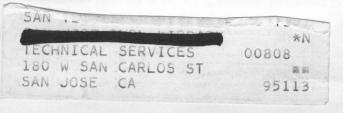


Peacock Courtship

Computers in Banking The Antisocial Use of Computers Computers and Cartography The Construction of Living Robots The June 1972 Raid on Democratic Party Headquarters

- J. Q. Hollom
- Donn B. Parker
- Dennis L. Bress
- Edmund C. Berkeley
- Richard E. Sprague



Sample page from the Fifth Edition, "WHO'S WHO IN COMPUTERS AND DATA PROCESSING"

#### Who's Who in Computers

ANDERSEN, Hans Peter Brostrup / console operator / b: 1946 / ed: Denmark / ent: 1966 / m-i: B Ma P Sa / t: console operator / org: Tretorn Data Center, AB, 25225 Halsingborg, Sweden / pb-h: -/ h: Tranemansgatan 14 3:e van, S-252 44 Halsingborg, Sweden

ANDERSON, Alfred O. / mathematician / b: 1928 / ed: BS, math / ent: 1953 / m-i: P / t: mathematician / org: Aberdeen Proving Ground, MD 21005 / pb-h: ACM / h: 602 Market St, Aberdeen, MD 21001

ANDERSON, Carl S. / systems analyst / b: 1934 / ed: BS, Univ of Kansas School of Business / ent: 1962 / m-i: A Mg Sy / t: computing systems analyst / org: The Boeing Co, 3801 S Oliver, Wichita, KS 67210 / pb-h: CDP / h: 806 N Florence, Wichita, KS 67212

ANDERSON, Edward J. / computer systems scientist / b: 1932 / ed: BS, Univ of California at Berkeley; MA, aerospace operations management, Univ of Southern California; MS, systems engineering, West Coast Univ / ent: 1959 / m-i: D Mg Sy / t: computer systems scientist / org: Computer Sciences Corp, 650 N Sepulveda, El Segundo, CA 90245 / pb-h: ACM, IEEE, "Design Considerations for a Telemetry Ground Support System", AIAA Aerospace Computer Systems Conference, 1969 / h: 1440 Florida St, Apt 8, Long Beach, CA 90812

ANDERSON, Frederick J. / engineer / b: 1923 / ed: Stanford Univ / ent: 1947 / m-i: A C / t: director of engineering / org: Sylvania Electric Products, Inc, 100 First Ave Waltham, MA 02154 / pb-h: - / h: 66 Woodridge Rd, Wayland, MA 01778 / \*C64

ANDERSON, Herbert E. / senior programmer / b: 1927 / ed: Univ of California, Univ of New Mexico / ent: 1957 / m-i: A P; statistics / t: staff associate / org: Sandia Corp, Sandia Base, Albuquerque, NM 87115 / pb-h: ACM, CDP, several papers / h: 501 Mesilla NE, Albuquerque, NM 87108

ANDERSON, Jess / systems specialist / b: 1935 / ed: BA / ent: 1955 / m-i: A P Sy; research in physical sciences / t: specialist / org: Univ of Wisconsin, PO Box 6, Stoughton, WI 53589 / pb-h: several papers / h: 2838 Stevens St, Madison, WI 53705

ANDERSON, Kermit C. / systems analyst / b: 1943 / ed: BS, Penn State Univ / ent: 1969 / m-i: L Ma P Sy / t: systems analyst / org: Marsh & McLennan,70 Pine St, New York, NY 10005 / pbh: - / h: 2 Park Ave, Green Brook, NJ 08812

ANDERSON, Marilyn B. (Mrs.) / junior engineer / b: 1927 / ed: Miami Univ / ent: 1949 / m-i: P /

Abbreviations include:			
b:	born		
ed:	education		
ent:	entered compu	ter field	ł
m—i:	main interests		
t:	title		
org:	organization		
pb—h:	publications, h other disting	•	nemberships,
h:	home address		
v:	volume numbe	r	
Main In	terests:		
А	Applications	Mg	Management
В	Business	Ma	Mathematics
С	Construction	Р	Programming
D	Design	Sa	Sales
		-	

ANDERSON, Walter R. / president / b: 1929 / ed: AB, Clark Univ; BSEE, Worcester Polytech Inst / ent: 1958 / m-i: Ma / t: president / org: Spiras Systems Inc, 332 Second Ave, Waltham, MA 02154 / pb-h: IEEE, Committee on Numerical Control EIA TR-31 / h: 36 Winsor Rd, Sudbury, MA 01776

