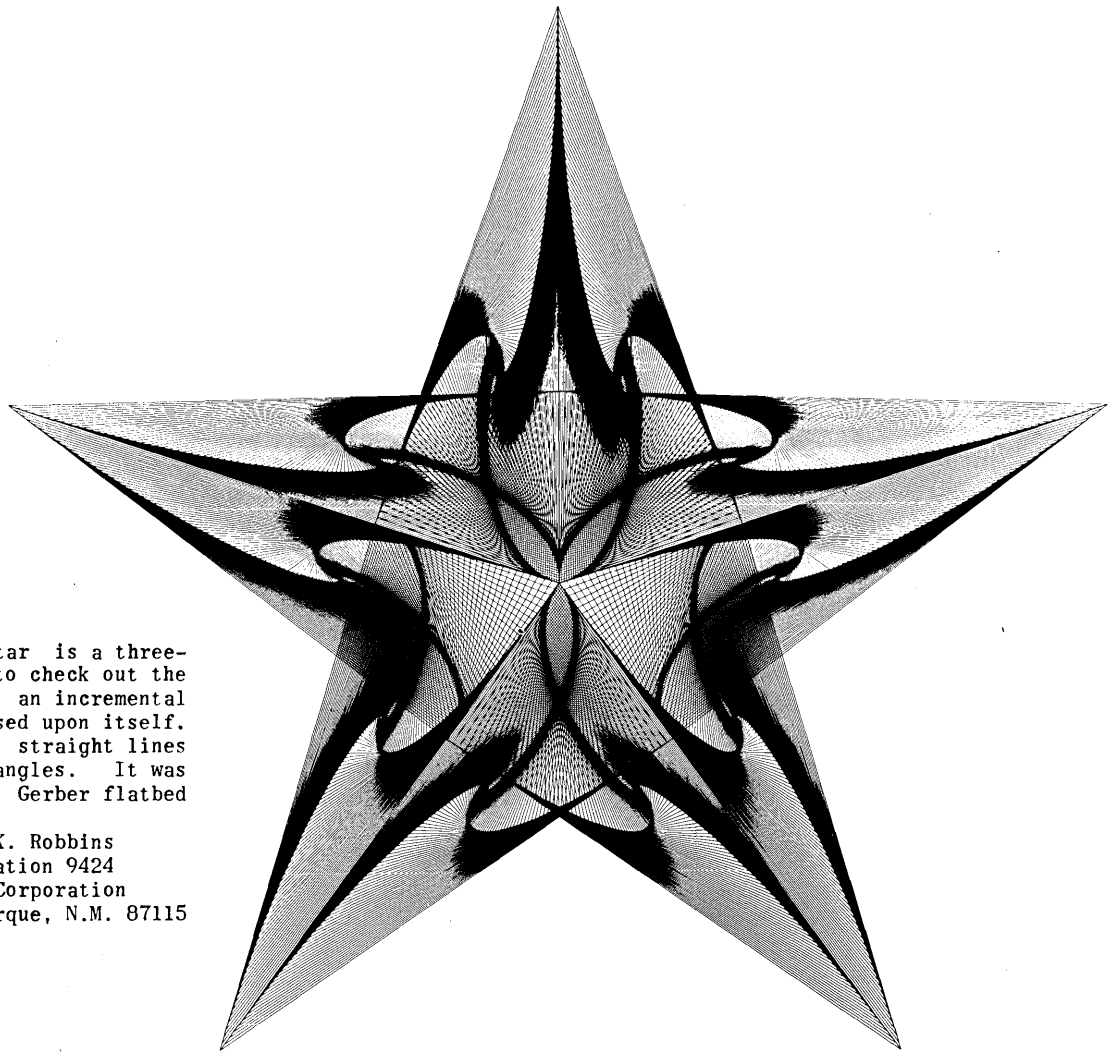
CHAOS TO ORDER



Each line of the bird was distributed at random. The computer drew the chaotic version first, and in progressive stages brought the bird back together.

- Charles Csuri, Professor, School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

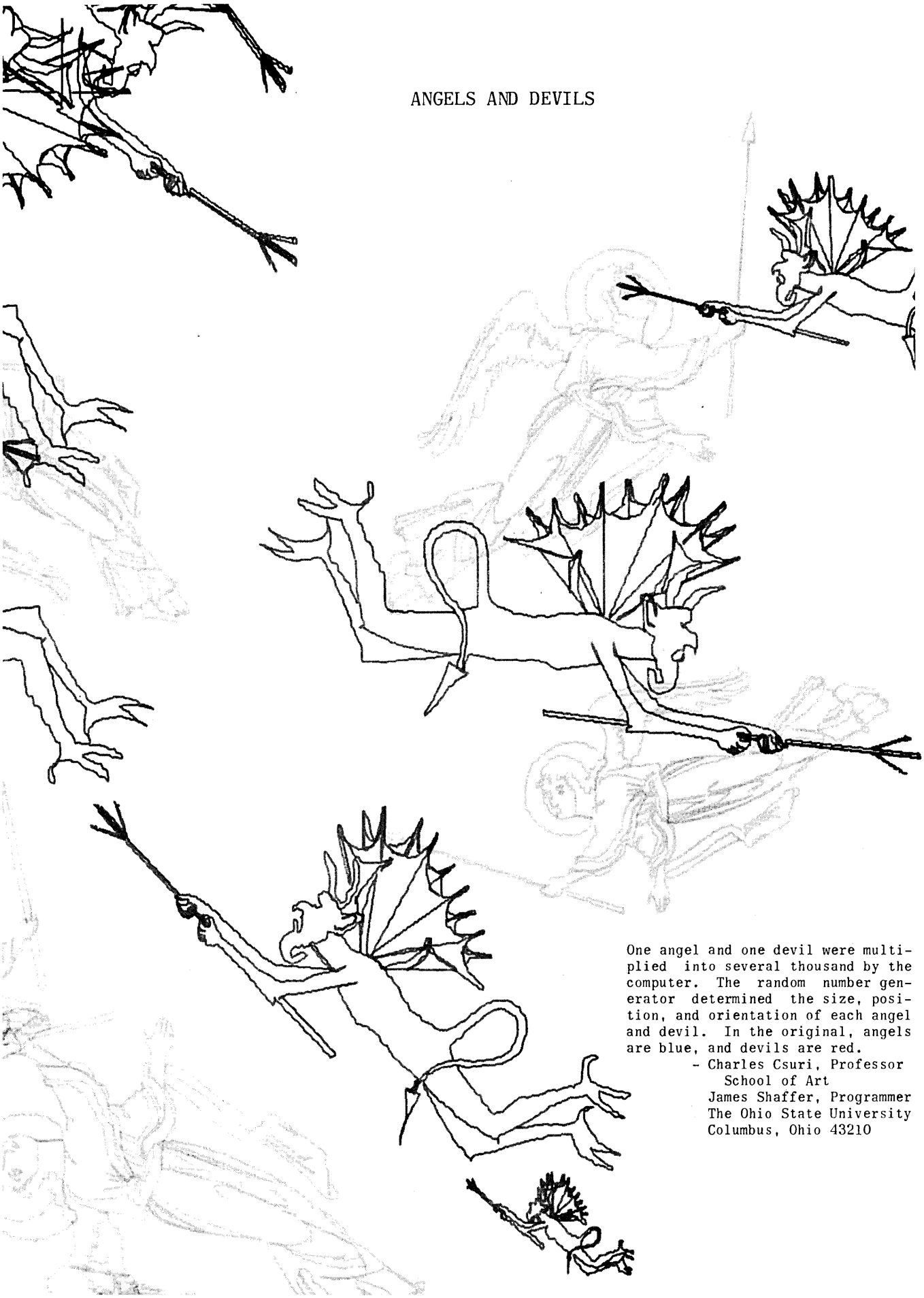
VERIFYING STAR



This five-pointed star is a three-pointed star, used to check out the incremental step on an incremental plotter, superimposed upon itself. The design has many straight lines at many different angles. It was produced on a large Gerber flatbed plotter.

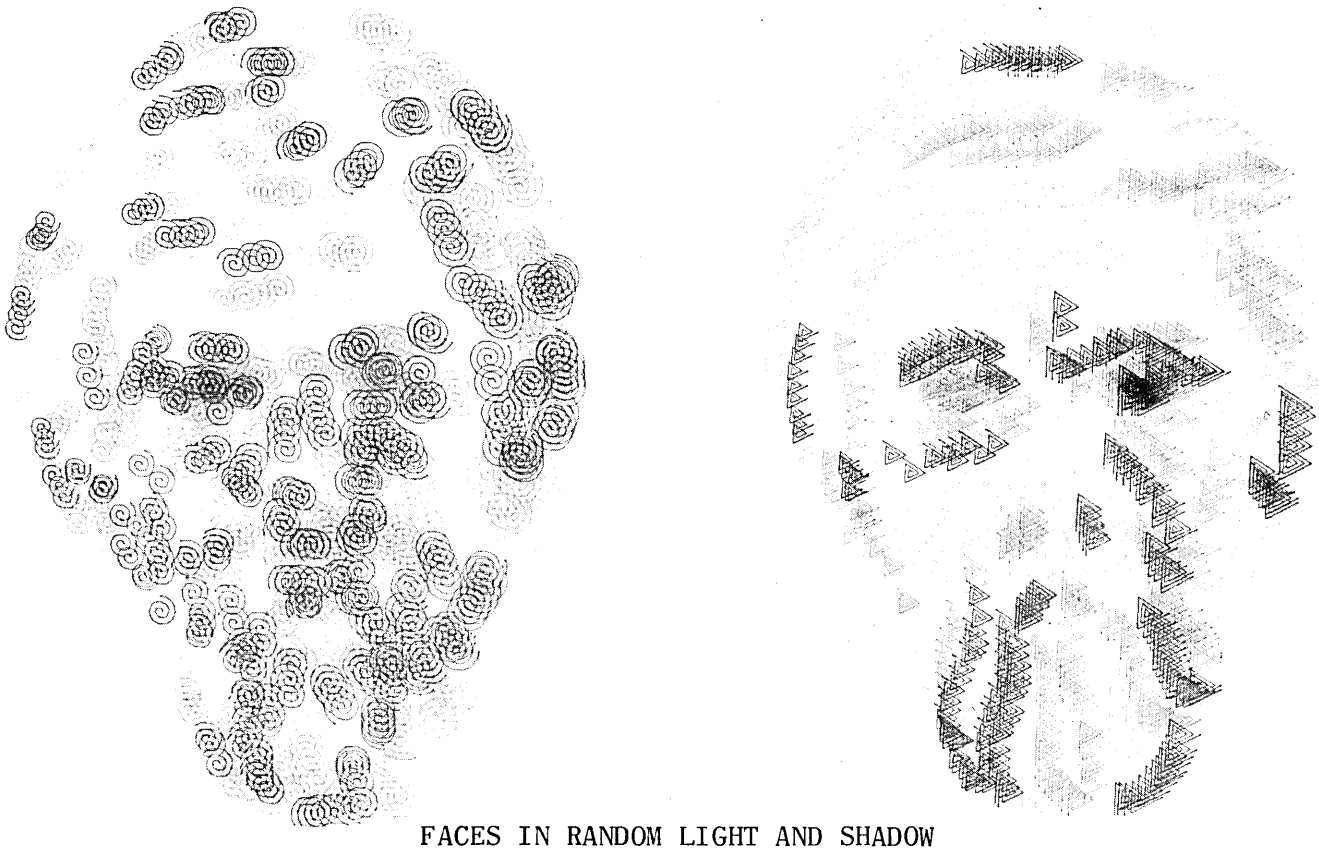
- Donald K. Robbins
Organization 9424
Sandia Corporation
Albuquerque, N.M. 87115

ANGELS AND DEVILS



One angel and one devil were multiplied into several thousand by the computer. The random number generator determined the size, position, and orientation of each angel and devil. In the original, angels are blue, and devils are red.

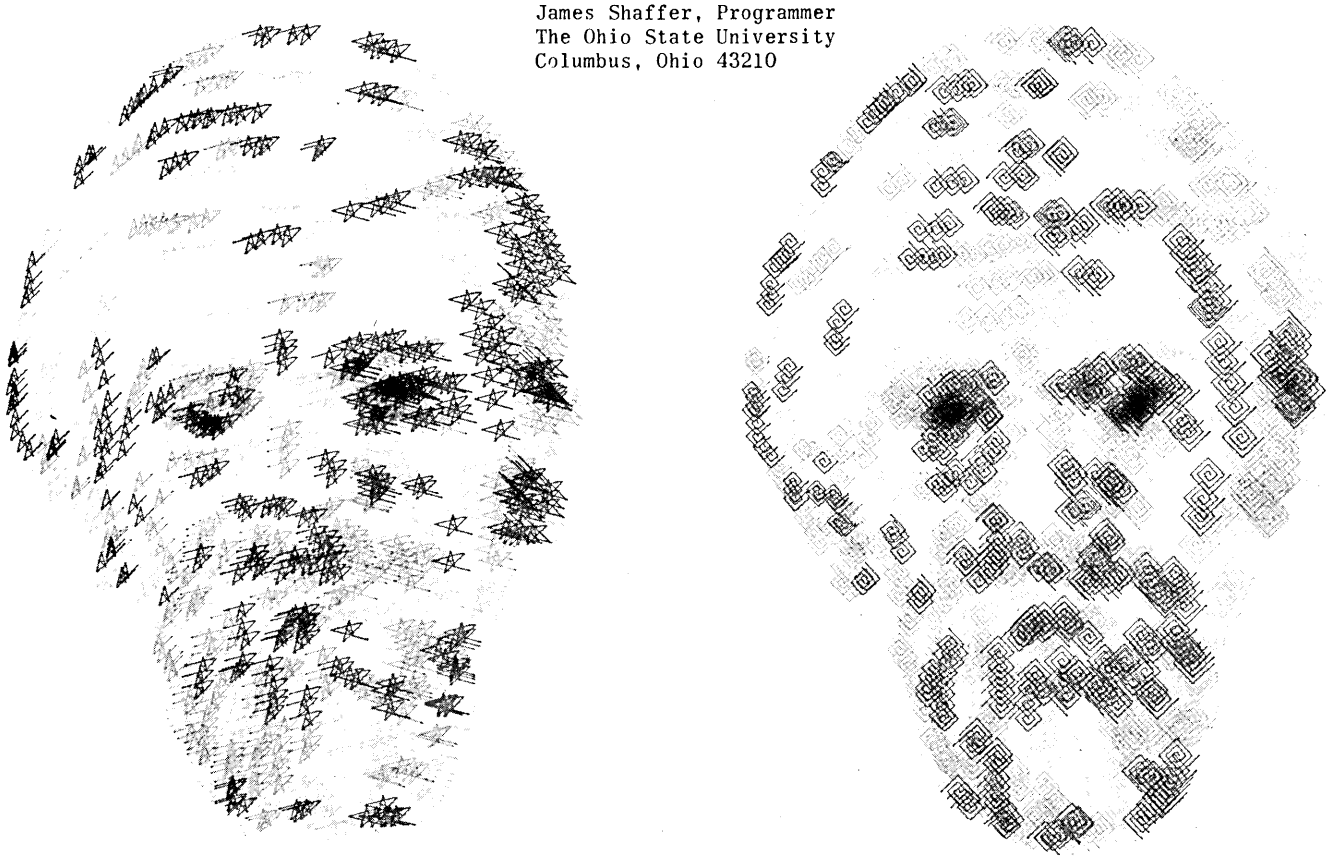
- Charles Csuri, Professor
School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

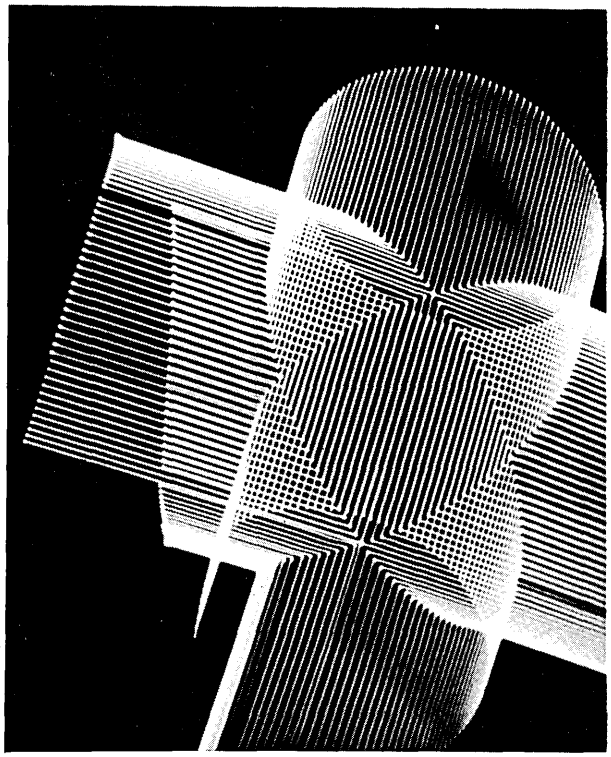


FACES IN RANDOM LIGHT AND SHADOW

A line drawing was transformed mathematically into a shaded image. Then a spiral, rectangle, triangle, and star were used as character symbols through each line segment. A random number generator determined the intensity; size of each symbol is a function of its distance from a reference point outside the picture.

- Charles Csuri, Professor, School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

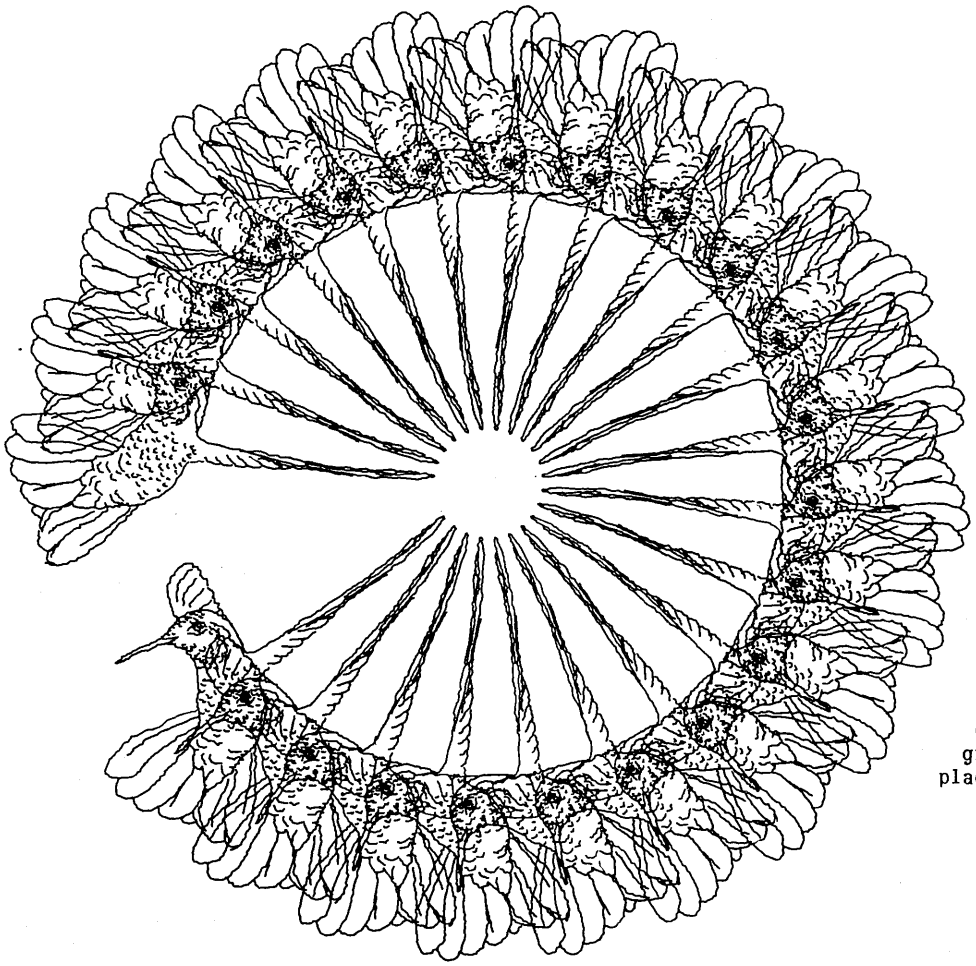




CYLINDERS

Picture of an image being displayed on a cathode ray tube. In the Ambilog 200 computer memory is a description in three-dimensional coordinates of the image. The image is similar to two intersecting cylinders. The image is drawn line-by-line at an overall frame rate of 40 frames per second.

- Adage Inc.
Boston, Mass. 02215

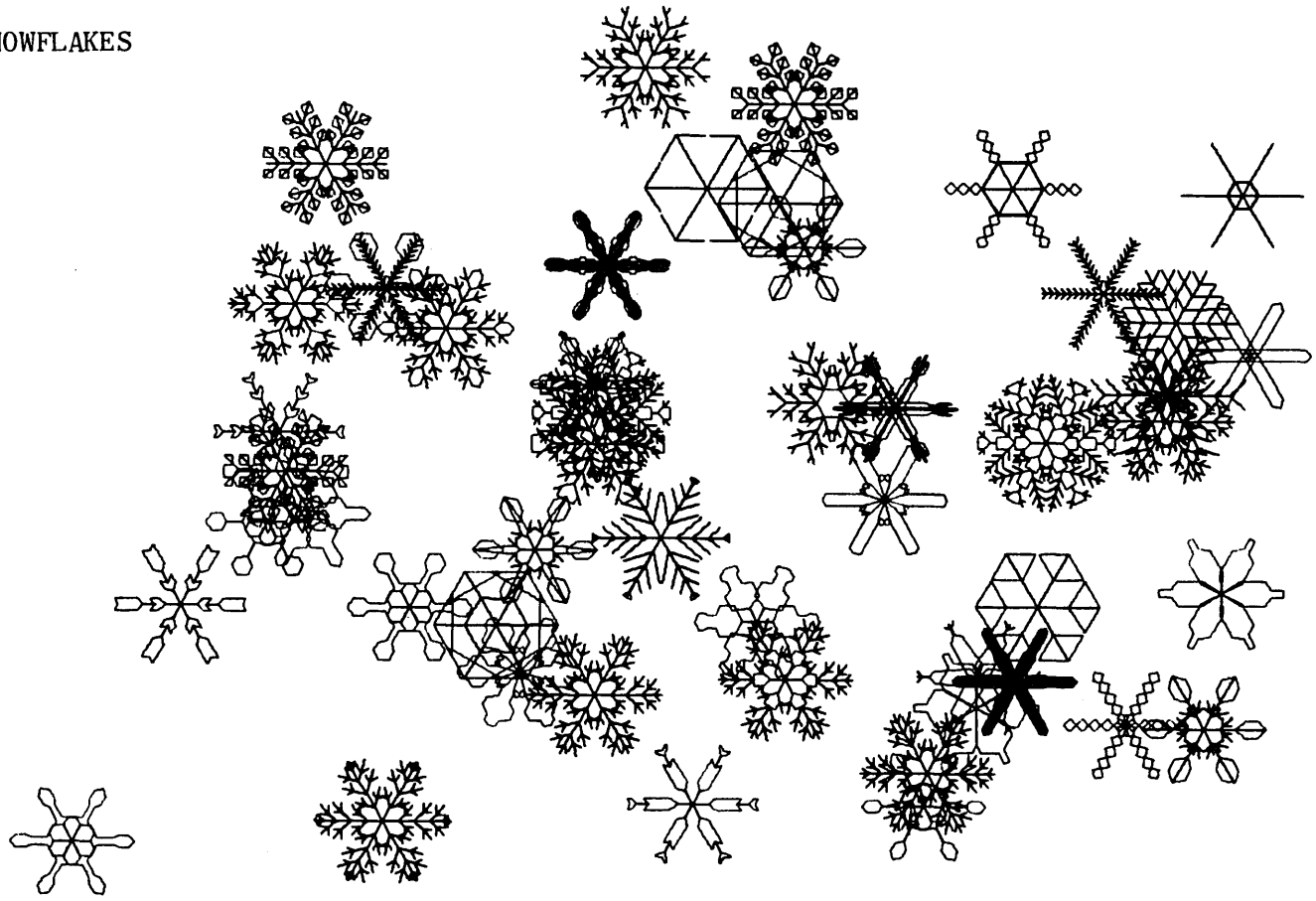


BIRD IN A CIRCLE

The drawing of a humming bird was placed on a polar coordinate system. The program calls for 22 birds to be placed in a circle.