Sγ

Systems

Logic

L

ANDERSON, Walter W. / systems auditor / b: 1934 / ed: BBA North Texas State Univ / ent: 1962 / m-i: A Sy / t: electronic data processing analyst / org: El Paso Natural Gas Co, PO Box 1492, El Paso, TX 79999 / pb-h: CDP / h: 10256 Luella, El Paso, TX 79925

ANDERSON, William M. / systems programmer / b: 1947 / ed: - / ent: 1967 / m-i: A P Sy / t: assistant data processing supervisor / org: Midway Platt Co, 2233 University, St Paul, MN 55104 / pb-h: - / h: 441 Lynnhurst W, St Paul, MN 55104

ANDRADE, Luciano P. / programmer / b: 1918 / ed: high school / ent: 1962 / m-i: P / t: senior computer programmer / org: HUD, Washington, DC 20410 / pb-h: - / h: 6419 Maplewood Dr, Falls Church, VA 22041

ANDREE, Richard V. / professor, author, lecturer, consultant / b: 1919 / ed: BS, Univ of Chicago, PhD, Univ of Wisconsin / ent: 1948 / m-i: A Ma P Sy; writing, information science / t: professor of math, research associate in computing science / org: Univ of Oklahoma, Norman, OK 73069 / pbh: ACM, AEDS, ASL, DPMA, MAA, NCTM, SIAM lecturer, American Assn for the Advancement of Science, American Math Society, American Society for Engineering Education, Mu Alpha Theta, Pi Mu Epsilon, Sigma Xi, 3 fellowships, numerous committees, Who's Who in America, World Who's Who, editor, 12 books, 8 paperbacks, about 20 articles / h: 627 E Boyd, Norman, OK 73069

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Vol. 21, No. 8 August, 1972

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# computers and automation

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by J. L. Dreyer, ADAPSO, New York, N.Y.

The service bureau business, which had its origin in the 1956 consent decree settling the government's antitrust case against IBM, is being confronted with serious problems from current secrecy by courts and in other ways.

The magazine of the design, applications, and implications of information processing systems – and the pursuit of truth in input, output, and processing.

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#### The Profession of Information Engineer and the Pursuit of Truth

6 The Pursuit of Truth in Input, Output, and Processing [NT E] by Edmund C. Berkeley, Editor, *Computers and Automation* One of the most urgent of human problems is deliberate, extensive, concealment and lying, in order to protect vested interests.

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	by Richard E. Sprague, Hartsdale, N.Y.		

A report on five men who have numerous connections with the Republican Party, the White House, the Central Intelligence Agency, anti-Castro Cubans, and plans for the assassination of President John F. Kennedy, and who were arrested seeking to bug Democratic National Headquarters at 2:30 a.m., June 17, 1972.

- 7 Lead Poisoning: The Hypocrisy of the Presidency and [NT F] of the Appropriations Committee of the House of Representatives
  - by Representative William L. Clay, U.S. Congress This year more than 400,000 American children will eat sweet-tasting chips of paint containing lead – and the President and the Appropriations Committee fail to spend authorized money to deal with the problem.

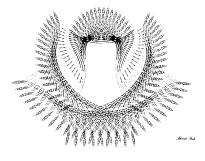
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#### Front Cover Picture

"Peacock Courtship", winner of the first prize in C&A's Tenth Annual Computer Art Contest, was created by a "computerized Spirograph method." The equipment used was an IBM 360/44 computer and a CalComp 760 drum-type plotter. The artist is Bharat K. Shah, Wichita, Kansas. For more information, see page 8.

#### NOTICE

\*D ON YOUR ADDRESS IMPRINT MEANS THAT YOUR SUBSCRIP-TION INCLUDES THE COMPUTER DIRECTORY. \*N MEANS THAT YOUR PRESENT SUBSCRIPTION DOES NOT INCLUDE THE COM-PUTER DIRECTORY.

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#### Key

[A]	– Article
[C]	— Monthly Column
[E]	<ul> <li>Editorial</li> </ul>
[F]	— Forum
[G]	<ul> <li>The Golden Trumpet</li> </ul>
[NT]	— Not Technical
[R]	- Reference Information
[T]	– Technical

### "The Pursuit of Truth in Input, Output, and Processing"

Two and a half years ago "Computers and Automation" changed its policy from being a trade magazine primarily restricted to the field of computers and data processing to being a trade magazine essentially in two fields:

- the design, applications, and implications of information processing systems; and
- the pursuit of truth in input, output, and processing.

The essential reasons for the change were expressed in our editorial "The House is On Fire," originally printed in the February 1970 issue, and reprinted in this issue on page 38. We invite our readers to read this editorial, again or for the first time, because "the house," our spaceship Earth, is still on fire, perhaps even more on fire, and still needs help from volunteer crews as well as the professional crew (governments and inter-governmental associations).

We said then that we need to "shed light on the major urgent problems of the earth today" — that professionals in the field of computers and data processing have to pay some attention, do at least some work, on urgent human problems outside the computer field. We say that again now.

What do we mean by "the pursuit of truth"? For obviously we cannot pursue all the truth in all fields.

One of the most urgent of human problems is deliberate, extensive concealment and lying, in order to protect vested interests, both capitalist in a country like the United States, and communist in a country like the Soviet Union — where people pretend that a situation is one kind of thing and in reality it is something altogether different. The kind of truth we are pursuing is the kind of truth which is socially important and significant and which people belonging to establishments, governments, organized' groups, are hiding or trying to hide — the kind of truth which, when one finally finds it out, makes one deeply angry that one has been so thoroughly deceived about it. There are perhaps three kinds of concealment.

First, the concealment may be the result of frank and open actions on the part of power, simple refusal to answer questions and to provide information. For example, Secretary of Defense Melvin R. Laird neglects or refuses to answer requests from Congress concerning the tonnage of bombs being dropped periodically in Laos, North Vietnam, South Vietnam, and Cambodia. This neglect and refusal is wrong, because Congress and the people of the United States are entitled to know, and because the "enemy" certainly knows. For another example, the central committee governing the Soviet Union certainly know approximately how many Soviet Jews wish to emigrate to Israel, but they are not answering any questions about that. All information available on this matter is indirect. For a third example, IBM certainly knows how many and which kinds of its computers are installed and where — information that would be of very great value for many purposes in the thinking that people have to do about computers for social and economic purposes. But IBM refuses to provide any such information.

Second, the concealment may be in the nature of a "silent conspiracy" in which a number of persons and organizations with common interests cooperate informally to allow some evil that does not hurt them to continue. One example consists of lead poisoning of children in the United States — see the report by Congressman William L. Clay on the page opposite. The information in this report makes me deeply angry.

Third, the concealment consists of biases, prejudices, stereotypes, and lies which are so deeply woven into the historical fabric of a country and its traditions that even recognizing a different point of view becomes very difficult. For example, take the attitudes towards American Indians which were expressed consistently and insidiously all through the history books I studied in elementary school. The Indians were portrayed as horrible savages, whose normal actions were to torture, scalp, and murder innocent white settlers. The American soldiers who killed and murdered Indian warriors, wives, and babies, were portrayed as gallant heroes. From time to time I would find the statement "The only good Indian is a dead Indian," a most hideous statement. Unfortunately, I did not realize for many years the thorough atrociousness of such assertions and this mindset.

To escape from these concealments, biases, prejudices, and lies, to fight continuously for the important, valuable truth, even if disturbing and unpleasant truth — this is one of the necessary duties of professionals who deal with information, computer people. A person cannot be a responsible information engineer unless he is able to strip off concealments and lies. A computer professional must take responsibility for:

- the truth and applicability of the input information;
- the correctness of the processing; and
- the truth and applicability of the output information.

Edmund C. Berkeley

Edmund C. Berkeley Editor

COMPUTERS and AUTOMATION for August, 1972

# Lead Poisoning: The Hypocrisy of the Presidency, and of the Appropriations Committee of the House of Representatives

Representative William L. Clay (D.-Mo.) The Congressional Black Caucus House of Representatives U.S. Congress Washington, D.C.

#### Sweet-Tasting Chips of Paint

Lead poisoning can injure or kill any child-but in all likelihood the child who will contact this man-made disease will be poor, under the age of 3, and black.

He will most likely be a child who does not eat regularly, is not well supervised and will live in tenements, run-down apartments, and dilapidated old houses.