- Charles Csuri, Professor
School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

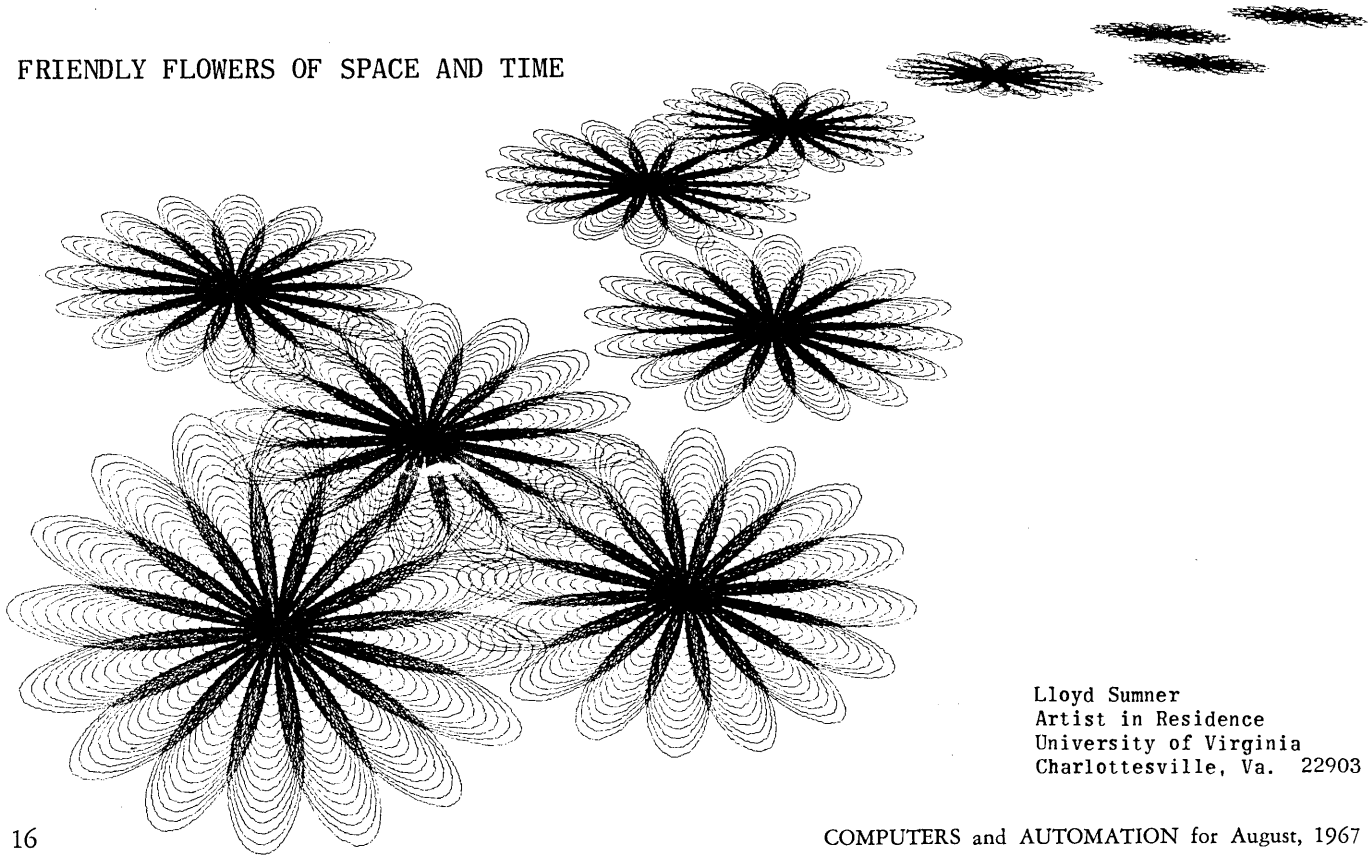
SNOWFLAKES



"Snowflakes" and "Friendly Flowers of Space and Time" were programmed in extended ALGOL, read into a Burroughs B5500, and plotted on a CalComp 565 plotter.

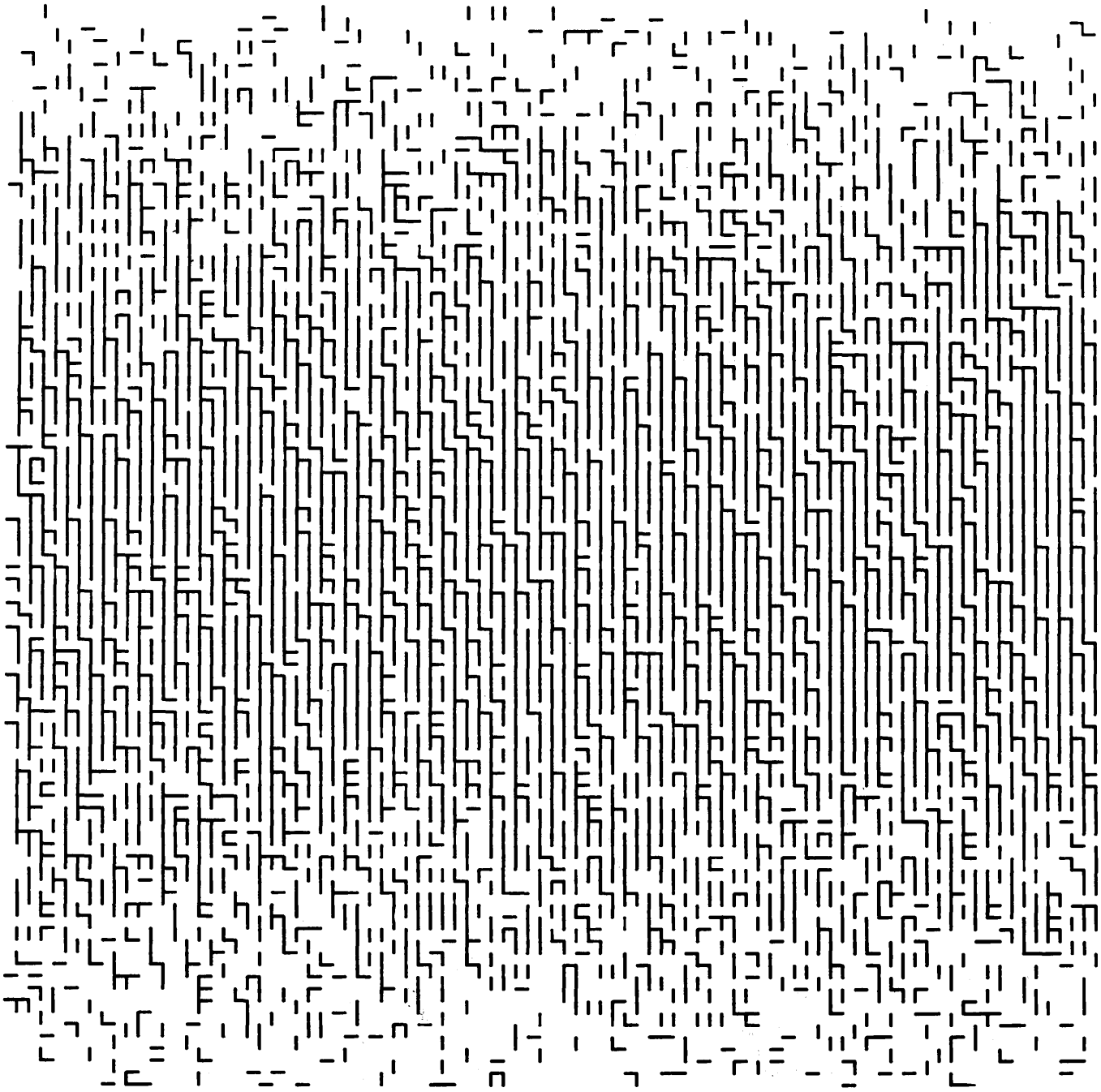
The snowflake crystal as it appears in nature is hexagonal, delicate, and has twelve degrees of symmetry. By calculating the coordinates of the points for one-half of one branch of the snowflake and making the proper reflections and rotations, intricate snowflake designs were approximated, and randomly placed.

FRIENDLY FLOWERS OF SPACE AND TIME



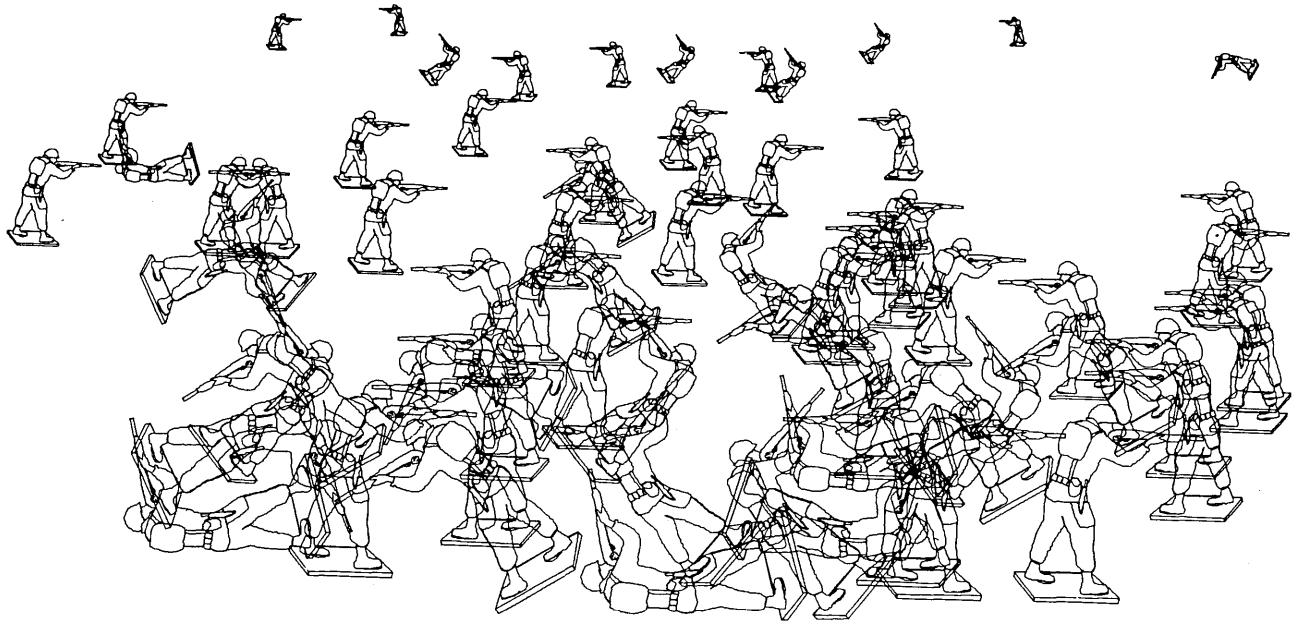
Lloyd Sumner
Artist in Residence
University of Virginia
Charlottesville, Va. 22903

LABYRINTH



– Frieder Nake
Herdweg 57
Stuttgart, Germany

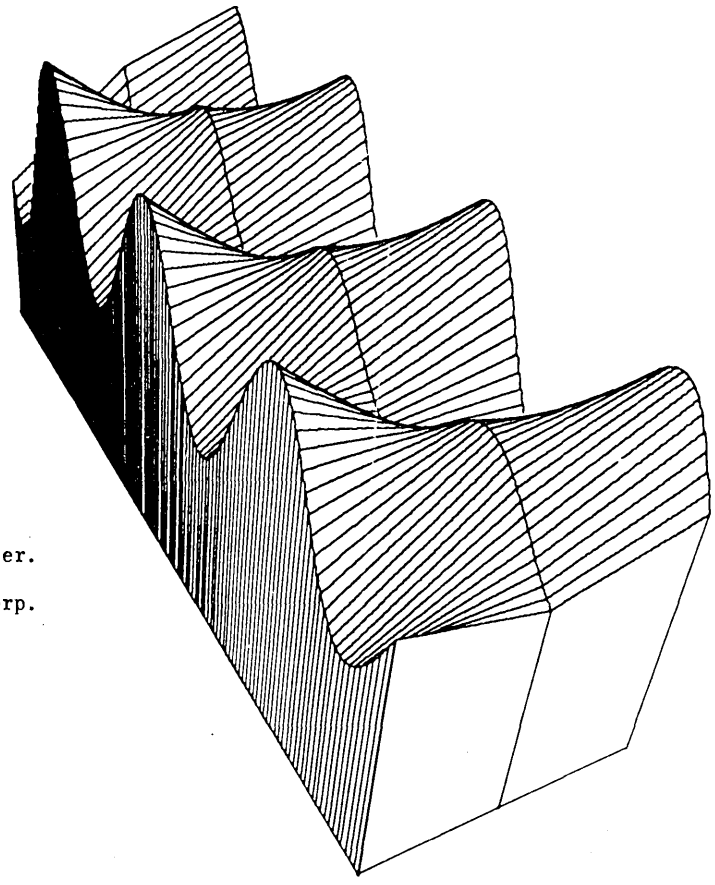
RANDOM WAR, 1967



A computer program which generates random numbers is called a pseudo-random number generator. Such a program determined the distribution and the position of soldiers on the battlefield. The program places each soldier into perspective. Names were assigned to each soldier. A random number generator also decided who is to die and who is to be wounded. A picture 30" x 100" (a portion shown here) in color of the battle was produced by the computer and gave the following information: (1) Total number of dead on each side; (2) Total number of wounded on each side; (3) Number of dead and wounded in each of 40 sectors of the battlefield; and (4) Identification of the dead and wounded in alphabetical order.

- Charles Csuri, Professor, School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

POWER OSCILLATION PERSPECTIVE



A perspective view of the power oscillation at a particular location in a nuclear reactor during a xenon transient. Drawn on a CalComp plotter by a FORTRAN program on the Philco 2000 computer.

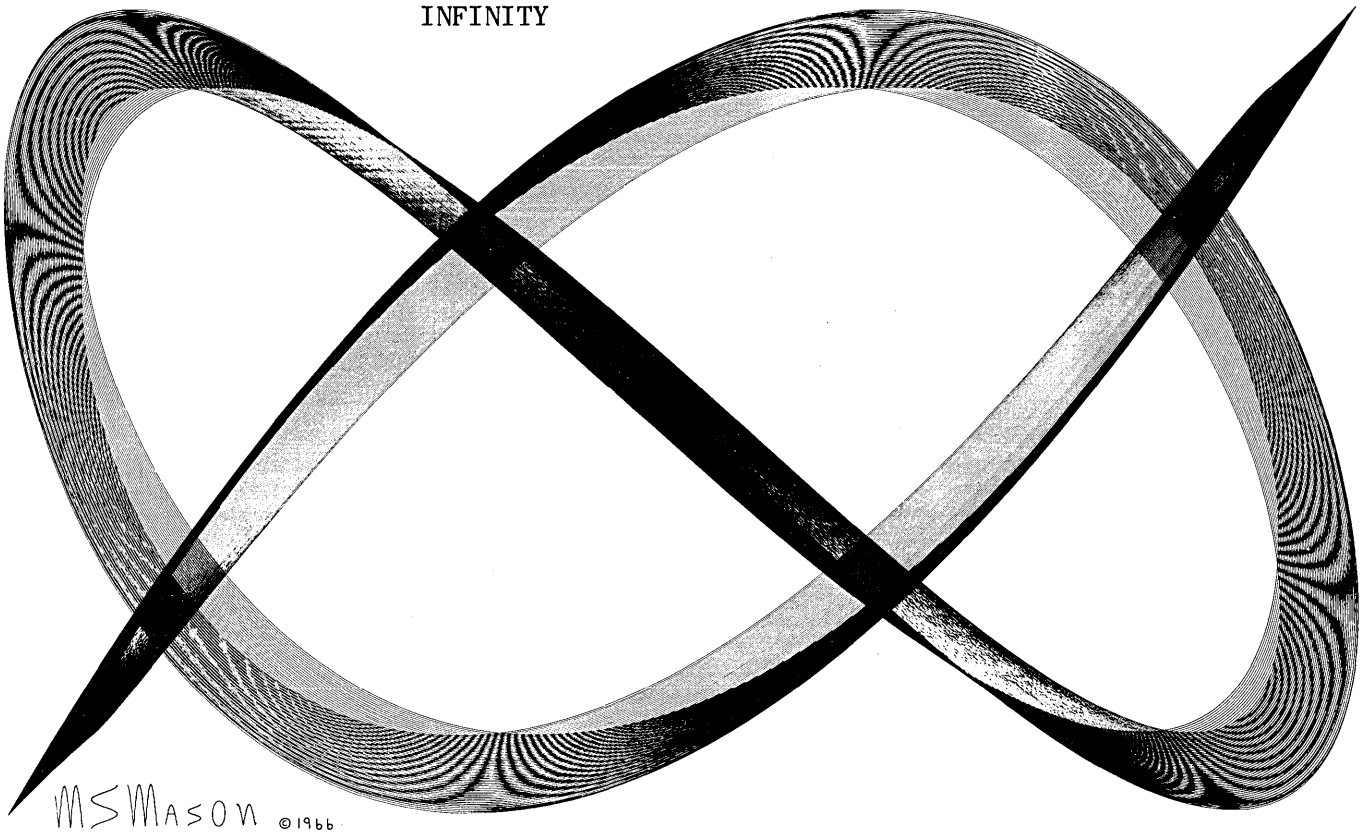
- D. J. DiLeonardo
Westinghouse Electric Corp.
West Mifflin, Pa. 15122

FLIES TRANSFORMED

"The distribution was based upon a combination of random numbers placed inside a region such as a triangle and then a transformation was made to another region such as a half circle. This was a problem in conformal mapping."

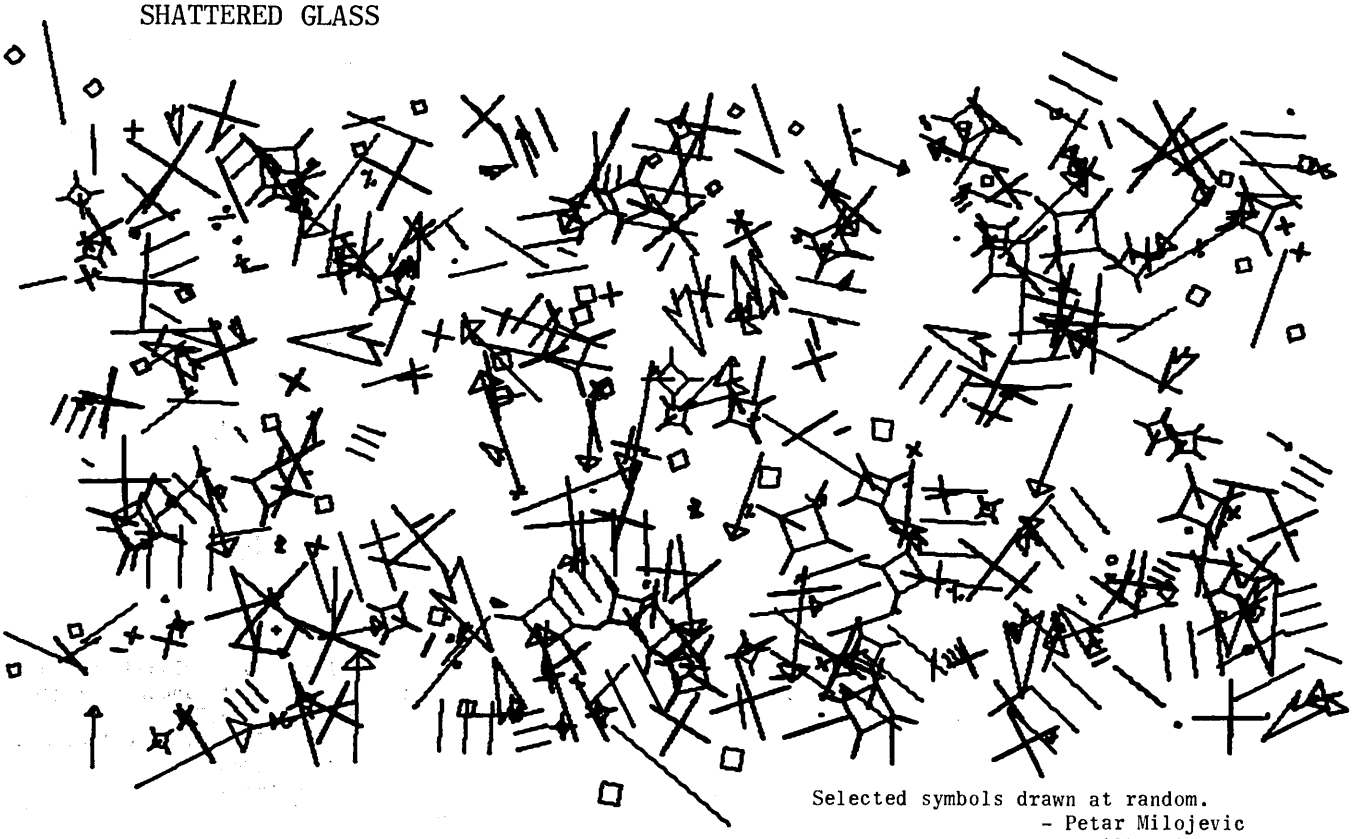
- Charles Csuri, Professor, School of Art
James Shaffer, Programmer
The Ohio State University
Columbus, Ohio 43210

INFINITY



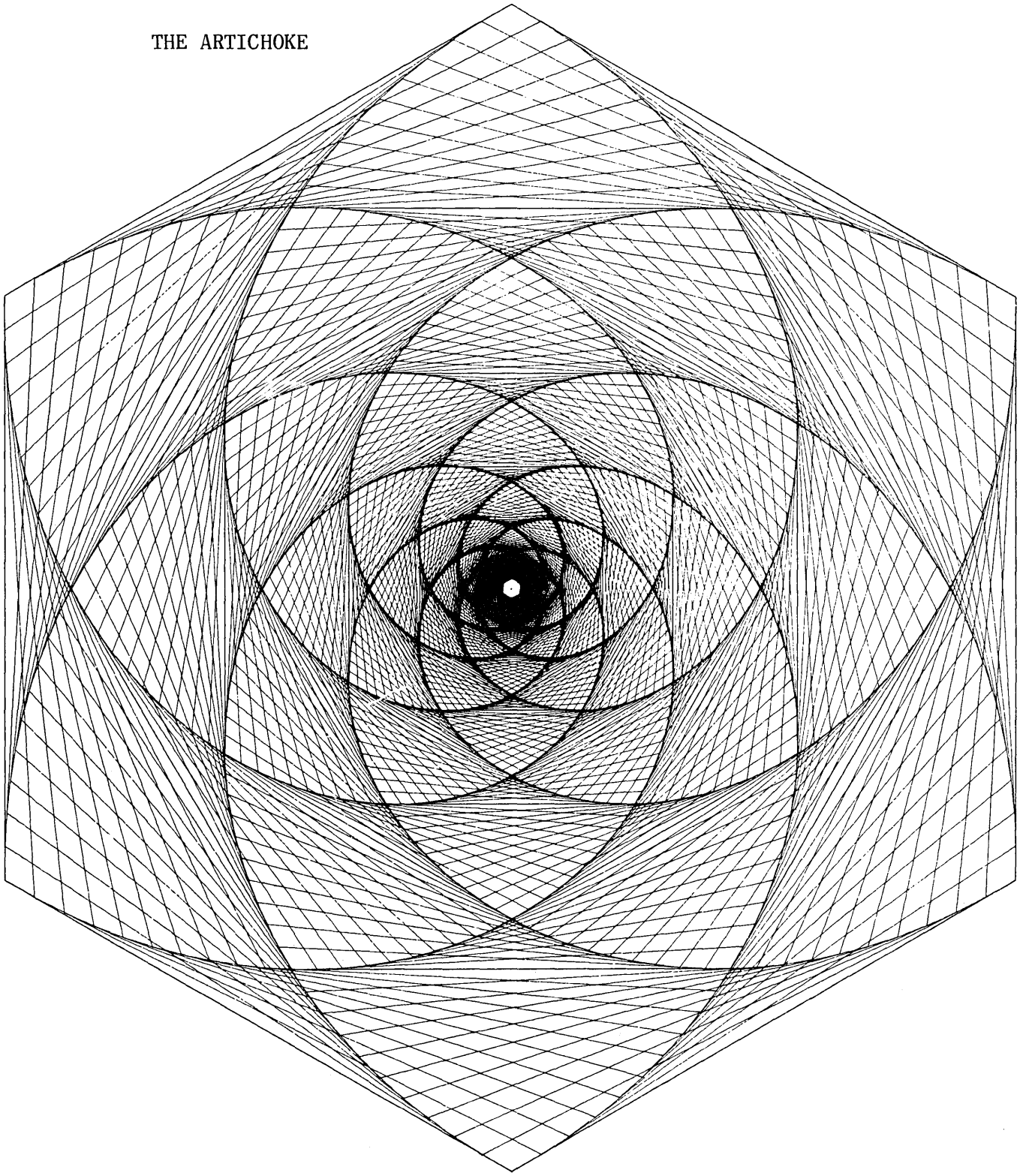
The sign of infinity, drawn by computer plus man.
- M. S. Mason
4008 Dobbs Drive S.E.
Huntsville, Ala. 35802

SHATTERED GLASS



Selected symbols drawn at random.
- Petar Milojevic
McGill University
Montreal, Quebec, Canada

THE ARTICHOKE



A hexagon is rotated clockwise and counter-clockwise while being reduced in size.

- Craig Sullivan
California Computer Products Inc.
Anaheim, Calif. 92803

MULTI-ACCESS FORUM

THE NATIONAL DATA CENTER CONTROVERSY: COMPUTER PROFESSIONALS' EVALUATIONS SHOULD BE BASED ON KNOWLEDGE

George Sadowsky, Director
The Brookings Institution
Washington, D.C. 20036

The May, 1967, issue of *Computers and Automation* contains a "Resolution on the National Data Center and Personal Privacy" proposed by the Washington, D.C. Chapter of the Association for Computing Machinery.

Lest it be assumed that this resolution represents the considered opinion of the chapter membership, I would like to point out that the resolution, although approved by a 90% majority, was voted upon by only 25% of the chapter. In formulating the resolution, the Special Interest Group on Social Implications did not refer to the Kaysen Committee Report or supporting material, nor were they familiar with its contents.