More than 400,000 American children fitting this description will eat the sweet-tasting chips of paint containing lead this year. Over 3200 of them will suffer permanent brain-damage; and over 200 will die.

In reality, no one knows precisely how many really will suffer or die from lead poisoning. The statistics just cited are official US figures which, in the past, have tended to be underestimated.

What a cruel indictment it is of America to needlessly subject helpless children to the misery and torture of brain damage, blindness, and kidney malfunction, from lead poisoning!

#### Funds

The problem of lead poisoning, its prevention, treatment, and cure cannot be met without funds. Congress passed a special law authorizing such funds. But no money was appropriated for fiscal year 1971, and no money was requested by the White House for that period.

The law authorized \$10 million for fiscal year 1971 and \$20 million for the present fiscal year. The White House included in its budget, a request for a mere \$2 million for fiscal year 1972.

#### Gall

And, the White House had the gall to suggest that a request for that amount was a clear indication of the President's concern for the problem.

(Reprinted from the "Boston Globe", June 27, 1972)

#### Appropriations

When Congress did battle with the White House for funds to implement the law, an amount of \$7.5 million was obtained. Congress clearly did not do much better in appropriating an amount still less than half the authorization. Already, applications from cities now pending before HEW ask for more than \$7.5 million, and many cities haven't yet filed reports or requests.

Because the incidents and tragedies of lead poisoning are so prevalent in black neighborhoods, the Congressional Black Caucus of the House has introduced special legislation calling for full funding of the Lead Poisoning Prevention Act.

#### Lead Content of Household Paint

The Congressional Black Caucus also endorsed a proposal to lower the ceiling on lead content of household paint from the present 1 per cent to the figure supported by the American Academy of Pediatrics, 0.06 percent.

President Nixon says we must spend whatever is necessary to find a cure for cancer. But, the cure for lead poisoning is known. It is a man-made killer of children and should not be considered less deadly.

#### **Additional Funds**

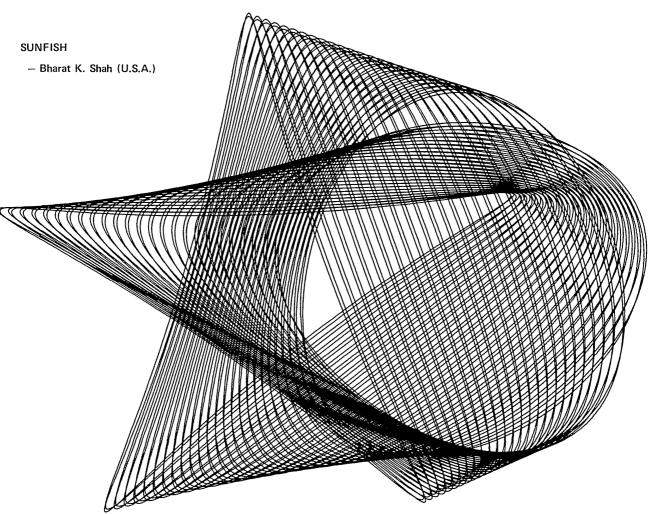
It is appalling that no action has been taken by the Appropriations Committee on the request for additional funds.

We are rightfully incensed that the general public, the Congress and the President seemed resolved to wait out lead poisoning — a man-made disease — which will eventually cure itself. In the meantime, the little children suffer.  $\hfill \square$ 

Footnote by the Editor: Over \$500 million per day is being spent in the present escalated air war in Indochina — and the Presidency and the Appropriations Committee are failing to authorize \$7 million dollars per year for dealing with the unnecessary lead poisoning evil in the United States.

# TENTH ANNUAL COMPUTER ART CONTEST

1972



Bharat Shah

The first prize in our 1972 Computer Art Contest has been awarded to Bharat K. Shah, 3005 East 21 St., Wichita, Kansas 67214. The winning entry, "Peacock Courtship", has been published on the front cover of this issue. Another of his entries, "Sunfish", is shown above.

"Peacock Courtship" and "Sunfish" were created by the "computerized Spirograph method." The equipment used was the IBM 360 System, Model 44, and a CalComp, drum-type, Model 760.

The computer art on the pages which follow receives honorable mention. For some of the drawings, the explanation is obvious or can be inferred easily; for others, explanations are given. In a number of cases, the computer and the peripheral equipment which produced the drawings have not been specified as much as we would like, because that information did not reach us by the close of the contest. We would, of course, like to identify the equipment that produced the art. Supplementary information of this kind should be sent to us for publication in a future issue.

The response to our Tenth Annual Computer Art Contest was good. We received over 100 computer drawings from all over the world. We are grateful to all those persons who sent us entries. A complete alphabetical listing of the names and addresses of all persons who submitted entries in this year's contest appears on the last page of the art section of this issue. In forthcoming issues of <u>Computers and Automation</u>, we hope to publish some of the drawings we were not able to include in this issue.

For August, 1973, we plan our Eleventh Annual Computer Art Contest, and we cordially invite contributions of computer art from all our readers and others who are interested in computer art.



ADVERSITY - James Lipscomb (U.S.A.)

> This drawing consists of five three-point nets, in which two nets were modified on one side by the cosine function, plus fifteen other less easily described manifestations of the same three-point net routine. "Adversity" was programmed in FORTRAN and run on an IBM 1130 computer, driving an online Calcomp 565 plotter.

Flat Projection 45<sup>0</sup> Angle of View

#### NINE PERSPECTIVE PROJECTIONS

- Kenneth F. Dunker and Paul Shao (U.S.A.)

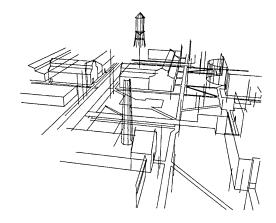
Professors Dunker and Shao of the Department of Architecture at Iowa State University in Ames have submitted what they believe is the first usage of the computer for perspective projections other than the flat picture plane method.

The perspective drawing method has long been established as a means for depicting objects in space. Usually, as an expedient, objects are drawn assuming a flat picture plane perpendicular to the principal line of sight. Since the geometry of this system is only a compromise between reality and technical limitations, at wide angles which are often desirable for architectural illustrations, distortions are readily apparent.

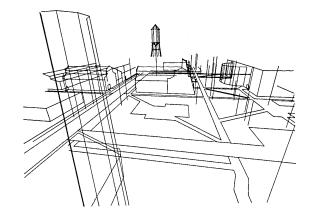
Because of the extreme difficulty in manual projection, perspective methods more accurate than the flat picture plane have seldom been employed. To overcome construction limitations, a FORTRAN program run on an IBM 360/65 computer with a CalComp plotter has been developed which facilitates execution of cylindrical and spherical projections.

The nine illustrations show a view of the I.S.U. campus. The vertical column on this page shows the view on a flat picture surface, the middle vertical column on the next page shows a spherical picture surface projected onto a plane, and the vertical column on the extreme right shows a cylindrical picture surface unrolled onto a plane. The top horizontal row shows a 45° viewing angle, the middle horizontal row a 90° viewing angle, and the bottom horizontal row a 120° viewing angle.

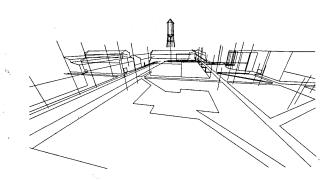
As can be seen, at angles greater than 45°, the least distortion occurs in the cylindrical perspective method. By enabling a wider choice of methods, the computer has improved the quality of twodimensional representations of three-dimensional objects in space.



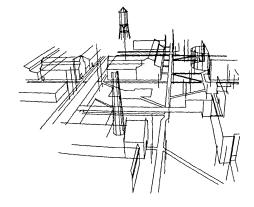
Flat Projection 90<sup>0</sup> Angle of View



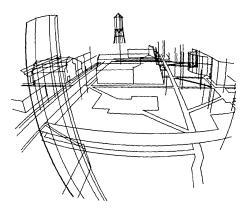
Flat Projection 120<sup>0</sup> Angle of View



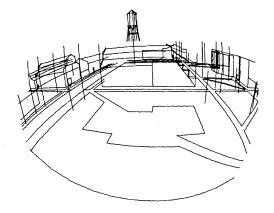
Spherical Projection 45<sup>0</sup> Angle of View Cylindrical Projection 45<sup>0</sup> Angle of View