The Kaysen Report, "Report of the Task Force on the Storage of and Access to Government Statistics," (GPO 915-095, October 1966) is a 30-page, double spaced typewritten document. It discusses the history, growth and problems inherent in the present organization of the Federal Statistical System, and proposes changes in organization in response to existing needs for formulating government social and economic policy. Supporting documents, such as the "Dunn Report," (Statistical Evaluation Report No. 6, Bureau of the Budget, Executive Office of the President) attempt to assess the merit of the proposal both conceptually and technically. For computer professionals interested in understanding the issues of the controversy, these documents provide an essential and basic introduction. Criticism of the National Data Center proposal without an awareness of this information is hardly worthy of professional consideration, and is a disservice to the computing community.

In contrast to the impression conveyed by recent publicity, the establishment of a National Data Center is not motivated by the desires of zealous bureaucrats for a mechanism allowing potential totalitarian control over individuals. The proposers are keenly aware of the potential problems concerning possible invasion of privacy inherent in the centralization of data files and automation of retrieval. The problem of constructing and enforcing safeguards to be applied to files of personal information is important. Computer people are correct in assuming responsibility for its solution.

The National Data Center proposal does not signal the first appearance of this problem. For several years the growth of both comprehensive credit information systems and local government person and property data banks has been evident. The latter seem to be actively supported by the computing community, yet implicit in these developments are systems potentially far more personally intrusive than that proposed by the Kaysen Report. The growth of credit information systems is, to my knowledge, unregulated, except by members of the system, and potential abuses of the system have not been publicly explored.

There is, however, an equally serious issue that has been submerged by recent publicity. Computer professionals concerned with the privacy problem should be equally concerned with the present availability of information to policy makers and the inadequacies of the present system that prompt the National Data Center proposal. It would be a declaration of immaturity by the computing profession and a cruel joke upon those groups in our society who would benefit substantially by more incisive application of public policy, for our government to make ineffective use of its very substantial investment in computer technology in constructing and applying its policies. Those who argue that computers have great potential for creative social progress within our society should be alarmed about any marked departure in the efficiency and creativity of our public information processing mechanisms from the best performance that can possibly be achieved.

I believe that the majority of computer professionals who considered the resolution were less informed of the history and content of the proposal than would be desirable for an issue of this importance. Whether the position of a group such as the Association for Computing Machinery is either essentially moral or technical, the professional stature of the organization lends authority to the position taken. It would be an unfortunate departure from professional ethics to speak in the absence of knowledge of or a particular competence in the subject being discussed.

INTERNATIONAL SYMPOSIUM ON AUTOMATIC CONTROL TO BE HELD IN JERUSALEM AS SCHEDULED

Dr. A. Shani, Chairman
International Federation for Automatic Control
Israel Committee for Automatic Control
Technion City, Haifa, Israel

Because of the recent crisis here, many people were doubtful whether the International Symposium on Automation of Population Register Systems would take place as scheduled. Now, when peace is at our gate and no more precious lives, we hope, are going to be lost on either side, we are happy to confirm that the Symposium is going to be held as scheduled, in Jerusalem, Sept. 25-28, 1967.

We pray that this peace will be a lasting one and that from now on we will be able to invest all our zeal and resources in constructive work. We hope we shall now be given the opportunity of sharing the fruits of our experience in all fields with the countries around us.

For this reason, we feel we should intensify our efforts to make the Symposium an international contribution to development and progress, especially in this part of the world.

We also feel that, through post symposium tours, participants will have the opportunity to get acquainted with our country and its people.

This International Symposium on Automation of Population Register Systems has been organized by the Information Processing Association of Israel, and is being sponsored by the International Computation Centre and the International Federation for Information Processing.

The program will include discussions on:

Central Population Register — State Systems
Design Problems of Population Registers
Various Population Register Applications
Statistical Applications
Theoretical Problems

Papers are scheduled to be presented by 65 persons from 17 different countries. There will also be a panel on "Integration of Automatic Data Processing Systems — Its Scope and Limitations."

Anyone interested in participating should contact the Secretary of the Symposium, P.O. Box 3009, Jerusalem, Israel.

MARKETING OF ELECTRONIC DATA PROCESSING SERVICES BY NATIONAL BANKS BRINGS LEGAL ACTION BY THE ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS

W. H. Evans, Exec. Vice Pres.
ADAPSO
947 Old York Road
Abington, Pa. 19001

The Association of Data Processing Service Organizations (ADAPSO) has commenced legal action to enjoin the Comptroller of the Currency of the United States from permitting the continued "unlawful" marketing of electronic data processing services by national banks.

The suit is predicated upon the National Banking Act, which makes it unlawful for a national bank to engage in activities which are not related to the banking business. Only recently national banks have been limited from extending their business into areas such as revenue bond and insurance. A suit is pending to restrain their activities in the travel agency business.

ADAPSO believes in free and open competition. We welcome competition, because we believe that through it all of us and our society must benefit.

However, the independent data processing service organization, almost by definition a small business, is not likely to be able to compete against banks, who because of their large financial resources, can subsidize profitless operations in data processing.

NATIONAL BUREAU OF STANDARDS SURVEYS INFORMATION RETRIEVAL AND DATA MANAGEMENT SOFTWARE SYSTEMS

A. Severo
Systems Research and Development Division
Center for Computer Sciences and Technology
National Bureau of Standards
Washington, D.C. 20234

The National Bureau of Standards Center for Computer Sciences and Technology is conducting a survey of comprehensive software systems for handling information-retrieval and data-management applications. The purpose of the survey is to obtain information on the state of the art for use by the Center, and for distribution to the technical community.

The Center was established in 1965 to provide technical support to all agencies of the Federal Government in the field of information processing. In addition to providing consulting and computing services for Federal agencies, the Center conducts an extensive program of research and standardization.

If your organization has a software system for handling information retrieval or data management applications, please send latest descriptive material to me.

NEW SYSTEM ANNOUNCED

The accompanying birth announcement came to the home of one of C&A's staff the other day. We pass it along as one more clever use of computers (though we probably won't add it to our list of applications in the 1968 June Directory).

A followup report indicates the system is functioning smoothly and on schedule. The maintenance staff is happy (if a little sleepy), and though they expect to make frequent changes, from wet to dry state, the system will, without question, be accepted as delivered and expanding.

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NELIAC BULLETIN TO BE ESTABLISHED

Mr. A. Furman
Orgn. 59-22, Bldg. 102
Lockheed Missiles and Space Co.
P. O. Box 504
Sunnyvale, Calif. 94088

An information bulletin for the NELIAC programming language will be published under the joint auspices of the NELIAC Implementers Council and Exchange (NICE) and the Special Interest Committee on Programming Languages of the Association for Computing Machinery. It will be distributed (along with the ALGOL, PL/I, COBOL, and JOVIAL bulletins) as an occasional supplement to the monthly *SICPLAN Notices.*

NICE are seeking contributions to the NELIAC Bulletin that may be of interest to NELIAC users and implementers, as well as to computer programmers in general. Suggested topics include:

- Applications of NELIAC believed to be new.
- Changes and extensions to the NELIAC language.
- Information about new or improved NELIAC compilers and operating systems, including equipments, status, restrictions, extensions, new techniques, and available statistics, particularly self-compiling times.
- Algorithms that can be efficiently stated in NELIAC.
- Philosophy and techniques of programming in the NELIAC language.
- News about NELIAC user personnel.

Please address all comments and contributions to me at the above address.

PL/I FORUM TO BE HELD

R. F. Rosin
Special Interest Committee on Programming Languages of the ACM
Computer Center
Yale University
New Haven, Conn. 06520

A forum on the PL/I language will be held in Washington, D.C. on Monday, Aug. 28, 1967, immediately before the Association for Computing Machinery National Conference. It is being sponsored by the Special Interest Committee on Programming Languages (SICPLAN) of the ACM.

The purpose of the meeting is to discuss: (1) specifications and objectives of PL/I dialect; (2) the consistency and completeness of the existing language; and (3) the effectiveness and potential development of unusual features such as tasking, ON-condition, and array expressions.

Participants in the forum should have an active interest in PL/I, be familiar with the current language manual (IBM document C28-6571-4), and be prepared to contribute to the discussion. Short papers that can be distributed before the meeting are particularly invited.

Anyone interested in participating should contact me at the above address. Attendance will be limited by space available and the qualifications of the applicants. Expenses will be met by a minimal registration fee.

COMPONENTS AND DEVICES IN SYSTEM APPLICATIONS SEMINAR — CALL FOR PAPERS

Prof. Karl Steiner
Seminar Chairman
Purdue University
Calumet Campus
Hammond, Indiana 46323

A Seminar on the State of the Art on "Components and Devices in System Applications" is scheduled on the Purdue University Campus, April 19 to May 25, 1968. September 15, 1967, is the deadline for the submission of abstracts for papers. For further information, please write me at the above address.

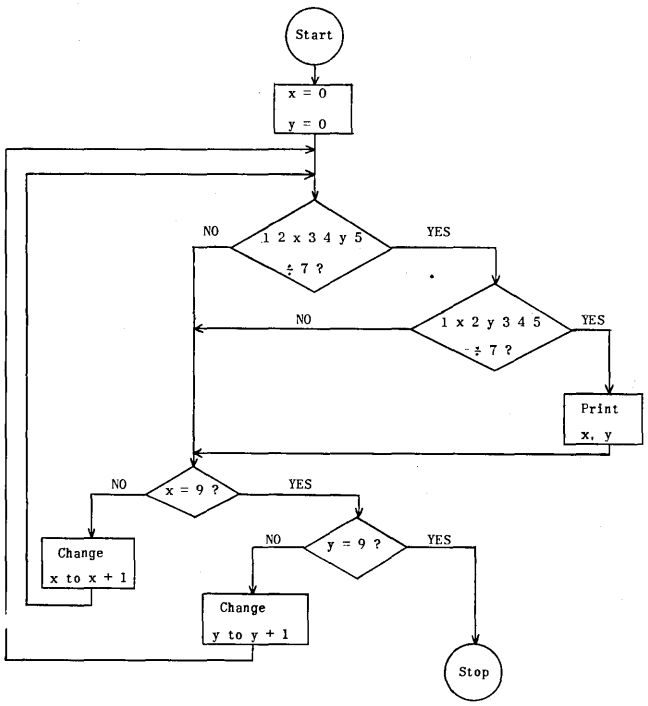
MONTHLY COMPUTER CENSUS FOR JULY — TOTALS

The totals for the "Monthly Computer Census" (page 51) in the July, 1967, issue of *Computers and Automation* were omitted through clerical error. The total number of installations was 47,487; the total number of unfilled orders was 26,485. Please enter the totals on your copy, if convenient.

c & a
PROBLEM CORNER

Walter Penney, C.D.P.
Problem Editor
Computers and Automation

Problem 678: A Fascinating Flow Chart That Doesn't Work?



"That's a fascinating flow chart," said Bill, looking over Al's shoulder.

"Yes, but it doesn't work," Al replied.

"It's supposed to solve the problem of finding x and y from the fact that the 7-digit numbers 1 2 x 3 4 y 5 and 1 x 2 y 3 4 5 are both divisible by 7. Professor Lawthorne wanted us to program it by trying every pair of values from 0 0 to 9 9, but I don't get any print out."

"Maybe there is no solution," Bill offered.

"Oh, yes, there's a solution all right. I worked it out algebraically and I know there's exactly one solution. I don't understand why this program doesn't find it."

Why doesn't the program work?

Solution to Problem 677: A Conversion Headache

If the number with 0's in alternate positions is N, so that N = a 0 b 0 c 0 . . . , the formula

$$N - 90\left[\frac{N}{100}\right] - 900\left[\frac{N}{10000}\right] - \cdots$$

will eliminate the 0's, yielding the number a b c. . . .

Readers are invited to submit problems (and their solutions) for this column to: Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160

BUSINESS SYSTEMS ANALYSIS— AN ORDERLY APPROACH

John J. Mason, Vice President
Holland Associates, Inc.
Washington, D.C. 20006

"Business systems analysis must be counted among the arts rather than the sciences. People, space, business objectives, available data, state of documentation, prejudices, and inbred concepts make it extremely difficult for the analyst to relate one case directly to another."

Many business managers and executives fear systems analysis — they fear it because many of them have learned from their own experience or from that of others that computers are expensive, programmers are expensive and scarce, and computer systems are complex things which quickly get out of hand and result in the creation of a record keeping ogre which they find difficult to understand and control. They fear systems analysis also because it often involves a program which devours funds, upsets personnel and results in automating the same tired old procedures they've been using for years. Finally, management fears being swamped with paper with which they have neither the time nor the inclination to deal effectively.

Unfortunately, many of the criticisms are true. Moreover, the business systems analyst is sometimes so technically oriented that profit-conscious executives find communication with him difficult. It is our attempt here to allay some of the misconceptions about systems analysis and to propose a phased program for orderly and controllable review which can be ended, expanded, or contracted at will. That is, it can be controlled at the will — and this is vital — of the executive who authorized it in the first place. The current difficulty, in far too many instances, stems from the fact that such control is exercised by an uninformed executive not in complete possession of all the facts and acting in sheer desperation or exasperation.

What is a Business System?

A business system is the organized use of people, forms, machines, tools, and communications in such a way as to permit a particular business or department to perform its intended function. A business system is all of the methods and procedures used in a business office to accomplish a certain end. It is also all of the people and the devices used by them to permit the system to work. It may be efficient or inefficient, simple or complex, manual or mechanical, wieldy or unwieldy. A good business system is one which accomplishes its results accurately, economically, and in a timely fashion. Very few cannot be improved, and even fewer can undergo analysis without revealing some area wherein change would be helpful.

What is Business Systems Analysis?

Business systems analysis is an orderly study of the detailed procedures for collecting, organizing and evaluating information within an organization, or subdivision of an organization, with the objective of improving control over its operations or reducing the cost of exercising this control. More simply stated, business systems analysis is the act of examining the way things are done to reveal weaknesses and to discover ways that the same things can be done better, more cheaply or more quickly.

Why Study a Business System?

When is it necessary to analyze a business system, and why should we analyze one that works? Usually, a business system is analyzed because it gradually or suddenly becomes apparent that the system has not kept pace with the changes in management problems that have come about from year to year and even from month to month. A system which was satisfactory last year or the year before is found to be unresponsive to the needs of management in its changing business environment.

John J. Mason is Vice President of Holland Associates, Inc. His career in data processing began in 1946 at Pan American World Airways, Inc., where he was Supervisor of Machine Accounting. In 1951 he became Director of Data Processing for Capital Airlines, Inc., and later became Director of Methods. In 1961, he was appointed Assistant Controller of C-E-I-R, Inc., and was promoted to Manager of Business Consulting Services in 1963.

Sometimes sharply rising costs or a weak labor market will trigger the need for an improved system. Too often the availability of new equipment or new methods provides the impetus for systems analysis. Unrelated changes in other departments or changes in company policy frequently cause a business system to be reviewed. A great many companies maintain substantial methods staffs specifically for the purpose of performing a continuing series of systems analyses under the proposition that the business is continually changing and the methods it uses must likewise change.

Objectives and Automation Plans

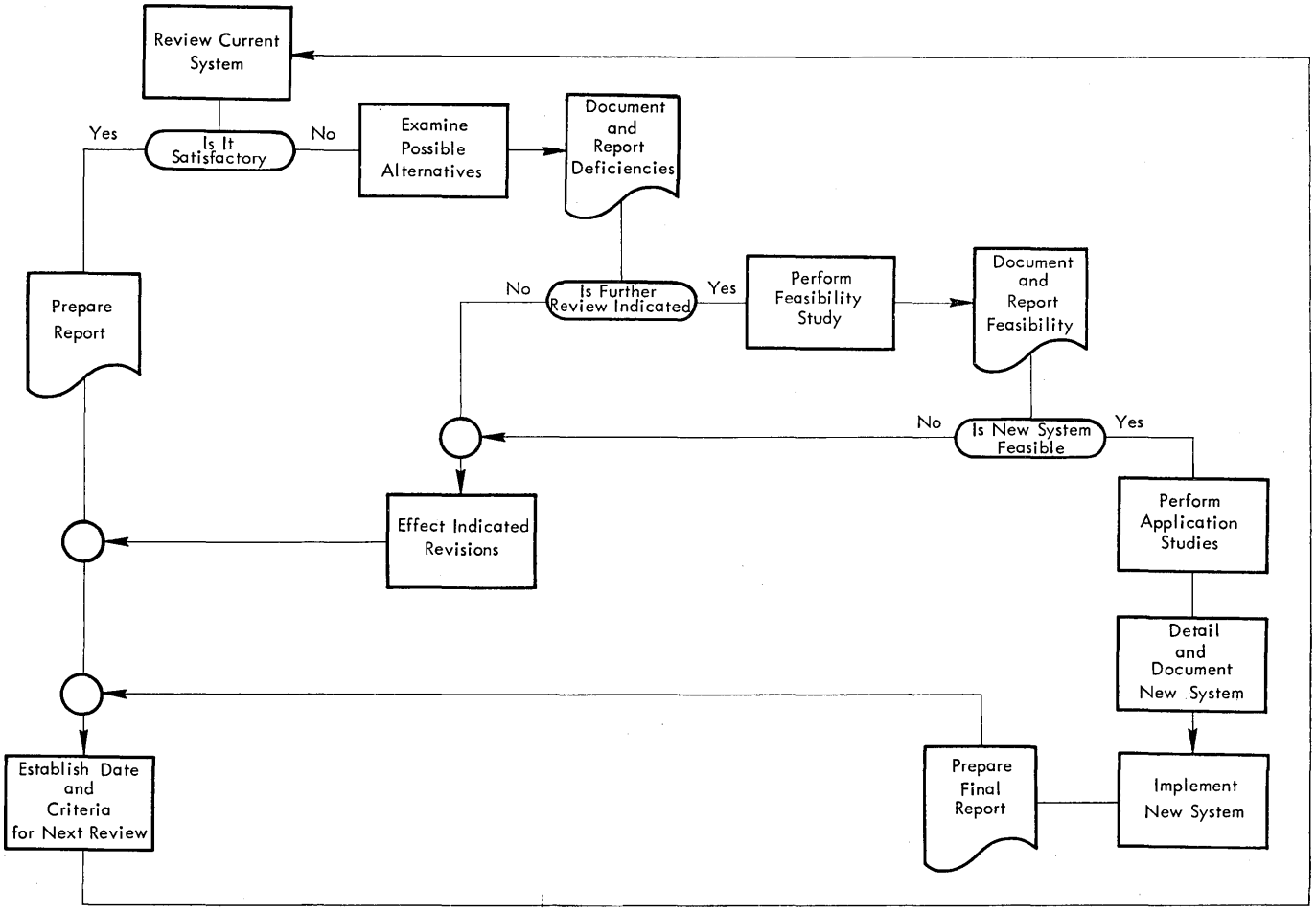
The objectives of systems analysis are many and varied. Stated very briefly, the ultimate objective of analyzing any system is to improve its value. Improvement can take the form of functional betterment to make the content of the system more meaningful to company management, or structural betterment to make it work better, easier and more economically. Often the objective of analyzing a particular system is to fit it into the automation plans which the company has made in some related area. Automation of the general accounting system, for example, generally requires that the budgetary system be automated to provide the necessary budgetary comparisons and analyses and to feed back data to be used in preparation of the next period's budget.

It is important to recognize that a reason should exist for performing analysis, and that analysis must have an objective. Without direction, the analyst works in an area of uncertainty, knowing that the system requires change, but having no clearly established guidelines or objectives to give direction to his efforts. Not unusually, definition of the objective is left to the analyst. This is not necessarily bad, depending upon the analyst, his experience, his position in the organization and, most important, his empathy with management and its goals. The analyst is the agent of company management and must receive clearly defined instructions as to objectives, or be sufficiently attuned to management thinking to be capable of formulating these objectives himself with equal clarity.

The Analyst as an Investigator

Management usually knows, in at least a general way, what it requires of a business system, but it can rarely be so specific as to define the details of its objectives. It becomes the analyst's problem to ferret out these details from information currently available, the uses to which it is put, and the manner in which it is presented. He then delineates management's precise needs and restates them in terms of concrete systems objectives. He must discuss these with management and insure that the restated elements represent, in fact, the real objectives of management, and then obtain management support in his efforts to achieve them. Without this support, expressed in a very positive fashion, it will be extremely difficult, if not impossible, for the analyst to overcome departmental barriers and enjoy the cooperation he must have in order to do an effective job. Unwavering management support of a systems

BUSINESS SYSTEMS ANALYSIS



study, expressed in clearly understood terms, is vital to a successful program. Without it, the analyst will be placed in the position of bargaining with lower levels of management, and compromising his objectivity by reduction to the status of a committee member trading points with other committee members.

Environmental Problems

Business systems analysis must be counted among the arts rather than the sciences. It is difficult to define any rules of procedure other than an unrelated set of general principles. Specific problems encountered in analyzing business systems vary widely from case to case. People, space, business objectives, available data, state of documentation, prejudices, and inbred concepts make it extremely difficult for the analyst to relate one case to another and to apply directly past experience to the particular project at hand.

In addition to such environmental problems, the fact that data processing systems have become highly complex in the last ten to fifteen years further compounds the difficulty. Rarely will the analyst be working in an antiseptic environment in which he can consider a single application and direct his efforts at the development of a system which will serve only that application. Far more frequently will a given application be intertwined with others, drawing much of its source data from functions not completely within its control and providing output information to functions having requirements not wholly in harmony, and often at complete variance, with the application under study.

Hardware Selection Problems

When computers and other hardware are to become part of the system complex, the analyst will usually not be free to make direct comparisons between hardware systems for the purpose of selecting the one singularly adapted to the application under review. Most often he must consider two or more hardware systems, each of which may be ideally suited to one facet of the problem, and effect the most workable compromise between these systems, choosing the one providing optimum results to all.

Another problem, not always recognized, is that the analyst is frequently doing what amounts to original research in studying interrelated situations and attempting to define an optimum solution. This is especially so when more advanced gear become available from the hardware manufacturers and new concepts need to be developed and sold to management to capitalize on these fresh tools.

Since the business of an organization must continue even during times of original research, the analyst finds himself working in an operational environment which changes from hour to hour. He is unable to stop the process at a particular point in its evolution and subject it to clinical analysis, as is the more fortunate researcher in many scientific areas. Likewise, his solutions must be tested under operating conditions at the same time that the system under study continues to function. This latter part of the problem continues throughout the study and reaches crisis proportions on the day of implementation.

Problems of Cooperation of People

Perhaps the most disturbing and significant problems are encountered because a business system invariably involves the use and cooperation of people, from higher management, supervisors and clerks to customers, suppliers and regulatory officials. Management is interested in results. If the current results are poor and recognition is given to the necessity for improvement, retention of management support is usually not difficult. Obtaining the cooperation of the supervisors and clerks who are closely involved with the function under study and who may, in fact, be contributing to the problem is another matter. The analyst frequently discovers that dealing with these people is far more difficult than dealing with management.

Economics, resistance to change, distrust of things mechanical, and fear of empire crumbling are all factors to be reckoned with. Systems design often encounters problems involving customer relations, restrictions in union contracts, declining markets, changing markets, "sacred cows," and what to do with displaced equipment too expensive to discard and too obsolete to use or sell. All of these and myriad other problems will be encountered, must be recognized, and must be dealt with during the course of the study. The analyst must be tactful, diplomatic and capable of dealing effectively with people at all levels in addition to having the required technical and analytical skills. He must be able to formulate a plan of action to cover all situations and must stand ready to modify or defend it as conditions will require. Most important, he must secure the cooperation and active support of people, because the most comprehensive and efficient system he is capable of devising will not work unless the people ultimately responsible for its operation want it to work.

How Much Systems Analysis?

How much analysis? This is one of the most difficult questions the analyst must answer, particularly in an activity he is reviewing for the first time. He can't really determine the amount and duration of analysis until he has had an opportunity to perform at least a casual review. On the other hand, management insists on knowing how long the job is going to take, how many people will be involved, and what it is going to cost.

Since this demand is at the same time reasonable and unreasonable, we offer an approach which gives the analyst some flexibility and freedom of action and also provides management a hand on the throttle. This can be accomplished by a three-phase program in which each phase is undertaken only if the results of the previous phase so indicate. The analyst is required at the end of each phase to report in detail the conduct and results of that phase and to make specific recommendations for further action. He then awaits management review of his efforts and his report before proceeding.

Review of Current Systems

Phase one, The Current Systems Review, has as its objective merely the determination of whether or not the current system satisfactorily performs the functions expected of it. At the end of this review, the program calls for a detailed report advising management on the findings of the review. The opportunity exists here to make whatever revisions are indicated in the current system and then end the effort at that point; or, if the facts warrant, to proceed to the next phase.

Review of current systems can be accomplished by a very small team of analysts. For relatively small and restricted areas, this team may even consist of one person. The primary reason for reviewing the current system is to determine its adequacy and to locate those areas, if any, where it falls short of its purpose or where conditions have so altered its purpose that change is called for. This type of investigation can normally be done in very short order without getting too deeply into the procedures, by examining primarily the results.

Essentially this phase asks questions:

Is the current system adequate?

Does it perform its intended functions?

Does it perform them efficiently, economically, and to the satisfaction of management?

Is the system output useful and valuable?
Has anything occurred in the business which would change the requirements and demands placed on the system?
Is anything contemplated in the future which promises to change these requirements and demands?
Can we obtain more information of value to the company from this system if we make some changes in it?
Have changes taken place in related systems which require change in this system?
Has some new methodology or technology evolved which can effectively be put to use in this system?
Specifically, what are the deficiencies of this system?
What are its strong points?
Must the system be totally overhauled or should it be patched?
If patched, how long will the patches last before a total overhaul becomes necessary?
What are some alternatives to the current system?
Are these alternatives more desirable from an economic or efficiency point of view?
Finally, what does the system contribute to the profitability of the business and what would its alternatives contribute?

Evaluation of the Current System

If the replies to these and similar questions establish system inadequacy, it is obvious that further study in greater depth is necessary. It is the analyst's responsibility, if he reaches this conclusion, to report it to management. He must support this contention by describing his review and its findings in his report, carefully tracing the logic by which he reached this conclusion and documenting his reasons for recommending further study. He must then describe the study he proposes, its scope, cost, and the time period over which it will be conducted.

Likewise, if the analyst concludes that the current system is satisfactory, perhaps with minor changes, he must so report. Again, he must describe his activities, document his logic, and support his recommendation with facts about the current system and the manner in which it fulfills its objectives. He should also select a time for a fresh review of the system and establish the criteria under which the next review will become necessary and desirable. In this way, he establishes a review cycle for keeping the system under periodic surveillance and preventing it from deviating too far from its intended purpose. Good documentation of the current review will facilitate future reviews.

Feasibility of a Proposed System

Phase II, the Feasibility Study, will be undertaken only if the Current Systems Review so indicates and management concurs with the analyst's conclusions as expressed in his report. The Feasibility Study might be defined as a study in which a projection is made of how a proposed system might operate in a particular organization or environment to provide the basis for a decision to replace or not to replace the existing system. In the context of the approach presented here, the fact that we have passed the first review stage indicates the high probability that the existing system will be changed. By this we do not mean to imply that the feasibility of a proposed new system is a foregone conclusion, but we do mean to state that there is an excellent chance that the feasibility of a new system can be established.

In a sense, the Feasibility Study is an extension of the Current Systems Review in that its principal objective is to define an alternative system and establish its practical and economic feasibility. As a guiding principle, we might say that the amount and depth of analysis performed during the Feasibility Study will depend to a large degree on the prospects for improving the situation. It is obvious that possible alternatives must be defined and examined in order to assess these prospects. The study can and should be ended when and if a point is reached where the value of potential improvements is determined to be less than the cost of completing the study.

A Management Information System

Very frequently, a Feasibility Study will be undertaken not as a result of any single system review, but following review of many systems. Currently available computer equipment is capable of integrating a number of different systems into a single one, often called a management information system. Although it is common practice to reserve this term to describe certain integrated automated systems, every combination of clerical, accounting, record-keeping and reporting processes in the business world is truly a management information system. Once each process has performed its primary function, it feeds data into a central collection point where information is accumulated, organized, analyzed and displayed for management use in making decisions calculated to maintain and improve the company's profitability. The Feasibility Study, then, should deal with an entire process rather than isolated elements of that process, because its aim is to explore the use of some very expensive and high-powered equipment to perform a series of tasks formerly accomplished by relatively isolated groups of people or unsophisticated bits of hardware.

The Feasibility Study can be a costly process involving a large number of people over a long period of time. It must, therefore, be carefully planned and executed. The objectives must be fully defined and made clear to all participants. Information gained concerning the deficiencies of the current system will help to establish and detail the specific aims of the study. The analyst must be particularly cautious about defining these sub-goals within the broad structure of his charge from management. He must be coldly objective and realistic in rejecting those which fit into the "nice to have" category in favor of staying with the essentials. If some of the objectives are impossible of attainment, or should not be striven for because of their cost, this must be made known as soon as possible. Otherwise management is likely to be misled into believing it is going to get something highly desirable, when in fact the system could prove unrealistic, unwieldy or uneconomical.

Once defined, the objectives become working guides, not only for the Feasibility Study, but also for the Application Studies to follow.

The Key Man

The key man on the study staff is, of course, the project manager. If at all possible, the project manager of the Feasibility Study should be the same person who directed the preliminary Systems Review. He must be an extremely well qualified individual. His abilities to plan properly, give direction to the efforts of his subordinates, and communicate convincingly and tactfully with other people are vital. Project direction of a feasibility study is not a part-time task and should never be assigned to a committee whose members have other responsibilities in the organization. A policy committee of executives to guide the project director, assist him to open doors otherwise closed to him, and receive his reports performs a very useful function; but actual on-site project direction must be the fulltime responsibility of a competent administrator.

The size and complexion of the working staff will depend upon the scope of the study, the areas of study and the length of time allotted to its completion. All working members of

the group should be professional analysts or supervisory personnel. Also included should be persons acquainted with electronic data processing techniques and devices. It is useful, if the objectives and scope warrant, to include some programmers in the group in order to facilitate communications when the applications studies are performed and implementation begins. The Feasibility Study staff must be expected to provide the nucleus for the Applications Study groups and should be chosen with this in mind.

Study of the Applications of Automatic Equipment

Phase III, the Applications Study, consists of the detailed process of designing a system or set of procedures for using data processors for a selected function, and establishes the specifications for equipment suitable to the needs. In this context, the Applications Study refers primarily to those systems which involve the use of computers and other automatic equipment, although similar techniques are involved in the detailed design and description of any business system, automated or manual.

The Feasibility Study normally deals with a large scale information or data processing system. It applies the "total system concept" to a major area of the business. The Applications Study deals independently with each of the integrated elements or subsystems of the major activity. The Feasibility Study has defined the areas in which the application studies are to take place, and has served to integrate these elemental areas into a total activity area. During the Feasibility Study, each application area was defined with the others in mind so that the work flow and forms will proceed naturally from one to the next. The Feasibility Study report provides a take-off point for the applications studies, and defines the guiding principles for the detailed design of each system element.

The various alternatives which were considered in the Feasibility Study have now been reduced, and the applications studies will deal only with the surviving alternative. The dimensions of each application study will be narrowed and clearly defined to avoid areas of duplication and to provide analytical coverage for each element. The scope of the applications studies will be restricted to the system as defined in the Feasibility Study. This is not to imply that the analysts should be blinded to new elements which might arise as a result of closer investigation; rather it is for the purpose of controlling the objectives and direction of each applications study team.

Even Flow of Data

The total systems concept requires that data which passes between subsystems be developed in such a way as to cause it to flow evenly and without disruption between activities. The input documents must be created and translated into mechanically sensible form as close as possible to their point of origin so that the data on them can be conducted in automated fashion through the various activities. The procedures for data handling should likewise be established to ease the flow of data between elements of the system.

Normally, different teams of analysts will be assigned to the various applications making up the total study. It is essential that a co-ordinating body be formed to deal with and define those items that belong to more than one application area. This group should comprise the project director and the leader of each application study team.

Manpower for the Applications Study

The Applications Study normally requires considerably more manpower over a longer period of time than the Feasibility Study. In fact, it is usually possible to juggle manpower against time, particularly when a large number of individual applications are involved. It is the responsibility of the project director to select, organize and train his Applications Study group. He should determine those application areas that are to be covered in the first part of the study and appoint a group leader for each. Working with each group leader, the project director can assign to each application the number and kind of personnel required. Each group may consist of one or more systems analysts and one or more programmers. In addition, there may be representatives from some of the operating departments concerned and, in some instances, specialized personnel. These latter may include outside consultants or technicians who can be borrowed from other parts of the business. Any or all of these persons may be shifted from one team to another as need for their skills rise and fall or as exigencies of the time schedule require.

The project director will normally be the same person who conducted the Feasibility Study and his principal applications team leaders will normally be the analysts who assisted him. Other personnel may be drawn from the staff of the Methods and Procedures Department or from the staff of the operating department under study. The important thing is that each team include the number and kind of people required to carry out the tasks assigned. The project director, department heads, and other technicians in the company should be available for consultation when necessary.

The Coordinating Group

The project director, with the assistance of his coordinating group, must delineate precisely the responsibilities of each application study team. He must also define in very explicit terms those functions and decisions which, because of their homogeneous nature, are to be reserved to the coordinating group. The coordinating group must provide the basic system concepts which the analytical teams will use. All system inputs, common files, records, coding schemes and outputs should be specified by the coordinators and the study teams required to adhere to the standards established.

The coordinating group must specify the kind and amount of documentation required, and even designate the symbols to be used in flow charting and the terminology to be used in file and field descriptions. They should outline in careful detail the content and manner of presentation of procedures manuals and operating manuals. Each application study team leader should be required to make periodic reports in such a way that they can be readily compiled into project progress reports to management.

Time Schedule of the Project

Perhaps most important, the coordinating group must provide a realistic time schedule for completion of the project, balancing the effort required against the staff available. Such a schedule is very difficult to plan and may, at the outset, be little more than an educated guess based on previous experience and estimates of the team leaders. As the work progresses, however, and as feedback begins to come in from actual performance, the schedule can be revised and more realistically attainable goals established.

As a rule, such a schedule will prove more reliable in the gross sense than in any of its elements. Nevertheless, each element must be scheduled to the extent practicable in order to provide convenient check points to test progress. Each application leader should be required to report frequently to the project director on progress and adherence to schedule. Any significant variations from schedule should be recognized and investigated as early as possible to determine their effect on other activities and to take remedial action.

If scheduling is not carefully managed, there may develop a tendency for some phases to drag while other interesting possibilities are explored, or for one team to strive for perfection at the expense of another's time schedule. If unforeseen difficulties occur, the project director can make revisions in the schedule or he can take other steps to provide for this problem without revisions. He could, for example, assign more staff to a lagging application or transfer responsibilities from one team to another.

Documentation

The finest and most comprehensive application studies can be completely obviated if they are poorly documented. The Applications Study groups are composed primarily of technicians and specialists of one kind or another, and in the conduct of their affairs they communicate with each other in a technical jargon which is not always intelligible or understandable to the uninitiated. It is the task of each study team leader to document thoroughly all of the activities of his team. It is the task of the project director to insure that the documentation is consistent and in a form that is completely understandable and comprehensible to management and operating personnel.

Costs

A section of the Applications Study report must deal with costs. At the conclusion of the Applications Study, the project director should have a much firmer grasp on probable implementation and operating costs than he had at the end of the Feasibility Study. The cost section of the report should contain time schedules for implementation and testing and should make provision for the time, staff and cost of conversion from one system to the other, including the cost of files conversion. If a period of dual operation is contemplated, this cost must be calculated as part of the changeover costs. In addition, all costs of phasing out the old system, such as the disposition of obsolete equipment, must be determined and made a part of the conversion costs.

Implementation Phase

The final report of the Applications Study completes the analysis phase of the project and signals the commencement of the implementation phase, which may become the responsibility of a totally different group of people or may remain the responsibility of the same team that began the Systems Review. Normally, implementation requires an array of technical skills not present in any abundance in the Systems staff, and therefore new teams of programmers, coders, and hardware specialists take over the effort with guidance from the programmer-analysts who took part in the applications studies. Since we are primarily concerned here with describing an orderly approach to business systems analysis, we shall not dwell on implementation and the problems incident to it.

Review of System Performance after Changeover

The systems analysts, however, have not completed their responsibilities until they have reviewed the system after a reasonable period of operation. Their final report to management concerns itself with the system performance under operating conditions and compares this performance with the original objectives. The last step in the process is the selection of a date and criteria for the next system review. In this fashion, an orderly review cycle is begun which has as its objective the maintenance of the system as a viable tool, continuingly responsive to the needs of management in a constantly changing business environment.

"I JUST FED IT THE WORLD CONDITIONS AND NOW IT WANTS TO BE MOVED TO A BOMB SHELTER."

DIGITAL PLOTTER INDUSTRY GROWING MARKEDLY

Michel Feuche
Editor, Moody's Computer Industry Survey
Brandon Applied Systems
New York, N.Y.

"Incremental plotters, being both the least expensive machines and those with the best long-term growth potential, represent the area in which competition is likely to be most active. This competition is a new feature in the industry. Previously, most products available had been sufficiently different to avoid direct price competition."

The digital plotter industry, heretofore one of the quietest EDP equipment fields, may by the mid-1970's turn in one of EDP's most spectacular records of growth and expansion. This is the claim implied in a forecast by Lester L. Kilpatrick, president of California Computer Products, Inc., that by 1975 the digital plotter population should soar from today's less than 3,000 units of all types to a level of over 25,000. Not all of the estimates by Kilpatrick's competitors are quite so bullish. Nevertheless, all agree that, on the basis of new applications, technical developments, and reduced equipment costs, the plotter industry faces a rapidly expanding market. This new activity will be reflected not only in company balance sheets but also in the industry's marketing pattern. This pattern is changing from one in which few manufacturers' product lines overlapped to one in which competitiveness may match prospects for future growth.

For an EDP growth industry, the plotter industry is a surprisingly old one. The first effective machine is believed to be the free-standing digital-to-analog unit introduced by Benson-Lehner Corp. in 1951, several years before the large-scale development of practical general purpose computers. Similarly, Electronic Associates, Inc., which ranks both as a major plotter maker and as the largest U.S. analog computer manufacturer, began making plotters before computers.

The modern plotter industry dates back to the late 1950's, thus predating the existence of many major computer firms. Since plotters depend on computer input, however, their use did not spread widely until a sufficient number of computer users developed the necessary sophistication and applications to create a demand for plotters.

Major Equipment Types

Three major types of plotting units exist today. The two most common ones are incremental and digital-to-analog plotters. Incremental plotters operate under computer instructions, each of which calls for the printing of a tiny segment of a line. Incremental machines usually feature a compact continuous roll feed and can achieve a high degree of speed and accuracy. They are also the most economically priced. However, they are less economical of computer time, for as many as several hundred computer instructions may be required for the drawing of a single line. The slower but highly accurate digital-to-analog plotters, also called drafting systems, are relatively slow, but they can draw entire lines at a time through conversion of digital data into analog representations. These relatively expensive devices are often flatbeds particularly adapted to automatic drafting applications.

The fastest unit, the cathode ray tube plotting system, is also the most expensive, costing from $100,000 to $300,000. This machine "draws" on microfilm photographically at speeds up to several hundred times faster than standard plotters. Its accuracy is, however, not as great as that of slower equipment.

The total market for all three types of plotters is estimated at about $36 million for 1967 by industry sources. Of this, the largest share, $15 million, is for incremental plotters. CRT systems follow with an estimated $11 million share of the

market. This figure reflects the systems' high cost rather than the number installed. Drafting system business this year is estimated at $10 million.

Competition in the Plotter Industry

There are only five major firms competing actively for the plotter market. These companies and their estimated share of the market are:

California Computer Products, Inc. (CalComp)	40%
Stromberg-Carlson Div. of General Dynamics	35%
Benson-Lehner Corp.	10%
Gerber Scientific Instrument Co.	10%
Electronic Associates, Inc. (EAI)	5%

These figures, based on dollar sales, do not reflect machine volume. Thus, CalComp, which specializes in small, inexpensive equipment, claims to have delivered 80% of plotters now in use. The reverse holds true for Stromberg-Carlson, which, since the introduction of its 4020 model in 1959, has led the field in costly CRT systems. Two other firms, not shown in the table, Milgo Electronics and the Universal Drafting Co. make specialized plotting equipment.

Among the plotter manufacturers, only Benson-Lehner manufactures all three types of plotters. The others tend to limit their production to one or two types as shown in the accompanying table.

Company	Incremental	Digital to Analog	CRT
Benson-Lehner	X	X	X
CalComp	X		X
EAI		X	
Gerber		X	
Milgo	X		
Stromberg-Carlson			X
Universal Drafting		X	

The growth rates of these markets are uneven. That for drafting systems, for instance, is the highest, presently averaging about 30% per year. It may, however, decline in this decade and be overtaken by that for incremental plotters, whose market is registering a 25% annual growth rate which it is thought will be maintained. Incremental plotters, being both the least expensive machines and those with the best long-term growth potential, represent the area in which competition is likely to be most active. This competition is a new feature in the industry. Previously, most products available had been sufficiently different to avoid direct price competition. This is no longer true and the two chief contestants appear to be CalComp and Benson-Lehner. The latter, whose competition was previously chiefly with EAI in the digital-to-analog area, has now moved to compete directly with CalComp through the introduction of a line of incremental drum plotters.

In the contest between CalComp and Benson-Lehner, the latter may have gained new aggressiveness through its recent takeover by University Computing Co. Previously wholly owned by UCG Instruments, Inc., itself a subsidiary of United Gas Corp., Benson-Lehner now forms the nucleus of the University Computing Company's new computer industries division. University is active in oil industry data processing, a major area of plotter application, and together with its subsidiaries and service centers, the parent company should provide a ready market for Benson-Lehner equipment. University plans to acquire other EDP manufacturing firms and these could bring substantial benefits in terms of increased equipment capabilities.

How Fast Will the Market Grow?

CalComp, the largest of the plotter manufacturers is also the one whose business has expanded most rapidly to date. President Kilpatrick claims that since 1962 the average yearly percentage sales increase of plotter products by CalComp has been 50% per year. He believes that the increase of the plotter population will far outstrip that of computers. Thus, by 1975 when there might be over 100,000 computers installed by U.S. manufacturers, the ratio of computers to plotters will, he foresees, have declined from the present 15-1 to less than 4-1. This growth rate would imply that by 1975 the annual plotter market would be worth over $125 million. The estimate has not met with universal agreement. Dallas Talley, former Benson-Lehner marketing manager and now Systems Engineering Laboratories, Inc. sales manager, predicts slower growth of the market to about $75 million by 1975. But even this would imply a doubling of the plotter market within the next eight years.

Unexploited Applications — Lower Costs

Market growth will largely come through development of new plotter applications fostered by lower equipment costs. For the latter, manufacturers look to the use of Large Scale Integration (LSI) circuitry components. Hardware represents a larger share of plotter costs than in the case of computers where it accounts for at most 35% of total expense.

New applications will be largely for business and will mainly involve the use of small, inexpensive drum plotters. These will be used for the many marketing, financial and administrative applications where computer output in graphic form is more useful and readily comprehensible than bulky computer print-outs. This market is still largely unexploited. In addition, new plotter applications are being developed for production applications. A system has thus been developed by CalComp to generate garment patterns of various sizes from the designer's original pattern. The proprietary program for the system, developed in conjunction with Catalina, Inc., a major bathing suit manufacturer, and a subsidiary of Kayser Roth, Inc., has received response from other apparel manufacturers. Such firms as Pendleton; Hart, Shaffner & Marx; Genesco; Warner Bros.; and Angelical Uniform have sent in patterns to be graded experimentally. The possibility of setting up a pilot service bureau to grade patterns commercially is now being considered by CalComp. Pattern-making can obviously be extended to the aerospace, metalworking and any other industries where initial layout of parts forms is required. Similar work is being done in England by Compugraphics International, Ltd. This service bureau operation offers an automatic pattern grading service, permitting production of a complete range of sizes using one set of dimensions. Future applications include the production of aircraft and motor contour drawings. Compugraphics uses German-made Zuse equipment, which is not presently available in the U.S.

The trend to plotter service bureau operations has just begun to spread. Plotter services are now provided on a contract basis only by plotter manufacturers and a handful of organizations on the East Coast. In addition, under an agreement between CalComp and General Electric, the GE commercial timesharing services have been expanded to support remote plotting operations by GE customers.

COMPUTERIZED INTELLIGENCE NETWORK IN SOUTH VIETNAM

Frederick Taylor, Staff Reporter
The Wall Street Journal
New York, N.Y.

According to computerized intelligence: The insurgents can keep on fighting at the present pace indefinitely . . . 14,000 men a month are added to their forces . . . and increasingly sophisticated weapons find their way into an increasing number of insurgent hands. . . . "It's not a pretty picture, but we think it is a realistic one."

SAIGON. — In a nondescript white concrete-block building on the outskirts of this capital city, an International Business Machines Corp. Model 1430 computer runs 24 hours a day grinding out one of this war-torn country's most valuable products: Military intelligence.

The building houses one of four intelligence centers scattered around Saigon. Using automatic data processing equipment, this intelligence setup — the biggest operated by the United States outside Washington and the biggest ever used against a single enemy — is now handling a massive assortment of facts and figures aimed at winning the Vietnam war.

More than 100,000 separate items are being added to the system's computerized files each month; a 60-ton haul of enemy documents seized last January is still yielding valuable information. Tens of thousands of IBM punch cards help keep tabs on the foe; they bear detailed identification of captured Communists and Vietcong suspects.

To man the operation, intelligence officers have built an organization that includes 1,100 Americans and Vietnamese in Saigon alone. Hundreds of them are trained in computer operations. One of the centers here manages to interrogate as many as 60 Communist prisoners or suspects at one time.

Tunnels and Arms Caches

Today, when a U.S. or South Vietnamese unit is going to move into unfamiliar territory, intelligence personnel can, by feeding data into a computer plotting system, show on a map what intelligence reports indicate are the sites of enemy base camps, arms caches and tunnel complexes, the location and condition of bridges and the location of dozens of other militarily important points. In one recent operation, more than 80% of the items plotted in advance on a map were found within a few meters of their map location.

Sometimes, though, even the best intelligence goes for naught — ignored by field commanders. In early May, the Marines were warned that the North Vietnamese were going to try to infiltrate and attack a Hawk antiaircraft missile site overlooking Danang in northern South Vietnam. Convinced their security was inpenetrable, the Marines apparently ignored the warning. In mid-May, North Vietnamese raiders slipped through, blew up 12 Hawk missiles, damaged three missile-launchers and wounded nine Americans.

If anything, accurate, comprehensive intelligence is considered even more essential in this war than in others. U.S. forces must operate constantly over territory infested with enemy agents and sympathizers. Military men naturally want constant collection, processing and evaluation of every shred of data about the country and the populace that might contribute to U.S. goals.

The More Paper, the Better

"Pieces of paper are to the intelligence officer what nickels and dimes are to the banker; the more you have, the better off you are," says soft-spoken Major Gen. Joseph A. McChristian, who has just finished a hitch as Gen. William C. Westmoreland's assistant chief of staff for intelligence. During the past two years, Gen. McChristian has built from next-to-nothing a skilled intelligence organization that employs thousands of people throughout South Vietnam.

(Reprinted with permission from *The Wall Street Journal*, June 15, 1967.)

The volume of material handled by the intelligence system is staggering. It comes from a variety of sources: Captured documents, interrogation of prisoners, tips from villagers, reports from province and district officials, aerial photographs, scouting patrols, secret agents and informers and questioning of defectors from the Communist camp.

The punch-card data on each captured Vietcong guerrilla or North Vietnamese regular includes his physical characteristics, military training and past movements and assignments — or at least as much of this information as can be obtained. Every Vietnamese suspected of belonging to the Vietcong is listed by name and aliases (which may number a half-dozen or more) and physical description. Intelligence people want to build a complete file on all known or suspected Vietcong members in South Vietnam and then track their movements. "That's the only way we can ever hope to discover them and smash the infrastructure," says one officer.

Further, by analyzing data and piecing together thousands of details, the intelligence men hope to detect patterns in the enemy's behavior that make it possible to locate his bases and thus defeat him in battle.

Field Intelligence

Intelligence work begins, of course, with fact-finding in the field. Each U.S. division or independent brigade has a 75-man intelligence detachment. In each combat operation, hundreds, sometimes thousands, of Vietnamese are rounded up: Innocent civilians, Vietcong, North Vietnamese regulars. It is the detachment's job to attempt to winnow out the innocent from the enemy, the civilians from the military. Some 20 men interrogate suspects, captured foes and deserters, seeking answers to such questions as whether the enemy plans an attack or where its headquarters are — answers of immediate import to U.S. and South Vietnamese forces.

Once the immediate tactical picture has been probed, prisoners who are ready to talk more fully or who appear to have considerable knowledge of enemy activities are sent to Saigon for further interrogation. The questioning of any one person may last only a few hours, or it may go on for months. Lt. Col. Le Xuan Chuey, the former operations officer of the 5th Vietcong Division, who turned himself in last August, still is questioned regularly, though he now has a full-time government job as director of a Saigon office that tries to encourage Communist desertions.

Enemy documents and other papers picked up by U.S. or South Vietnamese forces are sent to a special Saigon center where they are translated and studied, after which about 10% of the information is filed for future reference. Just the other day, investigation of last January's 60-ton haul turned up 25 pages of a speech in which Major Gen. Tran Do, a deputy commander of the Vietcong, asserted Hanoi's "right" to infiltrate 5,000 to 6,000 men each month into South Vietnam. He also made clear that Hanoi rather than the Vietcong's political arm, the National Liberation Front of South Vietnam, would be responsible for any peace negotiations that take place.

Sometimes captured documents yield material that supports the U.S. position in the propaganda war with the North. Recent translation of a paper captured last February bears out American contentions that the North Vietnamese and Vietcong have deliberately used various truce periods to resupply their troops. The paper, picked up in the Mekong Delta, was dated Dec. 31 and said in part: "To take advantage of the New Year truce, the rear section is organized to transport goods across the river on the night of 31 December." It went on to make assignments for the task.

By choice, all U.S. intelligence work in Vietnam is done on a joint basis with the South Vietnamese. "Our basic concept was that we ought to do our intelligence together," says Gen. McChristian. "The Vietnamese had the continuity, and we had the experience."

Security Breaches

He concedes, though, that such joint operations can permit security breaches. "In insurgency war, there's always a security problem," he says carefully, "and we've got to assume there are some leaks. But we think if there are leaks, they are about our estimates of the enemy's capabilities, which he already knows, and not about our plans." Nonetheless, U.S. field commanders frequently complain that enemy agents in the South Vietnamese ranks do tip off the Vietcong to forthcoming U.S. operations, enabling the foe to escape attack.

Gen. McChristian, who was Gen. George Patton's intelligence officer in Germany late in World War II, took over the job under Gen. Westmoreland in 1965, just after U.S. ground forces had been committed to battle. There was little information on hand and little organization. The South Vietnamese government's intelligence files were not only disorganized but many were missing as the result of the series of government upheavals that followed the death of Ngo Dinh Diem in 1963.

The general started building up an intelligence system that combined American and Vietnamese organizations with a group from the U.S. Military Advisory Command and the Vietnamese joint general staff. Military intelligence units from each country were attached to the other's military units. Military advisory groups were converted into intelligence detachments to interrogate prisoners and suspects, interpret photos and learn the enemy's battle organization.

Then Gen. McChristian set up his Saigon intelligence centers to exploit the material turned up in the field, training hundreds of Vietnamese and Americans to run the computer operations. ("When we started out, we had people who thought IBM stood for intercontinental ballistic missile," says an intelligence officer who struggled through the training period.)

Estimates of Intentions and Capabilities

Out of this effort, the "intelligence community" here has been able to come up with estimates of the enemy's intentions and capabilities. They are not encouraging to those looking for an early end of the war. Here's the picture seen:

The North Vietnamese high command no longer has hopes of an outright military victory, as it did in 1965 before the U.S. committed troops to battle. But Hanoi does not intend to scale down the fighting to a guerrilla-warfare stage. Instead, the Communists are prepared to fight a protracted war of attrition. They aim to wear down and dishearten the U.S., causing it eventually to withdraw and deliver South Vietnam into the Communists' hands. Some captured documents suggest Hanoi thinks this might happen by 1970, others that it won't happen for 20 years; in any case, Hanoi expects to fight for years at about the present level.

The enemy can keep on fighting at the present pace indefinitely. Despite high casualties — 190,000 killed since 1961, according to U.S. and South Vietnamese estimates — the North Vietnamese and Vietcong forces in South Vietnam today total 292,000 men, compared with 280,000 a year ago and 230,000 in 1965 when the U.S. entered the ground war. Infiltration of men from North Vietnam continues to run at 7,000 a month despite all U.S. efforts to cut it and may have increased in recent months. Another 7,000 men a month are recruited one way or another in the South. Increasingly sophisticated weapons continue to find their way into an increasing number of enemy hands.

"It's not a pretty picture," says an intelligence expert, "but we think it's a realistic one."

WORLD REPORT — GREAT BRITAIN

English Electric and Elliott-Automation Merge

The $400 million a year English Electric organization has been combined with the Elliott-Automation group. English Electric builds everything from nuclear power stations to giant turbines, infra-red controls, and fast military computers. Elliott-Automation (with over 100 subsidiaries) makes 4,000 different instruments in addition to their complete mechanical handling plants, chemical process plants, and other industrial systems, many based on a central control computer. Its turnover is above the $100 million mark.

The merger was something of a shotgun wedding celebrated under the auspices of the new Government organisation called the Industrial Reorganisation Corporation. The Corporation has been given $800 million — and instructions to go out and preach the wisdom of hanging together or hanging separately in this naughty modern world of vicious competition. The Corporation has blessed the merger with a medium-term loan of $42 million to help both companies expand still further.

While this move is not aimed solely at computers, its first major effects will be on the British computer market, and more particularly on the process automation side.

Elliott has a range of first-class process computers and is the major supplier of Eastern Europe, including Russia. English Electric has had its hands full with developing System-4 and making both hardware and software work.

It has not had the time to bring up to date its own small machines; and Marconi's advanced solid-state military Myriad is not the type of machine to use for heavy industrial applications. (Marconi is a fully-owned subsidiary).

At the same time, both companies have ideas for multiprocessor super number-crunchers, while Elliott's 4100 series has had a good reception for scientific work throughout the universities.

The two groups complement each other well. Elliott, with its 920M microminiature computer, is the only UK group to have penetrated the American market, mainly with navigational and head-up display machines for Corsair, C-5A, and a number of other advanced craft. Both groups have advanced transistor and microcircuit plants of their own and a big in-house market.

Where does this leave the rest of the market? International Computers and Tabulators still leads the computer market in Britain with a share of about 40 percent, followed closely by IBM. The new organisation probably has a 15 percent share.

Univac Inroads

Estimates of the market are difficult to make at the moment because of the inroads of Univac with multi-processor 1108 systems. The most recent Univac victory, and a considerable triumph for what is described by discomfited rivals as a "staid and elderly design," is the displacement of a 360/67 at C-E-I-R UK for their planned 400 terminal time-sharing service.

Only a few days before, ShellMex and British Petroleum announced planned installations of the Univac 1108's to the tune of at least $6 million. This was not surprising, since Shell International has already installed the Univac 1108, and British Petroleum fully owns C-E-I-R of Britain.

I met a leading member of Univac's software staff recently, and she explained that while many of the newer machines have circuits between three and five times faster than those of the Univac, they are not only too delicate but also rather badly served by their software, while their paging systems sometimes produce ludicrous situations in which the central processor has hardly any time to get down to work. She thought the British Government would be wrong to go for a super number-cruncher of highly advanced design — so many of these have fallen by the wayside. It would be far better to secure a comparatively small technical advance, but support it with superlative software.

Embargo Rules Bent

It is believed that hard words are still flying between the U.S. State Department and Britain's Ministry of Technology over the two 1905 computers worth $1.4M which ICT sold to Peking. Coming almost simultaneously with the sale by English Electric of third generation System-4 machines to two East European countries, it looks as if the COCOM strategic embargo rules are definitely bent. At the same time, recent American exports of computers seem to be limited to GE 400's built in France.

Problems in the Post Office Plan

The bill to give Britain's General Post Office the major data processing role in the country is having a slow and painful ride through Committee. This is not surprising because it would give the GPO a network of 20 large computers, and power to compete not only with the banks but also all the service bureaus. These 20 machines, each in the $1½M class, will be linked by powerful transmission systems, and are the heart of the National Data Processing Service. Any subscriber to the service would have a simple console which would hook in to this huge network for virtually any problem.

The biggest question mark over the whole of this ambitious scheme is personnel. Just as in the United States, good analysts and programmers here are at a premium and can command fantastic salaries compared with the rest of the business or scientific world. The change in Post Office status from a government organisation to a free enterprise one may help, but not much.

Another problem the Post Office faces is that while it is already providing some data transmission links, it has not yet established what system it will ultimately use in its own network. Users who might want to put their own computers on line to the Post Office would also face compatibility problems.

This problem has been put squarely in the manufacturers' laps by the Post Office, which considers that the problem will provide a powerful argument for standardization.

Ted Schoeters
Stanmore
Middlesex
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5. **If you are a data processing manager,** you'll have the ability to respond to sudden demands because of the computer's dynamic multiprocessing ability. You'll achieve full system utilization and high throughput, automatically scheduled and controlled by the computer itself. You'll have more time to manage people, and explore ways to serve your company's information processing needs.

In short, a Burroughs 500 System can help any company make a faster, better prepared response to customer needs, competitive moves, and a changing business environment.

For more information, see your Burroughs representative. Or write us at Detroit, Michigan 48232.

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ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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APPLICATIONS

CONNECTICUT CONGRESSMAN USES COMPUTERS TO KEEP IN TOUCH WITH CONSTITUENTS

When constituents of Rep. Donald J. Irwin (Conn.) had something to say recently about the way he represents them, they told it to an IBM computer. That was fine with the Congressman, who thinks modern data processing techniques are an excellent means for public servants to keep attuned to opinions back home.

When first elected to Congress in 1958, Irwin promised his first objective would be to keep his constituents informed of his activities through a newsletter which grew from an initial circulation of 2000 to a still growing 40,000. Response to items in the newsletters brought him many answers, but he felt the need for a more accurate appraisal of the thinking and feelings of the more than 500,000 he represents. Increasing the number of surveys, however, would make record-keeping in the standard manual way almost impossible.

With the help of the Computing Sciences Division of The Service Bureau Corporation, Irwin designed a questionnaire that covered virtually every current problem — from Vietnam to personal and corporate taxes; from expanded foreign trade with Communist countries to water and air pollution.

Computerized assistance alleviated the problem of sending a 17-point questionnaire to 170,000 postal patrons. Some 13,000 responses were returned, 50% more than any previous survey made. The Congressman was impressed by the notable increase in interest and in the quality of the responses. He said he was "surprised at the completeness of the answers — and at the many additional comments that were added to the survey."

And with computers, the complete report on the returns was ready in a matter of days, not weeks, and was more fully analyzed than any previous survey conducted by the Congressman. Rep. Irwin said that getting the complete reports in record time "gave me a closer tie with my constituents and helped me to plan my legislative program."

REMOTE COMPUTER WRITES SPECIFICATIONS FOR NEW BUILDINGS

Dalton-Dalton Associates, Cleveland, Ohio, has devised a system whereby they are using a remotely located computer to write specifications for buildings they design. (Specifications are instructions to the contractor detailing such things as the materials to be used and the method of installation.) This is believed to be a first in the architect-engineer field.

The new technique uses a master set of specifications that took Dalton-Dalton one year to complete. The master set has been stored in a computer. Through an IBM system called DATATEXT, it is used to write specifications for new buildings. Calvin B. Dalton, president, said, "Using a master set of specifications and a computer, we have been able to cut writing time by one-third and clerical costs in half."

The master set of specifications includes most of the materials and instructions that might be needed to construct any building. It is updated monthly to reflect new developments in the building industry and currently contains 85 separate sections. It uses the 16 division format of the Construction Specifications Institute.

DATATEXT is an IBM time-sharing system that enables a typist to communicate with a computer through a typewriter-like terminal. With DATATEXT, she can store all kinds of written information, change it at will and have it automatically printed at her command.

To prepare the specifications for a new building, an architect merely pencil edits a printed copy of the master set. Materials and instructions not needed are deleted. In this manner, more than 80% of a specification can be prepared. The balance is provided with original writing.

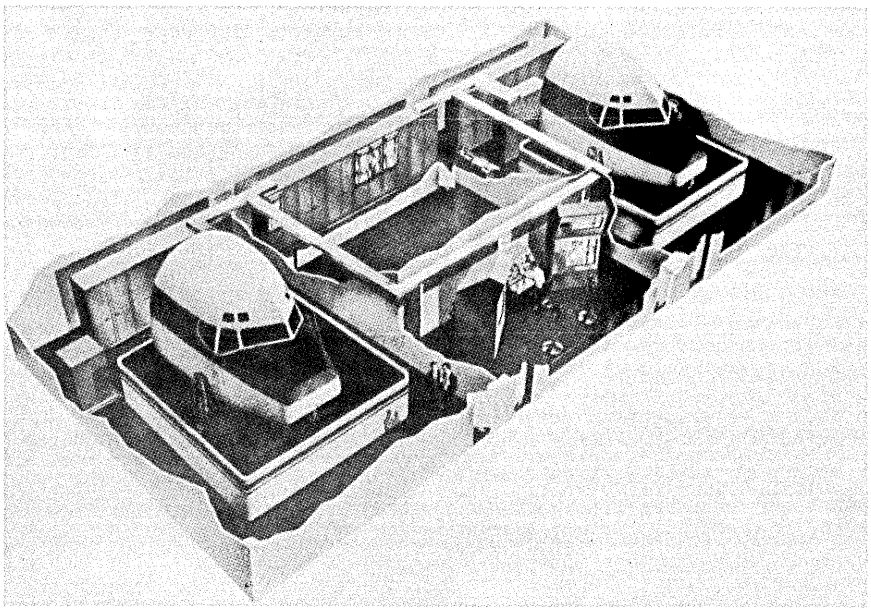
To prepare the final document, a secretary simply indicates the architect's changes on Dalton's IBM

2741 terminal, which transmits them to the computer. The computer accepts the changes and automatically assembles a tailor-made set of specifications for the new building. Reproduction masters can be printed out by the computer at the rate of five pages per minute.

COMPUTERIZED FLIGHT SIMULATION CONTROL

Shortly after the advent of the integrated circuit, Link's Digital Group began designing and constructing the world's first large-scale, all integrated circuit computer for flight simulation. In addition, this specially designed large-scale computer would be capable of running two simulator cockpits simultaneously, even if the two cockpits were of different aircraft.

The computer is called the GP-4 general-purpose digital computer, and it possesses a high-speed, sequential-access Bryant magnetic drum memory capable of storing permanently, 131,072 words of information. The GP-4 is the first operational, commercial computer where computing logic is entirely made up of monolithic microcircuitry.



— The two replicas of the Boeing 707 flight deck will operate from the single digital computing source, the Link GP-4 and a three-million bit Bryant Computer Products Drum memory.

The most recent shipment of the GP-4 Computer was to the Pan American World Airway's new automated cargo terminal at John F. Kennedy International Airport. This GP-4 Computer is used for dual cockpit 707-321B flight simulation. The two replicas of the Boeing 707 flight deck will operate from the single digital computing source, the Link GP-4. Both cockpits can be "flown" simultaneously with crews simulating different problems in each unit.

The GP-4 Computer used in this application is slightly smaller in size than the first digital computer used for flight simulation. However, it is three times faster and has more than twice the memory capacity. For this particular application, the GP-4 Computer utilizes a three million bit Bryant Computer Products Drum memory for all of its program storage. The GP-4 can perform 491,520 add-type operations per second.

Among the many flight characteristics that can be simulated in this training unit are: sink, rise, pitch up or down, and roll left or right. Indications of pre-stall, and rough air are also experienced. The flight crews are even subjected to the sensations of taxiing on a rough runway.

Engine sounds, slip-stream noise, air-conditioning and pressurization effects, as well as the noise that accompanies engine compressor stall, are audibly reproduced in the simulator through programming of the GP-4 Computer. In addition, sounds associated with nose wheel steering and the thump made by the main landing gear as the airplane leaves the runway are provided.

Flight crews can also automatically tune in any one of 500 radio navigation facilities that have been pre-programmed into the Bryant drum memory used with the GP-4 Computer.

A Bryant Computer Products, three million bit Auto-Lift Drum Memory is used with all GP-4 flight simulator computers. The Auto-Lift Drum is used primarily to store all flight characteristic patterns and for all computer program storage.

The Link Group is a division of General Precision Inc., and is headquartered in Binghamton, N.Y. The GP-4 was developed at Link's Western Development Laboratory in Palo Alto, Calif. At present, over 22 GP-4 Computer flight simulator installations are in use throughout all parts of the world.

ELECTRONIC "CAPTAIN" MANS BRIDGE OF MARINER V

A 12-pound electronic "captain" manufactured by TRW, Redondo Beach, Calif., mans the bridge of the Mariner V spacecraft as it loops to within 2000 miles of Venus. The Central Computer and Sequencer (designed by Jet Propulsion Laboratories and built by TRW Systems Group) functions on board the spacecraft in the same way that the captain gives orders to the helmsman, engine room and radio shack. The electronic equipment selects spacecraft operations, keeps time, and computes.

The CC&S commands operations in three important sequences of the 212.5 million-mile Venus mission: launch, midcourse, and cruise/encounter. Like an earth-born ship's captain, it also receives orders from its home port via radio.

During launch sequence it programs events from launch until the cruise mode is established, a maximum of 16 2/3 hours after lift-off. Electronic orders are passed to the spacecraft to unfold and extend the solar panels, to put the altitude control or stabilization system into operation, and to sight the star Canopus as a navigational aide.

Three commands are radioed from earth and "memorized" by the device for the midcourse maneuver sequence. These are necessary to alter the course of the spacecraft midway on its long voyage to Venus. During the cruising portion of the flight and planet encounter, the CC&S issues orders and then clocks the time

required to execute them in a series of actions similar to a ship approaching port. Commands during this sequence switch the telemetry transmissions to a slower rate and the transmitter to an antenna capable of radiating a stronger radio signal through the heavy Venusian atmosphere.

Nearing Venus, a "pilot" takes over in the form of the data automation system which begins the encounter sequence. Finally, telemetry is switched to a different mode for the transmission of recorded scientific data to Earth from the payload experiments carried aboard the spacecraft.

TRW duplicated the CC&S for the Mariner V after successfully building identical units with the same command functions for the Mariner IV. Also supplied by TRW were light-weight louver assemblies which control the temperature on six of the eight electronic compartments aboard the spacecraft.

COMPUTER "BROWSES" THROUGH NEW TECHNICAL LITERATURE

A computer system that "browses" through the new technical literature, and tells each scientist the latest developments in his particular field, recently began operating at Fort Monmouth, N.J., the U.S. Army Electronics Command announced. The purpose of the new automated system, called Selective Dissemination of Information (SDI), is to ensure that each scientist is continuously aware of the latest technical publications in his field, without having to spend hours each week in the library.

Twice monthly, a Burroughs 5500 computer sifts through thousands of newly published technical reports, articles, and translations. It then prepares for each scientist an individualized listing of new publications in any of 7144 areas of interest he selects. The listing, in the form of a booklet, is different for each subscriber, depending upon his technical interests. The computer-printed booklet gives the title, authors, source, data, and a descriptive abstract for each pertinent document discovered by the computer. Full copies of any document cited are sent to the subscriber by mail, on request.

The average subscriber selects about 20 subjects for his interest profile, and his semi-monthly booklet contains, on the average, about 25 citations. At Fort Monmouth, there are over 3000 potential users of SDI.

The SDI service is achieved by special arrangement with the Defense Documentation Center (DDC), which collects and indexes technical documents for Defense Department use. Is is one of the world's largest collection points for reports in science and technology. DDC sends Fort Monmouth a special computer tape twice a month containing a description of each new document it collects. The tape includes for each citation a "document profile" that describes the specific subjects covered in that document. These subjects are selected from the same 7144 descriptors used to prepare the Electronics Command (ECOM) user "interest profile".

About 20 other SDI systems, most of them with relatively small subscribership, are in operation in other Government agencies and in industry. The ECOM system, which is expected to serve as a model for an Army-wide SDI service, features low cost, simple ordering of documents, easy self-profiling, and use of the immense document resources of DDC by computer tape exchange. The ECOM Computation Agency prepared the computer programs and directs operation of the computer run.

MULTI-UNIT COMPUTER CONTROLLED PARTS WAREHOUSE FOR GM

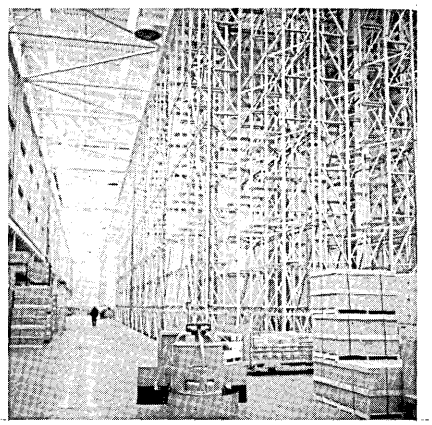
Westinghouse Electric Corp., Pittsburgh, Pa., has supplied an automatic, computer-controlled storage system for one of the world's largest warehouses. The system was installed for the Fisher Body Division of General Motors Corporation in Euclid, Ohio. The warehouse will be a key link in supplying warehoused standard parts to General Motors assembly plants across the country.

The mammoth warehouse — larger than two football fields and more than five stories high — contains 7830 storage locations for more than 4000 different automobile parts.

A Westinghouse Prodac 50 computer directs the systems' 15 stacker cranes, each capable of "pigeon-holing" loads weighing up to three tons.

As the parts are received at the Fisher Body Euclid warehouse, they are inventoried and loaded onto special wheeled racks. The racks are then hooked to an automatic driverless tractor which follows a cable buried in the floor to a programmed "stop" location in front of the storage cranes.

After the wheeled racks have been unhooked from the tractors, an operator positions the rack for crane pickup. A punched card accompanies each card, identifying the rack and its contents. When the operator inserts the card in a reader, the computer chooses a storage location most convenient for that particular load and directs the crane to insert it there. The storage information is then put on a memory tape by the computer for inventory purposes.



— Driverless tractor follows a cable buried in the floor to a programmed "stop" location

To retrieve a load, a card made from the memory tape is inserted in the card reader and the input process is reversed.

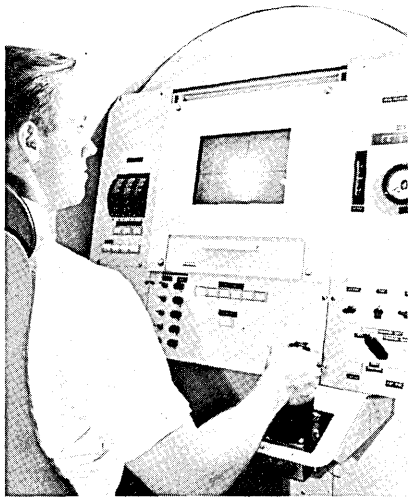
TELESCOPE AIMING SIMULATOR

Lockheed Missiles & Space Co., Sunnyvale, Calif., has announced the completion of a system that simulates telescope aiming tasks astronuats will be called on to perform on space missions of the future. NASA is currently studying several programs which would involve orbiting telescopes, including the Apollo Applications Program in which the Apollo Telescope Mount (ATM) will investigate solar phenomena.

The Lockheed simulation device is a computer-driven astronaut control station with a television display system which shows where and how well the telescopes, or cameras

in the case of the ATM, are aimed at various celestial bodies, sun spots, or other solar activity.

In simulating the ATM aiming, a Lockheed technician (shown in photo) in the control station moves the controls, and a computer adjusts the sun's image on the dis-



play screen to show how the ATM would react in space to those control movements.

Dr. Robert L. Martindale, who supervised construction of the system, explained that many points will be considered in building real aiming systems, including the necessity for astronauts to point telescope can camera mounts quickly and accurately.

COMPUTER TO SPEED LAW-MAKING FOR FLORIDA LEGISLATURE

An RCA Spectra 70/45, assigned a "front-row seat" in both the House and the Senate of the Florida Legislature, has the task of keeping track of all actions taken on more than 5000 bills scheduled to be introduced during the session. The computer has the capability of answering — within seconds — each of more than 4000 questions daily concerning pending legislation. Secretary of the Senate Edwin G. Fraser said the computer system electronically records every action on each bill and immediately distributes the information, upon request, to any or all of 27 inquiry terminals. (These terminals are located throughout the 130-year-old Capitol Building and its annex, the Holland Building, both located in downtown Tallahassee.)

Mr. Fraser explained that every action taken on a bill, from the time it is introduced in the legislative chambers until it is either passed or vetoed by the Governor, is entered into the computer through RCA Video Data Interrogators (VDI). Information is typed on the VDI by an operator and is recorded by a stenographer. Only seconds after this information is fed into the computer, it can be retrieved by lawmakers and their staffs, the Governor, the Cabinet, the press, lobbyists and visitors.

In addition to providing inquiry capability, the RCA computer each night prints a reference book on the status of all bills. This book, delivered to officers and key legislators each morning, contains bill status up to the end of the previous day's session, an index to all bills, a daily report on the previous day's activity, alphabetical listing of legislators, the bills which they sponsored and other pertinent information.

Technically described as an on-line, communications computer system, the RCA network is the first real-time computer system used for bill status referral. More significantly to the computer industry, it is the first on-line, communications computer system with third generation software and multi-programming capabilities in operation in the U.S.

Commenting on future plans, Secretary Fraser said the Florida Legislature eventually will store the entire text of every bill in the computer. "This will provide us with computerized printing of the Senate and House Journals and will greatly improve legislators' efficiency in writing and amending bills," he said.

ORGANIZATION NEWS

VARIAN DATA MACHINES, NEW VARIAN SUBSIDIARY

Varian Associates of Palo Alto, Calif., has announced that negotiations between Decision Control, Inc. and Varian Associates have been completed. Effective immediately, both Decision Control and Data Machines will operate as a subsidiary of Varian Associates, under the name Varian Data Machines. They will remain headquartered in Newport Beach, Calif. Robert W. Herman, Founder and President of Decision Control, becomes the new president of Varian Data Machines.

"The merger with Varian", said Mr. Herman, "will allow the new subsidiary to grow at a much faster rate than previously possible."

Varian Data Machines' most rapidly growing product area is the DATA/620-1 line of small to medium size general-purpose scientific computers. They also will market the VersaSTORE line of computer memory systems and the micro VersaLOGIC line of integrated circuit digital modules.

C&S ACQUIRES CCC

Computing and Software, Inc. (C&S), Panorama City, Calif., has announced the acquisition of Consumer Credit Clearance, Inc. (CCC) of Los Angeles, Calif. Norman E. Friedmann, President of C&S, said the acquisition of CCC will add, at its current sales level, approsimately $1.4 million in profitable commercial sales to C&S' annual revenues and provide the company with further penetration into non-government markets. Financial details of the acquisition were not disclosed.

Friedmann said the newly acquired company will operate as a wholly-owned subsidiary and will be a major segment of the company's Western Computing Operations headed by Donald L. Drukey, Vice President of C&S. The current CCC management will be maintained.

SYSTRON-DONNER ACQUIRES DATAPULSE, INC.

At a special meeting in mid-June, stockholders of Systron-Donner Corp. (AMEX, PCSE) voted to acquire Datapulse, Inc., Culver City, Calif., it was announced by G. H. Bruns, Jr., Systron-Donner president.

James S. Johnson, president of Datapulse, also announced approval of the acquisition at a simultaneous meeting of Datapulse shareholders.

The transaction, based on the exchange of one share of Systron-Donner for 4½ shares of Datapulse, may involve up to 172,282 Systron shares, based on future performance of Datapulse. Initially 111,505 shares will be issued.

Datapulse will be operated as a wholly-owned subsidiary of Systron

with the Datapulse top management — James S. Johnson, president, and Stanley S. Keller, financial vice-president and treasurer — continuing in their present positions, Mr. Bruns said.

CONTROL DATA CORPORATION ANNOUNCES FORMATION OF CONTROL DATA KOREA

Mr. William C. Norris, President of Control Data Corporation, Minneapolis, Minn., has announced the formation of Control Data Korea, a wholly owned subsidiary of Control Data Corporation.

Control Data Korea, which will be located in Seoul, will be engaged in the marketing and servicing of Control Data computers in Korea as well as the manufacturing of computer components.

Mr. Ken Wallis will be in charge of the new manufacturing operation in addition to his present responsibility as Managing Director of Waltek, Limited of Hong Kong, another wholly owned Control Data subsidiary engaged in similar work.

LAWRENCE SYSTEMS MERGES WITH C.G.S. SCIENTIFIC CORP.

C.G.S. Scientific Corporation, Southampton, Pa., has announced that on June 30th Lawrence Systems Corporation, Willow Grove, Pa., merged with C.G.S.

Lawrence Systems, which manufactures computer controls for materials testing and industrial processes will be operated as a division of C.G.S., which also is active in this field. In addition, C.G.S. Scientific manufactures chambers and instrumentation for the biomedical and aerospace industries.

NEW CENTER ANNOUNCED BY DR. DOXIADIS AND SDC

Creation of a major center for applied research and training in operational problem-solving for the American city was announced jointly in Athens, Greece, by Dr. Constantinos Doxiadis, international urban authority, and in Washington by the System Development Corporation (SDC), a U.S.-based research and development firm.

The new organization, to be known as the Doxiadis System Development Center, will be based in Washington, D.C. Chairman is Dr. Doxiadis, president of Doxiadis Associates International, Athens, Greece. Vice chairman is Dr. Thomas C. Rowan, vice president of SDC.

Principal objective of the new Center, spokesmen said, is to contribute to improved operation of the contemporary American city and to better development of future cities. The Center will pursue a long-range, continuing study of the operational problems of the American city and will create a training facility for officials and others concerned with the operation of a city as well as the direction of its future.

Staffing the Center will be leading scientists from the two firms. They include specialists in town planning, transportation, engineering, computer sciences, economics, mathematics, geography, sociology, statistics and psychology.

The Center will work with government agencies, universities and other educational institutions, public utilities, business and industry, in attacking economic, social, administrative, technological and cultural problems of urban areas. Special emphasis will be placed on conservation of human and natural resources, safety and security, and satisfactory operation of the city's services.

UCC PURCHASES BENSON-LEHNER

University Computing Company, an international computer services organization headquartered in Dallas, Texas, has purchased the Benson-Lehner Corporation, Los Angeles manufacturer of peripheral equipment for computer systems, and Benson-Lehner Ltd. of Southampton, England, it has been announced by Sam Wyly, president of University Computing.

Benson-Lehner, a 16-year old specialist in input and output devices for use with computers, and Benson-Lehner Ltd. were formerly subsidiaries of UGC Instruments, Inc., a subsidiary of United Gas Corporation. Terms of the purchase were $3.3 million cash, Mr. Wyly said.

"With the acquisition of the Benson-Lehner companies, University Computing has formed a Computer Industries Division, which is expected to seek other acquisitions," Mr. Wyly continued. "Manufacture of computer-related equipment is an important new field for UCC, which is currently developing terminal systems for remote users of UCC computer utilities."

Robert G. Dee has been named president of Computer Industries Division, which will be headquartered in Los Angeles. Andrew S. Huson, president of Benson-Lehner Corporation, will continue as chief officer of that company and Arthur F. Appleton will continue his responsibility as managing director of Benson-Lehner Ltd.

COMPUTING CENTERS

GE ADDS REMOTE PLOTTING TO TIME-SHARING SERVICE

The General Electric Co. has expanded the "conversational" features of its nationwide computer time-sharing service to accomodate remote digital plotting equipment manufactured by California Computer Products, Inc., of Anaheim, Calif.

The first remote plotting to be available through commercial time-sharing computer centers, it enables engineers, scientists, businessmen, and students to obtain immediate solutions to computational problems in both graphic and typewritten form without having to leave their offices.

Pictured here is the Model 33 teletypewriter (left) and the CalComp Model 565 plotter. Housed in

the stand under the plotter is a CalComp Model 210 controller which monitors all incoming data from the

GE computer center and directs it to either the teletypewriter or plotter.

According to E. L. McCleary, manager of marketing for GE's Information Service Department, the combined time-sharing service with plotting is locally available in most metropolitan areas throughout the country.

The CalComp system consists of a Model 210 Remote Plotter Controller and a standard CalComp 500-series plotter. The software needed to operate remote plotters was developed by CalComp and now is available from all GE Time-Sharing computer centers. The leased or purchased equipment operates with the same leased teletypewriter terminal used by subscribers of GE's time-sharing service to "talk" with a distant computer.

SAVINGS & LOAN ASSOCIATIONS IN FOUR-STATE AREA LINKED TO NEW $3.6 MILLION CENTER

Savings and loan associations in a four-state area are being linked to a $3.6-million computer center opened in Cleveland, Ohio, by Champion Services Corporation. John Hall, Champion Services president, noted that tellers at more than 40 financial institutions representing $2.2-billion in assets will use the center to handle all transactions of their savings and mortgage loan customers.

Terminals, equipped with keyboards, are installed at teller windows and linked via telephone lines to two IBM System/360 Model 30s at Champion's computer center. Two additional computers, Model 40s, are being added this summer.

Mr. Hall said, "some 300 IBM 1062 remote teller terminals will be in use by our customers in Illinois, Indiana, Ohio and Pennsylvania by the end of the year. Champion Services will open additional computer centers in Chicago, Indianapolis and Pittsburgh," he said. "Until then, customers in those cities will be serviced by the Cleveland center."

While the majority of the firm's customers are savings and loan associations, they also do payroll accounting and inventory control for a number of manufacturers. In addition, they prepare the student report cards for Lake County as well as their class scheduling and school registration lists.

EDUCATION NEWS

GRADUATION CEREMONIES FOR ELEVEN VISUALLY HANDICAPPED COMPUTER PROGRAMMER TRAINEES

Eleven visually handicapped computer programmer trainees received diplomas last June at graduation ceremonies marking the successful completion of nearly a year of intensive study. The course, first of its kind on the West Coast, was conducted by System Development Corporation (SDC) for the California Department of Rehabilitation.

The nine-month course involved approximately 120 classroom hours per month at a rate of six hours per day. The curriculum developed for the course contains significant portions of SDC's standard employee training program and is designed to prepare the legally blind student for a programming career in either a scientific or commercial environment.

The graduates are qualified to enter the field as computer programmers, and with a minimum of on-the-job training, will be able to design, test and implement programs to solve problems given them by a customer or employer.

SDC has conducted computer programmer training programs since the late 1950s, and conducts ongoing programs for employees, members of the Armed Forces, and offices of state and local governments.

CONTROL DATA INSTITUTE ESTABLISHED IN BOSTON

William C. Norris, Chairman of the Board and President of Control Data Corporation, Minneapolis, Minn., has announced that the Company has established a Control Data Institute in Boston, Mass., to serve that city's greater metropolitan area and northeastern United States.

The new Institute is devoted exclusively to training computer programmers. Courses are offered to the public in both day and evening classes on a tuition-paying basis.

Programming Technology Courses are designed for individuals having a high school education, or equivalent thereof, and who have had no previous experience in computer programming. Norris said he expects that these courses will be of especially high interest to many individuals who are seeking opportunities to change their present careers, as well as those who wish to begin their careers in the computer industry.

Courses in Advanced Programming and Analysis will be offered to persons who have an education beyond high school or who have had previous experience or training in computer programming. These courses will train students to perform problem-solving analyses and to write the programs required to run these problems on the computer.

Control Data Institute students in Boston will use a full complement of Control Data computing equipment in their course work. Enrollment will begin immediately with classes scheduled to begin this fall.
(For more information, designate #41 on the Readers Service Card.)

UNIV. OF PENN'S SIXTH ANNUAL COMPUTER-MATHEMATICS SCIENCE PROJECT

Ninety-two high school students and 14 teachers from Delaware Valley schools now are learning about computers at the University of Pennsylvania's sixth annual computer-mathematics science project. The 106 participants, selected from over 1500 applicants, are spending eight weeks studying mathematics and computer techniques. They are divided into basic and advanced groups.

The project, a cooperative venture of the University's Moore School of Electrical Engineering, Graduate School of Education, and Computer Center, is being supported by a $44,885 grant from the National Science Foundation and by IBM Corporation, which donated two IBM 1130 computers. The non-credit summer program is directed by Dr. S. Reid Warren, Jr., assistant vice-president for undergraduate engineering affairs and by Daniel Ashler, assistant director for user services at the University Computer Center. Charles Dur of the Moore School staff is assistant director.

The basic course which includes five hours of classes and "hands-on" lab work each weekday, covers number theory, abstract algebra, switching algebra, linear algebra, formal logic, as well as computer programming and information processing.

Sixty-six students and 13 teachers are enrolled in the basic course.

The 27 participants in the advanced course will study computer applications, including game theory, probability, and the design and implementation of computer languages. In their work with computing systems they will study current technology as well as various theoretical problems.

A special feature of this year's program is the use of a new computer program and language devised by a student from last year's basic course. Eighteen-year-old Norman Wattenberger, a former Radnor High School student, spent two months working out SIM30, a program which he says is "easier to learn and more logical" for beginning students. Like many graduates of the basic course, Wattenberger has returned to the project this year as a member of the advanced group.

COMPUTER RELATED SERVICES

TICKETRON CORP. COMPUTERIZED TICKETSELLING NATIONWIDE NEXT YEAR

James R. Sarver, formerly project officer, launch instrumentation, for the Apollo program of the National Aeronautics & Space Administration, has been elected executive vice president and chief technical officer of Ticketron Corporation, Fort Lee, N.J., it was announced by Charles W. Kallman, chairman and chief executive officer.

The company is installing a system whereby tickets to cultural, theatrical and sports events will be sold by computer on a nationwide basis, which is expected to be fully operational by late 1968. The firm has sales offices in New York, Los Angeles and other major cities.

Mr. Sarver, whose responsibility at NASA was the design, development and operation of ground-based instrumentation and communications systems for the Apollo program, has designed the new ticket distribution system, which will be dependent upon a bank of central processing equipment, nationwide communication facilities and a family of ticket-selling terminals.

The system will not only reserve a seat for a customer, but also will print the ticket in one second as he watches, thus eliminating the pre-printing and storage of tickets for public attractions.

Under the plan, theatres, stadia, arenas and concert halls will have their seating inventories programmed directly into a central computer at the company's headquarters. Hundreds of "satellite" or remote manned Ticketron entertainment centers, as well as conventional box offices, will perform the function of distributing tickets and filling the seats of places of entertainment.

With the new system, the public will have the convenience of buying tickets at regular box office prices, plus a nominal service charge, at the Ticketron centers. Orders from customers could be taken up to one year in advance, whether placed by individuals, subscription purchasers, theatre party groups or ticket brokers.

NEW PRODUCTS

Digital

GE-420 TIME-SHARING SYSTEM

The first in a new "family" of General Electric time-sharing computers has been announced by Vern S. Cooper, manager of the General Electric Information Systems Marketing Operation. The GE-420 time-sharing system has many of the features of GE's GE-265 time-sharing system plus many improvements. The new system, for example, has the ability to permit two programs to reside in core, providing multi-programming in a time-sharing environment.

The medium-scale GE-420 can be used as a powerful batch processing system for business data processing and scientific/engineering applications when not being utilized for time-sharing, Mr. Cooper said. This means that the system, when not dedicated to time-sharing, can handle overloads from other data processing systems.

The GE-420 time-sharing system will handle 30 communications lines concurrently. As many as 300 people can use the GE-420 in normal time-sharing operations, since experience has shown that this number of communications lines normally can serve more than 100 remote terminals and each terminal usually can serve the needs of three or four individuals. A password technique incorporated into the new system allows confidential data to be protected against unauthorized or accidental disclosure.

The GE-420 uses an extended form of the BASIC computer language, first developed by Dartmouth college and used on the GE-265 system. Present time-sharing users can move up to the medium-scale GE-420 easily and without retraining. For the scientific/engineering user, FORTRAN will be available for the GE-420 during the first quarter of 1968, Mr. Cooper said.

Hardware requirements for the GE-420 include a 32K GE-415 central processor, a 16K DATANET-30® communications processor and a DSU-204 disc storage unit. First deliveries of the GE-420 will be made in the last quarter of 1967.
(For more information, designate #42 on the Readers Service Card.)

Newsletter

MULTI-PURPOSE COMPUTER FOR SPACECRAFT, AIRCRAFT

A new multi-purpose computer compact enough to serve as a self-sufficient data processing center aboard aircraft or spacecraft has been developed by RCA for the U.S. Air Force. The computer occupies 3.1 cubic feet of space and weighs only 120 pounds, yet is capable of performing a wide range of data processing operations that previously required computer complexes many times its size.

Designated VIC, for Variable Instruction Computer, it has been under development since 1965 at RCA's Aerospace Systems Division, Burlington, Mass., under contract to the Air Force's Avionics Laboratory, Wright-Patterson Air Force Base, Ohio.

A key feature of the VIC computer, explained Edwin H. Miller, Manager, RCA Aerospace Computer Applications, is the RCA-conceived variable instruction technique. Mr. Miller said variable instruction enables the computer to electrically alter its instruction repertoire to perform a multitude of data processing functions. This allows a programmer to vary the source of information fed into the computer, the function performed on the information and the destination of the results.

Among the VIC's design features is the extensive use of integrated circuits to reduce the number of components and interconnections with a resulting increase in reliability. The computer also employs redundancy and a type of modular construction in which each major functional unit has been made as nearly independent of other units as possible. The VIC also can check itself and pinpoint trouble areas.

The VIC also offers a method called "graceful degradation" to prevent catastrophic failure. With this technique, made possible by the computer's flexibility, assurance is high that the machine will continue to operate even with a malfunction in one of its integral units or subsystems.

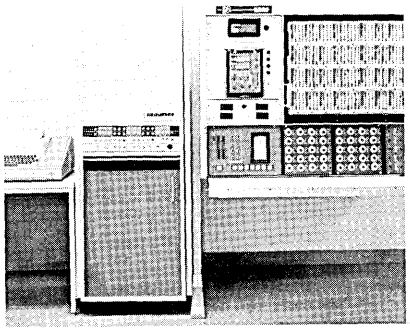
Although the VIC in its basic unextended version has an 8000-word memory, the computer can be expanded to a 32,000-word memory. In this configuration, it would occupy 4.4 cubic feet and weigh 175 pounds.
(For more information, designate #43 on the Readers Service Card.)

Analog

GPS 200T ANALOG COMPUTER

GPS Instrument Co., Inc., Newton, Mass., has introduced the new GPS 200T General Prupose Analog Computer with all solid state construction and unequalled bandwidth capability. Based on a fullscale amplifier bandwidth from d.c. to over one megacycle per second, the new computer operates from real time (slow speed) to frequencies higher than has previously been possible.

The computer also has all electronic mode control, individual integrator timescale and mode selection, push button address, and the incorporation of digital logic modules for iterative and hybrid operation. A master clocking system with precise thumbwheel timing selectors permits operation at repetition rates from 10 microseconds to 100 seconds display time. Two different repetition rates may be used simultaneously.



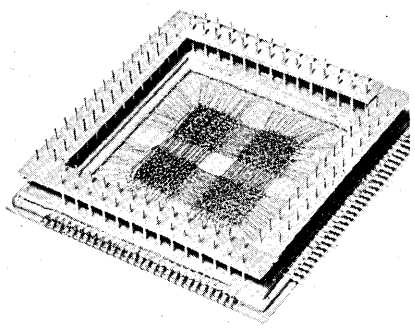
The GPS 200T is claimed to differ from other compact computers in that it is designed for greater expansion and for highest possible performance in real time and repetitive modes. Although furnished in a compact, desk top size cabinet, the GPS 200T is expandable to a complement of approximately eighty computing elements.

Because of its speed, entire output cruves may be displayed on scopes at eye persistence frequencies. This is a particular boon in research and exploratory projects because of the ease of observing behaviors while changing parameters. The firm expects especial interest will be shown in the educational, research, and bio-medical fields.
(For more information, designate #44 on the Readers Service Cards.)

Memories

PLUG-IN MEMORY PLANES SPEED SYSTEM ASSEMBLY

A new core memory storage plane developed by Ferroxcube Corporation, Saugerties, N.Y., features both low cost and substantial saving of assembly time. Called "Platrices", they are expected to find wide application in memory systems for desk-top business machines, digital instrumentation and many types of control equipment.



A stack of "Platrices" is mounted on a printed circuit board as simply as a transistor or other component. Connection pins at the bottom of the stack are pushed through the board and these leads are then soldered in the usual manner.

Low cost of the "Platrix" itself is achieved by special construction utilizing frames of glass-epoxy laminate instead of the expensive cut frames of conventional planes. For high resistance to shock and vibration, the cores are fixed to a base plate of the same material by a special lacquer.

Stacks of up to four "Platrices" can be furnished with series connected drive lines terminated in the plug-in connections at the bottom of the stack. Low drive currents (190 ma) allow use of simple drive and selection circuits. The planes are wired in 4-wire coincident current scheme.

"Platrices" are available in 8 standard configurations with bit capacities from 256 to 1024. Non-standard sizes can be supplied on special order.
(For more information, designate #46 on the Readers Service Card.)

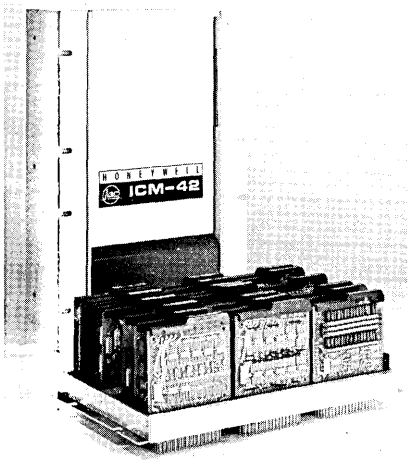
HONEYWELL ADDS ICM-42 TO CORE MEMORY LINE

Honeywell's Computer Control Division in Framingham, Mass., has introduced a low-cost fast core memory for use in communications, display, telemetry, code conversion, machine tool control and digital buffer applications. The new ICM-42 is designed for systems with moderate-to-high data rates requiring buffering of 1024 to 2048 words.

Full cycle time is 1.5 microseconds and access time is 700 nanoseconds. The self-contained system, available in capacities of 2048 words and 1024 words of 12 bits per word, includes address and information registers, internal timing and control, sense amplifiers, selection switches and a cooling unit. Operating temperature range is 0 to 50°C.

All circuitry and the core stack are packaged on removable printed circuit logic modules for easy access and maintenance. Both mechanically and electrically compatible with Honeywell logic modules, the ICM-42 uses integrated circuits for logic, addressing, decoding, control, line driving and sensing functions.

The compact memory is available in two mechanical packages. The system may be packaged in a set of six small connector planes (shown front in photo) for use in a drawer of digital logic circuitry,



or as a separately-housed, self-contained memory unit designed for rack mounting (rear of photo). The pluggable core stack and other circuitry are accessible from the front of both units.
(For more information, designate #45 on the Readers Service Card.)

Software

COMPUTER PROGRAM DEVELOPED FOR MEDICARE REIMBURSEMENT

The National Cash Register Company, Dayton, Ohio, has announced a "CARES" program for its 315 series of computers which will enable hospitals and other medical institutions to choose the best cost-finding and reimbursement method for federal Medicare reimbursement. CARES is a packaged program available to all NCR 315 users or to medical institutions through NCR data processing centers. It is believed to be the first program of its kind to be developed in the computer industry.

Medicare reimbursements are based on the cost of services rendered. The NCR program provides for allocation of non-revenue departments against revenue departments in order to reflect reasonable costs in the revenue-producing departments. The differing reimbursable amounts are then calculated by the program according to the methods available.

According to law, institutions must submit a report of cost-finding to the authorized federal agency before settlement can be made, using one of several allocation methods to arrive at final cost figures. In the final analysis, there are six possible answers from which to choose on reports to the federal agencies.

CARES program service will be available at NCR data centers for a flat fee per processing, NCR said, with no limit to the number of processings per year. The final figures for all methods are returned to the hospital within five days after receipt of the input form. (For more information, designate #45 on the Readers Service Card.)

Data Transmitters and A/D Converters

NEW TELETYPE PRINTER OPERATES AT 150 WPM

The ability to operate at 150 words per minute (15 characters per second) and print 128 graphics are key features of the new Model 37 KSR (Keyboard Send-Receive) Set introduced by Teletype Corporation, Skokie, Ill. The device is the first in a full line of data communications equipment and is designed to use the complete U.S.A. Standard Code for Information Interchange (USASCII). It also can be used as a computer input/output deivce, and has applications in such office routine as the preparation of sales orders and other business forms.

The machine can print in both upper and lower case letters. The letters, numbers, and symbols on the keyboard are arranged similar to those on a standard typewriter. To repeat a character, the key is simply depressed and held below the normal "down" position.

Designed to utilize an 8-level code that includes "even" parity, the Model 37 KSR also can be arranged to operate on 5, 6, or 7-level code. The keyboard provides parallel output and, like the printing mechanism, can be arranged to meet most code requirements up to eight levels. The output is serialized by an electronic distributor. (For more information, designate #48 on the Readers Service Card.)

UNISCOPE 300, A VISUAL COMMUNICATIONS TERMINAL

A visual communication terminal, the UNISCOPE 300, designed for instantaneous viewing of computer-stored information, has been developed by Sperry Rand Corporation's UNIVAC Division, Philadelphia, Pa. Typical applications for the device include provision of up-to-the-minute information for businessmen on all facets of their operations, expediting of travel reservations, and faster customer service at teller's windows in banks.

Basically the equipment consists of a keyboard with 61 keys, a cathode ray tube display screen and an associated control unit. The screen has a 10" x 5" flicker-free viewing area. Sixteen lines of information with up to 64 useful characters in each line, totaling 1024 characters, can be presented at any one time. Clear definition of the characters is aided by a 1.8 microsecond core memory and computer-type digital logic circuits.

In operation, an input or inquiry message for the computer is typed on the keyboard. Each character is immediately displayed on the screen so that the message can be visually verified before being

transmitted to the computer. Editing capabilities enable an operator to insert or delete any line on the screen. To each query, an immediate answer will be received from the computer. Many diggerent queries and replies can be shown concurrently. For purposes of comparison and analysis the screen can be split in half or into other segments.

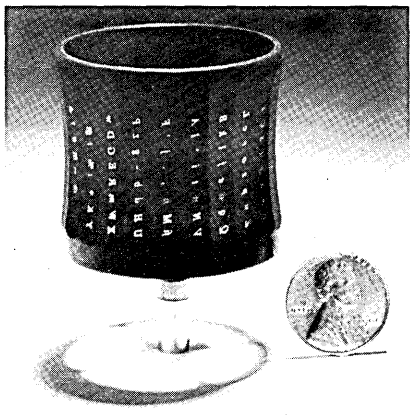
The device is suitable for use as a self-contained unit or in a multi-station version providing up to 48 keyboard displays directed by one control unit. Each UNISCOPE keyboard operates independently of any other keyboard.
(For more information, designate #49 on the Readers Service Card.)

Input-Output

TWO HIGH SPEED PHOTOTYPESETTERS BY FAIRCHILD GRAPHIC EQUIPMENT

Two high speed phototypesetters that automatically set quality type for newspaper, commercial and book printers have been announced by Fairchild Camera and Instrument Corporation, Plainview, L.I., N.Y. The new equipment, designated PhotoTextSetter® Models "2000" and "8000" are the first in a new family of phototypesetting machines.

PhotoTextSetter "2000" sets up to 18 newspaper lines of type per minute and is capable of producing 10 sizes ranging from five to 14 point from one type font. Each font contains two styles of a type face, such as roman and italic or roman and bold.



Type is produced by PTS "2000" with an hourglass-shaped font (shown above) that contains 216 characters, numbers and punctuation symbols. The computer sends positioning instructions to the font and optical system for the selection of characters during exposure.

An entirely new principle of non-sequential font scanning is used by PhotoTextSetter "8000" to produce up to 80 lines of type per minute for line measures up to 15 picas. It is capable of setting six sizes ranging from five to 14 point and can mix two sizes of two type faces in a single line.

Rectangular font segments mounted on the surface of a font carrier are used to set type on the "8000". Each segment contains six sizes of a character, number or punctuation symbol. There are 288 characters, numbers and punctuation symbols of each size, giving the machine 5608 character positions. This enables the machine to hold two complete type fonts.

A variety of type faces for newspaper, commercial and book printing will be available for both PTS models. Delivery of PhotoTextSetter "2000" and "8000" will begin in the third and fourth quarters of this year, respectively.
(For more information, designate #50 on the Readers Service Card.)

SANDERS 720 DATA DISPLAY SYSTEM

A high-speed electronic system which eliminates the need for reams of paper and time-consuming record keeping has been demonstrated by engineers of Sanders Associates, Inc., Nashua, N.H. During the "paperless" transaction, an employment application form was transmitted over telephone lines from Nashua, N.H. to Boston, Mass., displayed on a television-like screen, filled in electronically and the new data transmitted back to Nashua for computer storage, all in a matter of seconds.

Instead of paper, the Sanders system employs an 8½ by 11 inch television-like screen which displays computer-stored data as well as information being entered into the computer by the display operator. Unlike typed or written copy, the electronic "page" requires no erasures. The display operator can add, correct or delete data at will merely by typing on a keyboard. An editing feature enables words, sentences or even paragraphs to be inserted in the middle of displayed information and the text automatically opens up to make room.

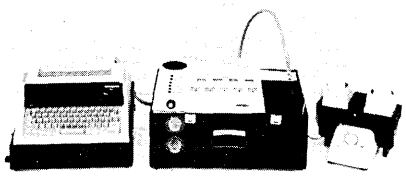
The display terminal, called the Sanders 720® Data Display System, can be located near a computer or thousands of miles away. When the displays are employed at remote locations, they are linked by the DATA-PHONE which transmits high-speed, bit coded data over regular telephone lines.
(For more information, designate #55 on the Readers Service Card.)

MAUCHLY-DATAPORT PORTABLE TERMINAL

The Mauchly-DATAPORT®, from Time Sharing Associates, Inc., Hartsdale, N.Y., is designed for principal use as input/output equipment interfaced with a remote computer system via a standard voice-grade telephone line. Data are transmitted from a keyboard at transmission rates up to 10 characters per second; data are received via the telephone equipment at the same rate and printed on a paper form. Transmission and reception may be performed in either full- or half-duplex mode.

DATAPORT is a completely integrated package. It is not simply a teletype machine connected to a coupler; rather it interfaces acoustically to any standard telephone to provide, in two lightweight luggage-like cases, all of the features normally associated with a teletypewriter, with the added advantage of complete portability.

The PT-1 teleprinter is contained in one of the two Kydex® luggage-like containers; the other contains the PC-1 electronic control circuitry and the T1-1 audio coupler. A separate, detachable



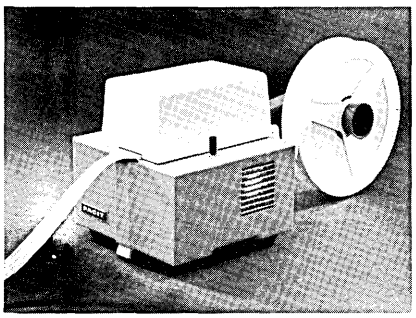
cable for each module connects the PT-1 and the T1-1 to the PC-1 control module. A third cable — a standard power cord — plugs into any domestic 120v 60cps power outlet.

DATAPORT serves two distinct areas of the data-processing community: as an end-user tool, it is used by scientists and students for office and home use; as a sales tool, it serves as a demonstration device for marketing a time-sharing service.
(For more information, designate #54 on the Readers Service Card.)

POTTER INSTRUMENT MARKETS FACIT TAPE PUNCH

Facit's PE 1500 Tape Punch now is being offered in this country by Potter Instrument Company, Inc., Plainview, N.Y. Potter has a joint marketing agreement with Facit AB of Sweden, whereby paper tape equipment will be sold in the U.S.A., Canada and Mexico through Potter's marketing organization.

Facit's PE 1500 Tape Punch is recommended for increased computer output, data transmission, recording of laboratory data and industrial measurements, and duplication of tapes.



The fully transistorized, electronically synchronized PE 1500 has electronic control, is convertible for 5, 6, 7 or 8-track tape, and punches up to 150 characters-per-second. An automatic motor shut-off contributes to long motor life and allows for cintinuous operation 5 seconds after the last character is punched. With a possible choice of 256 mark combinations, multiple data blocks can be marked off. The device is not limited to a single grade and thickness of paper tape, but can handle various materials, including plain and metallized Mylar.

Facit's PE 1500 Tape Punch requires only 180 watts of power for a full-load operation, and is easy to connect — input regiater and wide voltage range for input signals simplify installation.
(For more information, designate #53 on the Readers Service Card.)

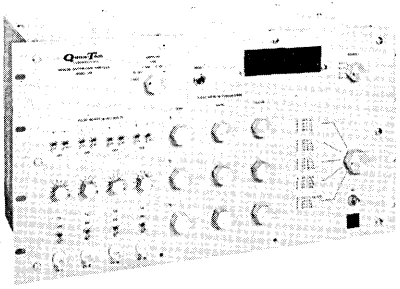
DATA PROCESSING ACCESSORIES

MODEL 318 DATA TRANSMISSION INTERFERENCE ANALYZER

Quan-Tech Laboratories of Whippany, N.J., has announced the development of its new Model 318 Data Transmission Interference Analyzer. The purpose of this device is to check transmission lines for suitability to relay coded data, and determine the probability of errors at the receiving end if data is transmitted over the line.

Problems associated with coded data transmissions are mainly cross modulation in the form of interference pulses being imposed on the data pulse train. These extraneous pulses are received at the repeater units, converted, treated as data information and restored to the same transmission proportions as the data pulse train. Therefore at the final receiving station the information can be appreciably different from that originally transmitted. Model 318 will analyze from one to four data transmission channels for interference which could be erroneously interpreted as data.

Basically the instrument measures the amplitude and width of impulses occurring in a channel and counts the number of times that they fall within certain amplitude and/or width limits. The data is stored in memory banks and presented on a four digit visual readout or to a printer.



Four separate amplitude threshold channels and four adjustable pulse width channels may be switched in various combinations to measure either amplitude alone, width alone, or both together. Frequency response is DC to 15 MHz, threshold sensitivity is 1 to 100 millivolts, and channel widths are adjustable from 0.1 to 99.9 microseconds.
(For more information, designate #57 on the Readers Service Card.)

DU PONT ANNOUNCES NEW MAGNETIC RECORDING TAPES

The Du Pont Company, Wilmington, Del., has announced it will manufacture and market new, high-performance magnetic recording tapes incorporating chromium dioxide as the magnetic medium. Trademarked "Crolyn", the new magnetic tapes have significant advantages over conventional iron oxide tapes in computer, instrumentation and video recording applications, Dr. Maurice L. Ward, magnetic tape manager of the Du Pont Photo Products Department, reports.

"Stated simply, chromium dioxides offer two principal advantages: higher signal output at the same degree of resolution, and better resolution at any given signal output level," Dr. Ward said. "These advantages accrue from the greater magnetic strength of chromium dioxides and from precise control of particle size and shape."

"Crolyn" magnetic tapes have been tested extensively at Du Pont and in cooperative programs with manufacturers of equipment in the areas of potential use. Results indicate that the new tapes will accept more information per inch and will record and reproduce high frequency signals with greater fidelity than present gamma iron oxide tapes. In addition, reduction of tape speed for longer playing time or economy appears possible with "Crolyn" magnetic tapes in a number of applications.

Chromium dioxides were developed as part of an extensive research program in magnetic materials and magnetism. Patents have been issued to Du Pont that cover the chromium diosides, the processes by which they are made, and the magnetic recording products containing them.

Only limited quantities of the tapes are available at present, but Dr. Ward pointed out that the manufacturing facility at Newport, Del, has the potential capacity to meet marketing needs for the near future.
(For more information, designate #56 on the Readers Service Card.)

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Burroughs Corporation, Detroit, Mich.	Medi-Data, Inc., Charlotte, N.C.	Two time-sharing B5500 computer systems and over 200 I/O units to provide instant, two-way communication with the computer center	$12 million
EG&G, Inc.	Air Force Systems Command's Electronic Systems Division (ESD), Hanscom Field, Bedford, Mass.	Development and production of weather chart transmission and recording equipment	$3.5 million
System Development Corp. (SDC), Santa Monica, Calif.	Department of Defense, Advanced Research Project Agency	Development of a computer-based information processing system	$2,685,000
General Electric Co., Special Information Products Dept., Syracuse, N.Y.	Department of Defense	A van-mounted computer system to be used for data collection and processing in support of war games field experimentation	$2.6 million
General Electric Co.	Hughes Aircraft Co.	Additional large-scale GE-635 computer equipment, which will compliment GE-635 computer complex installed by Hughes 6 months ago, bringing total value to over $7 million	$2.3 million
North American Aviation's Autonetic Division, Anaheim, Calif.	Naval Ships Systems Command	An auxiliary memory file for large computers, capable of storing two billion 'bits' of information	$1.96 million
REDCOR Corporation, Canoga Park, Calif.	Lockheed Missiles and Space Company, Sunnyvale, Calif.	A-D multiplexing equipment to be used in the Poseidon missile program for data gathering and production testing	$1,245,000
Purdue University, Lafayette, Ind.	The National Science Foundation	Acquisition of a time-sharing computer system — negotiations are under way to acquire a Control Data 6500 computer	$1.2 million
Hawker Siddeley Dynamics, Hatfield, England	The Boeing Company	A computer controlled automatic test equipment complex for aircraft production test facility at Renton, Wash.	about $1 million
California Computer Products, Inc., Anaheim, Calif.	U. S. Army's Frankford Arsenal	Production of test equipment used for field testing of Army's computerized artillery fire control systems — this is a follow-on contract increasing original order to $1,900,000	$750,000
Lockheed Electronics Co., Los Angeles, Calif.	Bell Telephone Laboratories	Design and fabrication of five large, 2-1/2D core memory systems	about $1/2 million
Bryant Computer Products, Walled Lake, Mich.	Scientific Control Corp., Dallas, Texas	Purhcase of a complete memory storage system for time sharing computer applications	$240,000
Lockheed Missiles & Space Co., Sunnyvale, Calif.	The State of Alaska	First major implementation phase of a statewide information systems project — system will link most of Alaska's governmental agencies for closer coordination and bring new efficiency to administrative and clerical tasks	$175,000
University of Pennsylvania, Philadelphia, Pa.	National Science Foundation, Washington, D.C.	Investigating how computers can aid men in making animated films for education and research	$161,000
Autonetics, a Division of North American Aviation, Inc., Anaheim, Calif.	Federal Bureau of Investigation	Development and testing of an engineering model of a system to prove the feasibility of rapid and automatic fingerprint reading at a very low error rate and reasonable cost	$115,000
ITT Research Institute, Chicago, Ill.	National Science Foundation	Determining the feasibility of developing a data file which would contain "chemical signatures" of organic chemicals	$99,680
EVCO, Albuquerque, N.M.	Bureau of Indian Affairs	Computer-mediated instruction and closed circuit television to be used in schools at Isleta Pueblo	$86,100
University of Rochester, Rochester, N.Y.	Esso Education Foundation	A study to determine effective methods of teaching large undergraduate science classes through computerized assistance (in collaboration with the State University of New York College at Geneseo)	$46,100
Institute of Computer Technology, Inc., Washington, D.C.	U. S. Office of Education	Curriculum development in data processing, specifically for the preparation of a curriculum for training computer operators	$31,159
Informatics Inc., Sherman Oaks, Calif.	National Civil Defense Computer Facility (NCDCF), Dept. of the Army, Washington, D.C.	Programming support for the Control Data 3600 computer and associated peripheral gear	—
Recognition Equipment GmbH, German subsidiary of Recognition Equipment Inc.	German Post Office	An Electronic Retina® Computing Reader on lease contract to be used in the German Giro banking system to process more than 500,000 "in-payment" forms daily	—
Philco-Ford Corporation's Philco Houston Operations, Houston, Texas	Jet Propulsion Laboratory (JPL), Pasadena, Calif.	A study of the operation of America's control center for interplanetary flights of unmanned spacecraft	—
Ecco Consulting, Inc., Pittsburgh, Pa.	City of Pittsburgh	Programming, systems analysis and development of a city planning oriented management information system	—

NEW INSTALLATIONS

OF	AT	FOR
ADVANCE 6040 system	British Petroleum Co., Ltd., London, England	Correction and analysis of seismic records
ADVANCE 6050 system	Societe de Prospection Electrique Schlumberger, Clamant, France	Well logging operations
	Gulf Oil Corporation, Houston, Texas	Processing seismic data logs
Honeywell 120 computer system	Wang Laboratories, Inc., Tewksbury, Mass.	Inventory control, accounts receivable and payroll functions
	Giant Tiger Stores, Inc., Cleveland, Ohio	Maintaining both a perpetual inventory and a continuing breakdown of sales information; also accounts payable, payroll and open-to-buy functions
	Ring Power Corp., Jacksonville, Fla.	Computing economic order quantities, control parts receiving, storage and consumption by customer; computing sales of 40,000 different parts and products in five branches; also customer billing and all general accounting functions
Honeywell 200 computer system	Ford Motor Co., Utica, Mich.	Scheduling production and distribution of seats, interior door panels, other soft trim elements, and safety items required for all Ford vehicles
	Leicester Regional College of Technology, London, England	Computer-aided instruction programs and general data processing studies
Honeywell 1200 computer system	Automation, Inc., Omaha, Nebr.	On-line communication system
IBM System/360	J. R. Ahart, Inc., Dayton, Ohio	Scheduling and assistance on building projects; plots types of materials needed for a given structure; also suggests how materials should be employed and when construction should begin to meet completion dates
	Girard Trust Bank, Philadelphia, Pa.	Answering telephone calls (about 2000 per day at present) as well as demand-deposit accounting, personal trust work and many other assignments
IBM System/360 Model 30	Armco Steel Corp., Middleton, Ohio	Serving as electronic switchboard for thousands of messages daily, monitoring communication network for machine or line failures; logs all message traffic, provides data on traffic loads and efficent use of terminals at branch office and plant sites
IBM System/360 Model 40	Suburban Trust Company, Hyattsville, Md.	Audio response system — system includes IBM 7770 audio response equipment, and over 250 touch-tone telephones at 38 branch offices
	Applied Data Research, Inc., Washington, D.C.	New data processing service center which will function in conjunction with ADR's Washington office (system valued at over $1 million)
IBM 1800 system	Thomas Washington (a Scripps Institution of Oceanography research vessel)	Gathering and acting on information obtained from the sea without waiting for processing by land-based computers
NCR 315 computer system	Tootsie Roll Industries, Inc., Hoboken, N.J.	Inventory control of over 100 items, order entry, invoicing, accounts receivable and shipping arrangements, and automatically provides customer histories
NCR Series 500	Cater Ryder and Company Ltd., London, England (3 systems)	Firm's main calculating and accounting work each day; one computer is employed on securities department work; the second, on bill and bond work; and the third, is used on general accounts, rebates and partly on bills and securities, and as 'back-up' capacity
RCA Spectra 70/45 computer system	Florida Power & Light Co., Miami, Fla. (2 computers)	Cornerstone of a complete management information system
	RCA Electronic Components & Devices, Harrison, N.J.	Customer billing, inventory record-keeping and other chores for 16 warehouses and distribution centers
	The Diners' Club, Inc., New York, N.Y.	Incorporation into firm's computer complex to speed billing of more than 1.5 million credit card holders
	Sunset House, Los Angeles, Calif.	Handling firm's customer file, statistical market research analysis, among wide variety of other uses
SDS Sigma 2 computer	Elbit Computers Ltd., Haifa, Israel	Design and evaluation of computer systems as well as for general computational purposes
SDS Sigma 7 computer	University of California, Berkeley, Calif.	Helping perfect analytical techniques that could detect and identify molecular fossils in meteorites and returned lunar samples
UNIVAC 491 real-time computer system	Berliner Kraft und Licht AG (BEWAG) (Berlin Gas and Electricity Corporation), West Berlin, Germany	Calculation of fuel and utility costs, processing over a million customers' bills each month; various scientific studies re performance of its generating plants (system valued at about $1 million)
UNIVAC 492 real-time computer system	Royal Navy Store Depot, Copenacre, Wiltshire in Southern England; a second system at Spare Parts Distribution Center, Eaglescliffe, County Durham in Northern England	Control of the distribution of naval stores (systems valued at about $3.5 million)
UNIVAC 1108 computer	Computer Sciences Corp., El Segundo, Calif.	Heart of CSC's international remote computing network
UNIVAC 9200 computer system	Jeppesen & Co., Denver, Colo.	General and cost accounting; additionally, it will process production control data and prepare copy for the Jeppesen Airline and Airway Manual Services
	Leiman-Scott, Inc., Denver, Colo.	Handling customer invoices, inventory control, sales analysis and payroll processing

MONTHLY COMPUTER CENSUS

The number of electronic computers installed or on order at any one time has been increasing rapidly during the past several years. New models have been offered in the computer market, and familiar machines have gone out-of-production and subsequently been retired from active use and dismantled. Some new computers have been received with open arms by users — others have been given the cold shoulder.

To aid our readers in keeping up with this rapidly changing profile of computer use, COMPUTERS AND AUTOMATION presents this monthly report on the number of general purpose electronic digital computers made by U.S.-based companies which are installed or on order as of the preceding month. These census figures include installations and orders outside the United States. The figures are compiled and updated each month by the International Data Corporation, Newton, Mass., a market research firm specializing in the computer industry. We hope they will serve as a useful "box-score" of progress for readers interested in following the growth of the American Computer Industry and of the computing power it builds.

In general, manufacturers in the computer field do not officially release installation and on order figures. The figures in this census are developed through a continuing market survey conducted by the International Data Corporation. This market research program compiles and maintains a worldwide computer installation locator file which identifies, by customer, the installation sites of electronic computers. The resulting census counts are submitted to the individual computer manufacturers for their review and voluntary confirmation.

AS OF JUNE 10, 1967

NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS
Autonetics	RECOMP II	Y	$2495	11/58	30	X
	RECOMP III	Y	$1495	6/61	6	X
Bunker-Ramo Corp.	BR-130	Y	$2000	10/61	160	X
	BR-133	Y	$2400	5/64	42	26
	BR-230	Y	$2680	8/63	15	X
	BR-300	Y	$3000	3/59	33	X
	BR-330	Y	$4000	12/60	28	X
	BR-340	Y	$7000	12/63	20	X
Burroughs	205	N	$4600	1/54	38	X
	220	N	$14,000	10/58	31	X
	B100	Y	$2800	8/64	194	13
	B200 Series	Y	$5400	11/61	608	18
	B300 Series	Y	$9000	7/65	290	150
	B2500	Y	$5000	2/67	7	45
	B3500	Y	$14,000	5/67	2	50
	B5500	Y	$22,000	3/63	70	20
	B6500	Y	$33,000	2/68	0	6
	B8500	Y	$200,000	8/67	0	4
Control Data Corporation	G-15	N	$1600	7/55	273	X
	G-20	Y	$15,500	4/61	25	X
	LGP-21	Y	$725	12/62	160	X
	LGP-30	semi	$1300	9/56	132	X
	RPC-4000	Y	$1875	1/61	63	X
	160*/160A/160G	Y	$2100/$5000/$12,000	5/60;7/61;3/64	462	X
	924/924A	Y	$11,000	8/61	28	X
	1604/1604A	Y	$45,000	1/60	58	X
	1700	Y	$3500	5/66	85	185
	3100/3150	Y	$10,000	12/64	115	30
	3200	Y	$14,000	5/64	66	X
	3300	Y	$19,500	9/65	75	50
	3400	Y	$18,000	11/64	19	X
	3600	Y	$48,000	6/63	45	X
	3800	Y	$49,300	2/66	21	10
	6400/6500	Y	$52,000	5/66	16	22
	6600	Y	$117,000	8/64	26	17
	6800	Y	$130,000	6/67	0	2
Data Machines, Inc.	620	Y	$900	11/65	62	10
	620I	Y	$500	5/67	3	44
Digital Equipment Corp.	PDP-1	Y	$3400	11/60	59	X
	PDP-4	Y	$1700	8/62	55	X
	PDP-5	Y	$900	9/63	114	X
	PDP-6	Y	$10,000	10/64	22	X
	PDP-7	Y	$1300	11/64	165	20
	PDP-8	Y	$525	4/65	795	130
	PDP-9	Y	$1000	12/66	24	70
	PDP-10	Y	$7500	7/67	0	16
Electronic Associates, Inc.	8400	Y	$12,000	6/65	18	9
EMR Computer Div.	ASI 210	Y	$3850	4/62	26	X
	ASI 2100	Y	$4200	12/63	7	X
	ADVANCE 6020	Y	$4400	4/65	15	12
	ADVANCE 6040	Y	$5600	7/65	9	12
	ADVANCE 6050	Y	$9000	2/66	11	12
	ADVANCE 6070	Y	$15,000	10/65	7	8
	ADVANCE 6130	Y	$1000	2/67	18	24
General Electric	115	Y	$1800	12/65	380	650
	205	Y	$2900	6/64	42	X
	210	Y	$16,000	7/59	45	X
	215	Y	$6000	9/63	54	X
	225	Y	$8000	4/61	202	X
	235	Y	$10,900	4/64	85	10
	415	Y	$9600	5/64	275	70
	425	Y	$18,000	6/64	98	46
	435	Y	$25,000	9/65	32	16
	625	Y	$50,000	4/65	25	17
	635	Y	$56,000	5/65	24	16
	645	Y	$90,000	7/66	2	7
Honeywell	DDP-24	Y	$2500	5/63	86	X
	DDP-116	Y	$900	4/65	170	42
	DDP-124	Y	$2050	3/66	36	34
	DDP-224	Y	$3300	3/65	52	8
	DDP-516	Y	$700	9/66	47	155
	H-120	Y	$3900	1/66	540	240
	H-200	Y	$8400	3/64	1110	92
	H-400	Y	$8500	12/61	99	X
	H-800	Y	$28,000	12/60	90	X
	H-1200	Y	$3800	2/66	128	91
	H-1400	Y	$14,000	1/64	12	X
	H-1800	Y	$42,000	1/64	20	1

NAME OF MANUFACTURER	NAME OF COMPUTER	SOLID STATE?	AVERAGE MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	NUMBER OF UNFILLED ORDERS
Honeywell (cont'd)	H-2200	Y	$12,000	1/66	44	62
	H-4200	Y	$20,500	6/67	0	12
	H-8200	Y	$35,000	4/68	0	6
IBM	305	N	$3600	12/57	118	X
	360/20	Y	$2000	12/65	3600	6600
	360/30	Y	$7500	5/65	4400	4200
	360/40	Y	$15,000	4/65	2350	1800
	360/44	Y	$10,000	7/66	70	190
	360/50	Y	$26,000	8/65	410	880
	360/65	Y	$50,000	11/65	100	300
	360/67	Y	$75,000	10/66	10	51
	360/75	Y	$78,000	2/66	24	39
	360/90 Series	Y	$140,000	6/67	0	19
	650	N	$4800	11/54	148	X
	1130	Y	$1200	2/66	1700	4800
	1401	Y	$6600	9/60	7650	X
	1401-G	Y	$2300	5/64	1610	X
	1401-H	Y	$1300	5/67	12	85
	1410	Y	$14,200	11/61	822	44
	1440	Y	$4800	4/63	3600	175
	1460	Y	$11,500	10/63	1695	X
	1620 I, II	Y	$4000	9/60	1670	80
	1800	Y	$7600	1/66	220	350
	701	N	$5000	4/53	1	X
	7010	Y	$22,600	10/63	220	4
	702	N	$6900	2/55	7	X
	7030	Y	$160,000	5/61	6	X
	704	N	$32,000	12/55	27	X
	7040	Y	$22,000	6/63	122	4
	7044	Y	$32,000	6/63	133	8
	705	N	$38,000	11/55	46	X
	7070, 2, 4	Y	$27,000	3/60	313	X
	7080	Y	$55,000	8/61	85	X
	709	N	$40,000	8/58	8	X
	7090	Y	$63,500	11/59	37	X
	7094	Y	$72,500	9/62	105	X
	7094 II	Y	$78,500	4/64	144	2
National Cash Register Co.	NCR-304	Y	$14,000	1/60	24	X
	NCR-310	Y	$2500	5/61	14	X
	NCR-315	Y	$8500	5/62	512	115
	NCR-315-RMC	Y	$12,000	9/65	52	41
	NCR-390	Y	$1850	5/61	300	12
	NCR-500	Y	$1500	10/65	1370	780
Philco	1000	Y	$7010	6/63	16	X
	2000-210, 211	Y	$40,000	10/58	16	X
	2000-212	Y	$52,000	1/63	12	X
Radio Corporation of America	RCA 301	Y	$7000	2/61	635	X
	RCA 3301	Y	$17,000	7/64	75	X
	RCA 501	Y	$14,000	6/59	96	X
	RCA 601	Y	$35,000	11/62	3	X
	Spectra 70/15	Y	$4100	9/65	120	120
	Spectra 70/25	Y	$6700	9/65	70	58
	Spectra 70/35	Y	$10,400	1/67	33	140
	Spectra 70/45	Y	$17,400	11/65	67	105
	Spectra 70/55	Y	$40,500	11/66	5	14
Raytheon	250	Y	$1200	12/60	175	X
	440	Y	$3500	3/64	20	0
	520	Y	$3200	10/65	27	1
Scientific Control Corporation	650	Y	$500	5/66	15	13
	655	Y	$1800	10/66	1	2
	660	Y	$2000	10/65	2	1
	670	Y	$2600	5/66	1	2
	6700	Y	$30,000	10/67	0	1
Scientific Data Systems, Inc.	SDS-92	Y	$1500	4/65	110	65
	SDS-910	Y	$2000	8/62	210	40
	SDS-920	Y	$2900	9/62	170	30
	SDS-925	Y	$3000	12/64	45	30
	SDS-930	Y	$3400	6/64	220	45
	SDS-940	Y	$10,000	4/66	21	30
	SDS-9300	Y	$7000	11/64	32	10
	Sigma 2	Y	$1000	12/66	17	200
	Sigma 5	Y	$6000	8/67	0	28
	Sigma 7	Y	$12,000	12/66	7	25
Systems Engineering Labs	810	Y	$1000	9/65	24	X
	810A	Y	$900	8/66	26	17
	840	Y	$1400	11/65	4	X
	840A	Y	$1400	8/66	11	22
UNIVAC	I & II	N	$25,000	3/51 & 11/57	23	X
	III	Y	$20,000	8/62	67	X
	File Computers	N	$15,000	8/56	13	X
	Solid-State 80 I, II, 90 I, II & Step	Y	$8000	8/58	222	X
	418	Y	$11,000	6/63	118	33
	490 Series	Y	$35,000	12/61	160	58
	1004	Y	$1900	2/63	3195	40
	1005	Y	$2400	4/66	740	200
	1050	Y	$8000	9/63	285	16
	1100 Series (except 1107 & 1108)	N	$35,000	12/50	9	X
	1107	Y	$55,000	10/62	33	X
	1108	Y	$65,000	9/65	58	75
	9200	Y	$1500	6/67	2	1100
	9300	Y	$3400	7/67	0	650
	LARC	Y	$135,000	5/60	2	X
				TOTALS	49,299	26,340

X = no longer in production.

* To avoid double counting, note that the Control Data 160 serves as the central processor of the NCR 310. Also, customers ordering a new computer model intended to replace a computer model in the same product line may continue to use much of their current peripheral equipment, which can account for 30-70% of the value of the total computer system.

BOOKS AND OTHER PUBLICATIONS

Neil Macdonald
Assistant Editor
Computers and Automation

We publish here citations and brief reviews of books and other publications which have a significant relation to computers, data processing, and automation, and which have come to our attention. We shall be glad to report other information in future lists if a review copy is sent to us. The plan of each entry is: author or editor / title / publisher or issuer / date, hardbound or softbound, number of pages, price or its equivalent / comments. If you write to a publisher or issuer, we would appreciate your mentioning *Computers and Automation.*

Reviews

Seligsohn, I. J. / Your Career in Computer Programming / Julian Messner, One West 39th St., New York, N.Y. 10018 / 1966, hardbound, 222 pp., $3.95

This is an interesting book written in a popular style, by a person who is well informed in the computer field. It could be very useful to a great number of people.

Lecht, Charles Philip / The Programmer's ALGOL: A Complete Reference / McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N.Y. 10036 / 1967, hardbound, 252 pp., $8.95

This book provides a technical description of ALGOL, graded from the simplest to the most complex forms of its elements. The ten statements and declarations of ALGOL have been expanded to appear as if they were composed of many more instructions. The author's purpose in doing this was to reduce much of the inference and deduction commonly required of programmers when they use the general forms customary in ALGOL presentations. Appendices present a list of mathematical functions available in most ALGOL compilers, a set of representative ALGOL programs, and a glossary of terms.

Golde, Hellmut / Fortran II and IV for Engineers and Scientists / The Macmillan Co., 60 Fifth Ave., New York, N.Y. 10011 / 1966, paperbound, 224 pp., $

This is a thorough study of the FORTRAN language, independent of any particular computer. The author is an Associate Professor of Electrical Engineering at the University of Washington, and the book is based on his experience in teaching students how to use FORTRAN. The language is illustrated with a number of typical scientific and engineering problems taken from many different disciplines such as: the analysis of a simple electronic circuit; the numerical integration of a function and the refraction of light by a prism. About half of these problems are accompanied by a reproduction of the actual computer output. Exercises are presented at the end of each chapter.

McCarthy, John, and 12 more authors / Information / W. H. Freeman and Co., 660 Market St., San Francisco, Calif. 94104 / 1966, hardcover, 218 pp., $5.00

This is a reprint of a famous issue of the *Scientific American* (September, 1966), which contained many very important articles by 13 authors related to computers and information. Interesting, important, and useful.

Smith, Frank, and George A. Miller, eds., and 13 authors / The Genesis of Language: A Psycholinguistic Approach / The M.I.T. Press, 50 Ames St., Bldg. E-19, Room 741, Cambridge, Mass. 02142 / 1966, hardbound, 400 pp., $10.00

This book consists of 12 papers presented at a conference on "Language Development in Children" sponsored by the National Institute of Child Health and Human Development in April, 1965. Investigations reported range from the private verbal activity of children to the syntax-learning ability of chimpanzees. An abstract of recent Russian work in the psychology of language learning is given in the appendix.

This is a thoughtful book and contains a summary of current thinking on the nature of language.

Nyers, Charles A., Editor and 10 authors / The Impact of Computers on Management / The M.I.T. Press, 50 Ames St., Cambridge, Mass. 02142 / 1967, hardcover, 310 pp., $10.00

The papers on which this book is based were presented at a research conference in April 1966 at the Sloan School of Management at M.I.T. Subjects include: "The Impact of Information Technology on Organizational Control"; "Computers and Organization Structure in Life Insurance Firms"; "The External and Internal Economic Environment"; "Computers and Profit Centers"; and "Changes in Management Environment and Their Effect Upon Values." Edited versions of taped discussions at the conference follow the presentation of each paper. The appendix presents a case study of the implementation of computerized programs in an integrated manufacturing company.

Seligsohn, I. J. / Your Career in Computer Programming / Julian Messner, One West 39th St., New York, N.Y. 10018 / 1966, hardbound, 222 pp., $3.95

This is an interesting book written in a popular style, by a person who is well informed in the computer field. It could be very useful to a great number of people.

McCormack, John M., and Mario D. Salvadori / Numerical Methods in Fortran / Prentice-Hall Inc., Englewood Cliffs, N.J. / hardbound, 1964, 324 pp., $?

This is a book for those who have a knowledge of elementary calculus and wish to apply this knowledge to FORTRAN. Chapters in Section I (pp. 1-146) include: Computers and Programming; Approximate Computations; Differentiation, Integration, Interpolation, and Extrapolation; Solution of Algebraic and Transcental Equations; Simultaneous Linear Algebraic Equations; Ordinary Boundary-value Problems; Ordinary Initial-Value Problems; Two-dimensional Problems. Each chapter presents problems for the student; answers appear later in the book. Section 2 (pp. 147-317) presents FORTRAN problems, flow charts, and beginner's hints and examples, all associated specifically with the numerical methods to which each program applies.

Design Quarterly 66/67, including 9 authors of articles / Design and the Computer / Design Quarterly, Walker Art Center, 1710 Lyndale Ave. South, Minneapolis, Minn. 55403 / 1966, paperbound, 71 pp., $2.00

Many illustrations accompany these articles on how and why the computer is used in design. The articles are "Computer-Aided Design," "Computer Graphics," "Design Augmented by Computers," "Problem-Solving Processes in Planning and Design," "Computer-Augmented Design," "Computers, Printing, and Graphic Design," "Computer-Generated Movies, Designs and Diagrams," and "Computers and the Visual Arts." Also included is a one-page glossary of computer terms. The authors include Kenneth Knowlton and A. Michal Noll.

Sheridan, Thomas B., and Sylvia R. Mayer / Design and Use of Information Systems for Automated on-the-job Training I: Conceptual and Experimental Approaches — AD 602041 / Clearinghouse for Fed. Scientific and Technical Information, Dept. of Commerce, Washington, D.C. / 1963, paperbound and xeroxed, 97 pp., $?

The purpose of this report is the development of automated training subsystems for information systems; the authors believe that these Systems could also "train their human components to use and maintain them." Sections include: "Studies on a Method for Self-Instruction in Task Logic," "Studies on Information-Solicitation and Problem-Solving Training," "The Phylogenic Concept of Program Order," "The long range objective of this work is to provide principles upon which to design into conventional information systems the capacity to train automatically their own users."

NEW PATENTS

Raymond R. Skolnick
Patent Manager
Ford Instrument Co.
Div. of Sperry Rand Corp.
Long Island City, N.Y. 11101

The following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the U. S. Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington, D.C. 20231, at a cost of 50 cents each.

May 16, 1967

3,320,592 / John L. Rogers, Hermosa Beach, and Horace T. Mann, Palos Verdes Estates, Calif. / by mesne assignments to TRW Inc. / Associative Memory System.

3,320,594 / Paul M. Davies, Manhattan Beach, Calif. / TRW Inc. / Associative Computer.

3,320,595 / Gilbert Yanishevsky, Phila., Pa. / Burroughs Corp. / Character Generation and Control Circuits.

3,320,597 / Joseph W. Hart, Audubon, Pa. / Burroughs Corp. / Magnetic Data Store with Nondestructive Read-Out.

3,320,598 / Jack Star, San Carlos, Calif. / Ampex Corp. / Self-Clocking Complementary Redundant Recording System.

May 23, 1967

3,321,611 / Terry A. Jeeves, Penn Hills, Pa. / Westinghouse Electric Corp. / Logic Circuitry for Binary Full Adder Employing Multi-Element Diode Strips.

3,321,749 / William M. Overn, Egan Township, Dakota County, Minn. / Sperry Rand Corp. / Magnetic Memory Apparatus.

May 30, 1967

3,322,965 / David R. Bennion and William K. English, Menlo Park, and David Nitzan, Palo Alto, Calif. / AMP, Inc. / Magnetic Logic Circuit.

3,323,112 / Donald E. Haselwood, Deerfield, and Carl M. Solar, Chicago, Ill. / A. C. Nielsen Co. / Data Handling System.

June 6, 1967

3,323,722 / Laurence J. Marhoefer, Jackson Heights, N.Y. / U.S. Army / Pure fluid shift register.

3,324,307 / Robert N. Mellot, Northridge, and Robert Feuer and Robert H. Cole, Canoga Park, Calif. / The Bunker-Ramo Corp., Canoga Park, Calif. / Flip-flop circuit.

3,324,455 / Jean-Jacques G. Mayer, Paris, France / Societe Nouvelle d'Electronique & de la Radio-Industrie, a corporation of France / Minority logical operator.

3,324,456 / Charles W. Brown, Burbank, and Grey E. Stone, Covina, Calif. / General Precision, Inc., a corporation of Delaware / Binary counter.

3,324,459 / Robert L. Woolfolk, Dallas, Texas / by mesne assignments, to Sperry Rand Corp., N.Y. / Program changing in data processing.

3,324,460 / Eugene Leonard, Sands Point, Edward M. Richards, East Northport, Edgar Wolf, New Hyde Park, Marvin Shapiro, Huntington, and Miles Skrivanek, Jr., Glenwood Landing, N.Y. / Digitronics Corp., Albertson, N.Y. / Serial information transfer system.

3,324,462 / Michael Godfrey Harman, Stroud Green, London, England / The National Cash Register Co., Dayton, Ohio / Magnetic memory elements and matrices.

June 13, 1967

3,325,789 / William E. Glenn, Jr., Scotia, N.Y. / General Electric Co., N.Y. / Reliability information storage and readout utilizing a plurality of optical storage medium locations.

3,325,790 / Eli Gloates, Haddonfield, N.J., and Laszlo L. Rakoczi, Phoenix, Arizona / Radio Corporation of America, a corporation of Delaware / Logic circuitry adapted to control the transfer of information to a storage element.

3,325,792 / Kenneth Charles Arthur Bingham, Chalfont St. Peter, Peter Mossman, Amersham, Donald Martin Rushmer, Ickenham, Middlesex, and Michael Williams, Watford, England / The General Electric Co., Ltd. London, England / Thin film magnetic storage device.

3,325,793 / Quinton W. Simkins, Poughkeepsie, and Norbert G. Vogl, Jr., Albany, N.Y. / International Business Machines Corp., N.Y. / Capacitive noise cancellation in a magnetic memory system.

June 20, 1967

3,327,296 / Arthur J. Radcliffe, Jr., Orlando, Fla. / Radiation, Inc., Melbourne, Fla. / Core memory circuit.

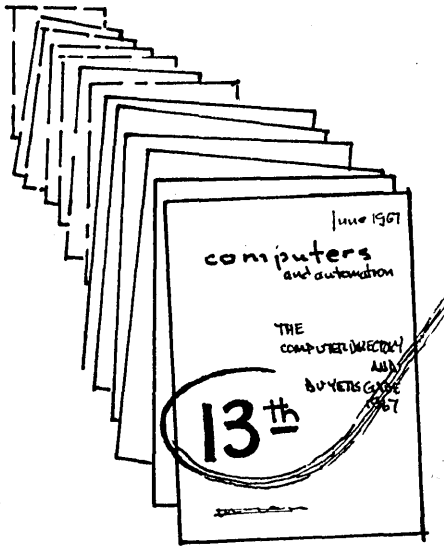
3,327,297 / Ian M. Croll, Pleasantville, N.Y. / International Business Machines Corp., N.Y. / Magnetic memory element.

June 27, 1967

3,328,566 / James E. Kinzie, Oceanside, John W. Pross, Jr., Escondido, Robert B. Steves, Vista, and Arville T. Trostrud, Encinitas, Calif. / General Precision, Inc., a corporation of Delaware / Input-output system for a digital computer.

3,328,567 / Akira Kamoi and Masakazu Ejiri, Tokyo-to, Japan / Kabushiki Kaisha Hitachi Seisakusho, Tokyo-to, Japan / Digital adding and subtracting device.

3,328,597 / James E. De Witt, Waukesha, and Roy Hyink and Richard P. Potter, Wauwatosa, Wis. / Cutler-Hammer, Inc., Milwaukee, Wis. / Magnetic memory means and systems.



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CALENDAR OF COMING EVENTS

Aug. 7-11, 1967: 12th Annual Technical Symposium of the Society of Photo-optical Instrumentation Engineers, International Hotel, Los Angeles, Calif.; contact Dr. John H. Atkinson, Technical Program Chairman, S.P.I.E. Symposium, P.O. Box 288, Redondo Beach, Calif. 90277

Aug. 7-23, 1967: Association for Symbolic Logic summer school and meeting, The University of Leeds, Leeds, England; contact M. H. Löb, Dept. of Mathematics, The University of Leeds, Leeds, England

Aug. 13-18, 1967: SHARE Meeting, Carillon/Deauville Hotel, Miami, Fla.; contact C. M. Kromp, Computing Center, University of Miami, Coral Gables, Fla. 33124

Aug. 22-25, 1967: WESCON (Western Electronic Show and Convention), Cow Palace, San Francisco, Calif.; contact Don Larson, 3600 Wilshire Blvd., Los Angeles, Calif. 90005

Aug. 23-25, 1967: International Conference on Computational Linguistics, Grenoble University Campus, St. Martin-D'Heres, France; contact Professor Bernard Vauquois, C.E.T.A., B.P. No. 8, 38- St. Martin-D'Heres, France

Aug. 26-28, 1967: ACM Symposium on Interactive Systems for Experimental Applied Mathematics, Sheraton-Park Hotel, Washington, D.C.; contact Melvin Klerer, Columbia University, Hudson Laboratories, Dobbs Ferry, N.Y. 10522 or Juris Reinfelds, Computing Ctre., University of Georgia, Athens, Ga. 30601

Aug. 28-Sept. 2, 1967: AICA (International Association for Analogue Computation) Fifth Congress, Lausanne, Switzerland; contact secretary of the Swiss Federation of Automatic Control, Wasserwerkstrasse 53, Zurich, Switzerland

Aug. 29-31, 1967: 1967 ACM (Association for Computing Machinery) National Conference, Twentieth Anniversary, Sheraton Park Hotel, Washington, D.C.; contact Thomas Willette, P.O. Box 6, Annandale, Va. 22003

Sept. 6-8, 1967: First Annual IEEE Computer Conference, Edgewater Beach Hotel, Chicago, Ill.; contact Professor S. S. Yau, Dept. of Electrical Engineering, The Technological Institute, Northwestern University, Evanston, Ill. 60201

Sept. 11-14, 1967: ISA (Instrument Society of America) Instrumentation-Automation Conference & Exhibit, International Amphitheatre Exposition Hall, Chicago, Ill.; contact Instrument Society of America, 530 William Penn Place, Pittsburgh, Pa. 15219

Sept. 11-15, 1967: Fifth International Cybernetics Congress, Palais des Expositions, Place André Rijckmans, Namur, Belgium; contact J. Lemaire, Managing Director, same address

Sept. 11-15, 1967: 1967 International Symposium on Information Theory, Athens, Greece; contact A. V. Balakrishnan, Dept. of Engineering, U.C.L.A., Los Angeles, Calif. 90024

Sept. 19-22, 1967: Joint Conference of the Univac Users Association and the Univac Scientific Exchange, Hotel Leamington, Minneapolis, Minn.; contact Robert H. Beaton, Neisner Bros. Inc., 49 East Ave., Rochester, N.Y. 14604

Sept. 25-28, 1967: International Symposium on Automation of Population Register Systems, Jerusalem, Israel: contact D. Chevion, Chairman of Council, Information Processing Association of Israel, P.O.B. 3009, Jerusalem, Israel

Sept. 25-29, 1967: The British Computer Society, DATAFAIR 67, Southampton University, Southampton, England; contact Clive Wilkins, The British Computer Society, 23, Dorset Square, London, N.W.1, England

Oct. 1-4, 1967: 1967 International Systems Meeting, Cobo Hall, Detroit, Mich.; contact Richard L. Irwin, Systems and Procedures Association, 24587 Bagley Rd., Cleveland, Ohio 44138

Oct. 16-19, 1967: UAIDE (Users of Automatic Information Display Equipment), Statler Hilton Hotel, Washington, D.C.; contact George E. Perez, Box 6749, Fort Davis Station, Washington, D.C. 20020

Oct. 18-20, 1967: Eighth Annual Symposium on Switching and Automata Theory, University of Texas, Austin, Tex.; contact Prof. C. L. Coates, Room 520, Engineering Sci. Bldg., Univ. of Tex., Austin, Tex. 79712

Nov. 10, 1967: Annual Symposium on "The Application of Computers to the Problems of Urban Society," New York Hilton Hotel, New York, N.Y.; contact Dan M. Bowers, One Millet St., Deer Park, N.Y. 11729

Nov. 14-16, 1967: Fall Joint Computer Conference, Anaheim Convention Center, Anaheim, Calif.; contact AFIPS Headquarters, 211 E. 43rd St., New York, N.Y. 10017

Apr. 30-May 2, 1968: Spring Joint Computer Conference, Atlantic City Convention Hall, Atlantic City, N.J.; contact American Federation for Information Processing, 211 East 43rd St., New York, N.Y. 10017

Aug. 5-10, 1968: IFIP (International Federation for Information Processing) Congress 68, Edinburgh, Scotland; contact John Fowlers & Partners, Ltd., Grand Buildings, Trafalgar Square, London, W.C.2, England

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

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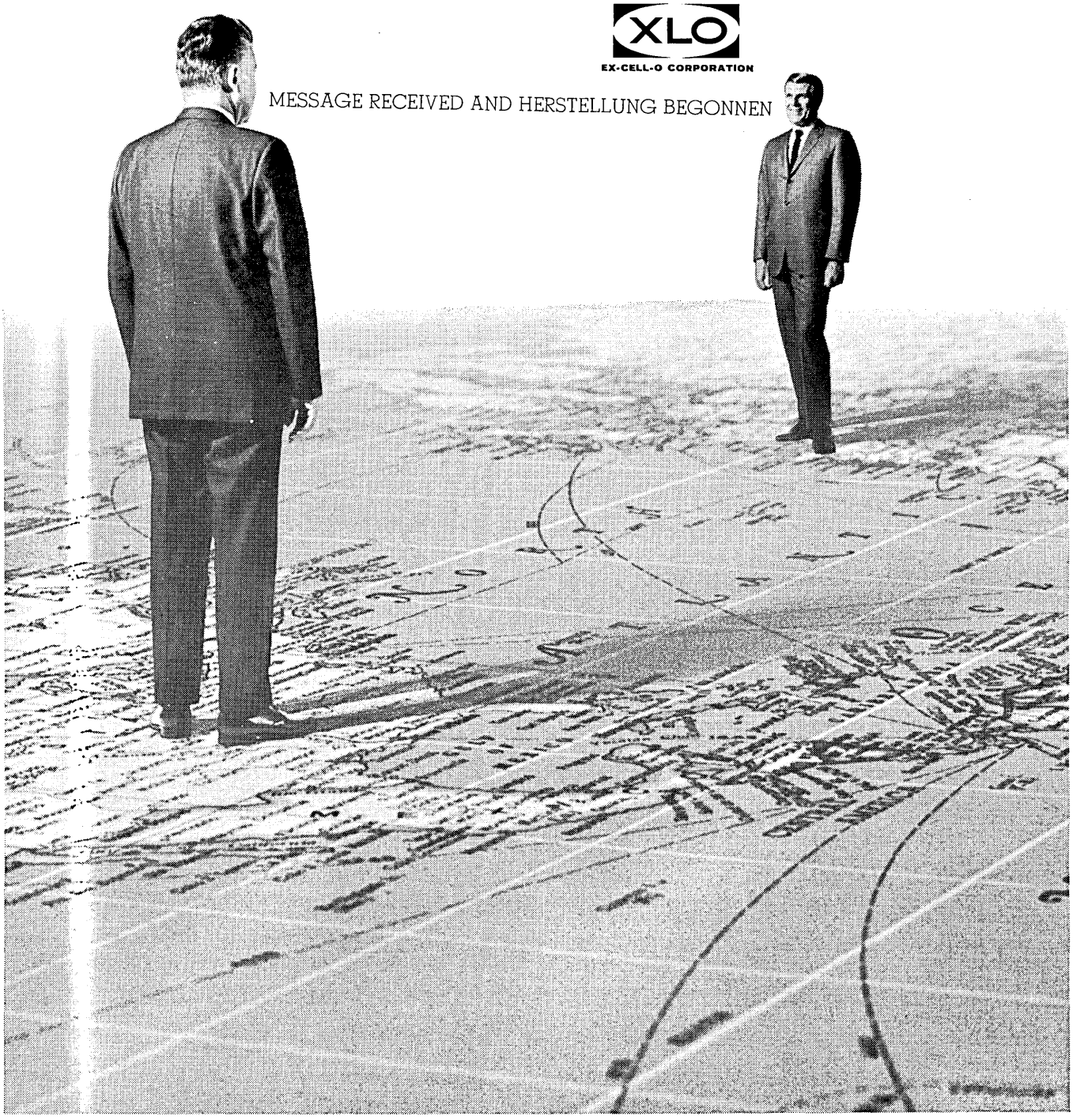

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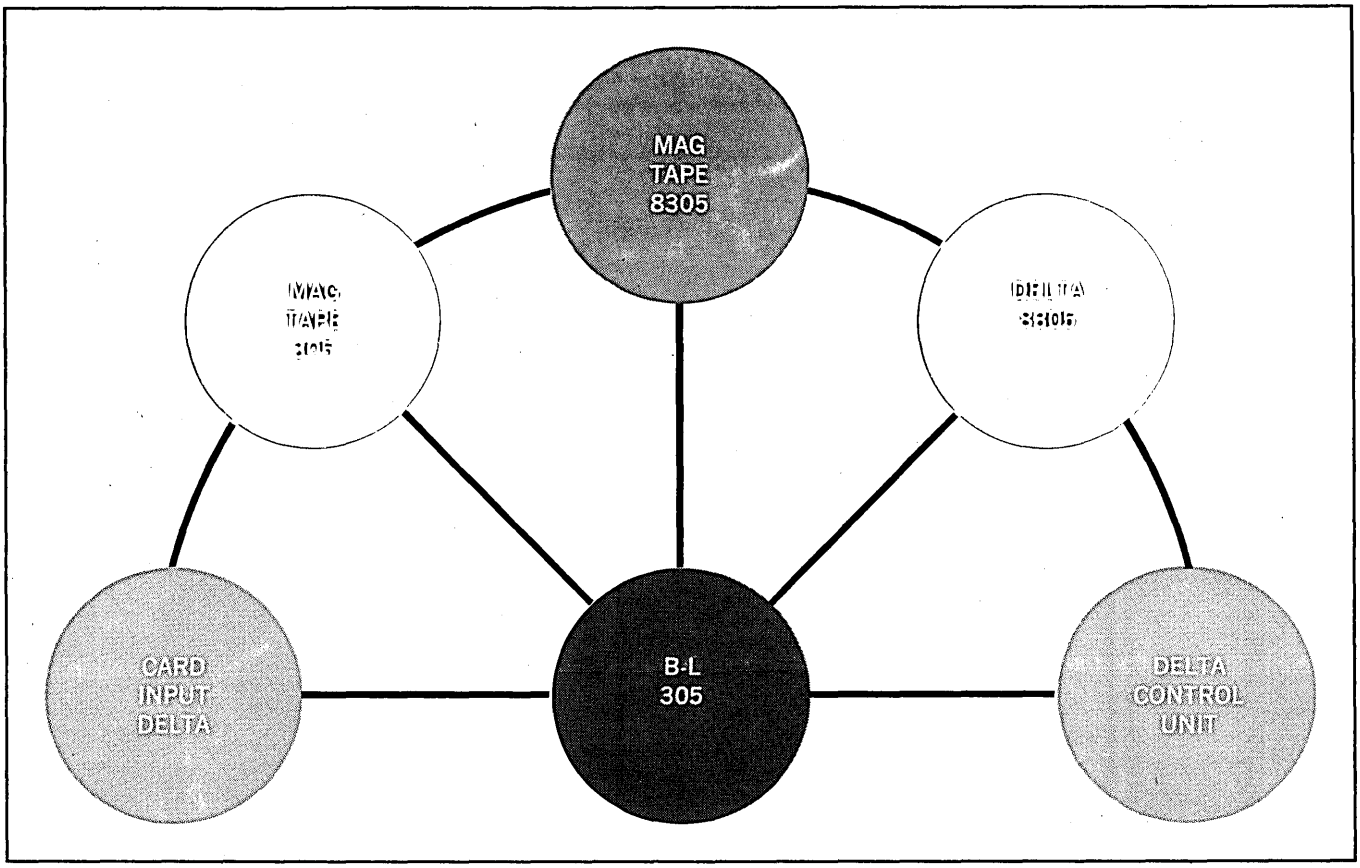

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