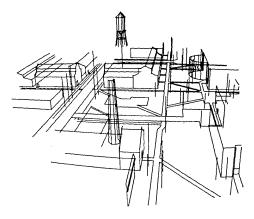


Spherical Projection 90<sup>0</sup> Angle of View

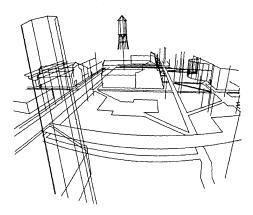


Spherical Projection 120<sup>0</sup> Angle of View

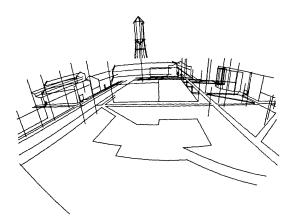


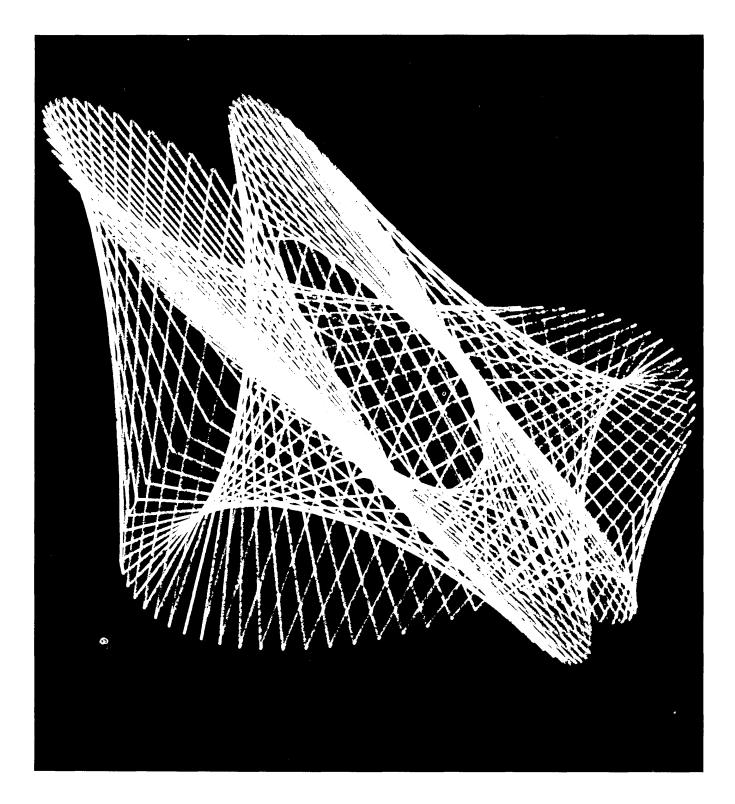


Cylindrical Projection 90<sup>0</sup> Angle of View



Cylindrical Projection 120<sup>0</sup> Angle of View





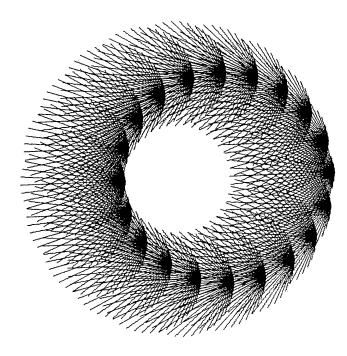
SKY LAB WVB - Thomas J. Huston (U.S.A.)

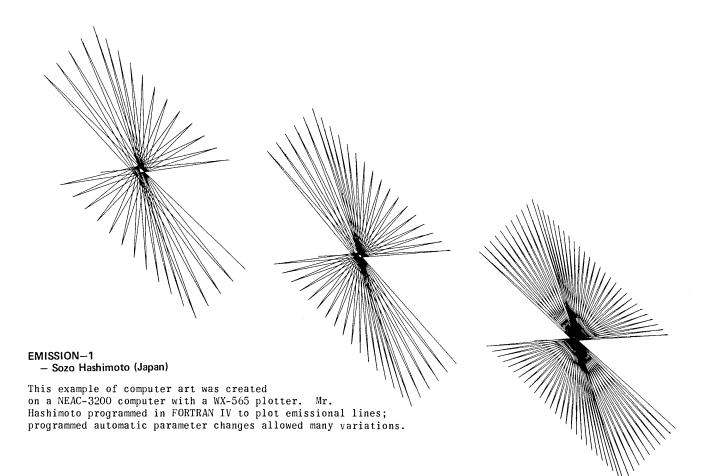
This drawing is an expression of free space. The program was written in FORTRAN and works with elements in three dimensions, "providing a stimulating experience to enrich one's perception". The work was done on an IBM 1130 computer with a CalComp plotter.

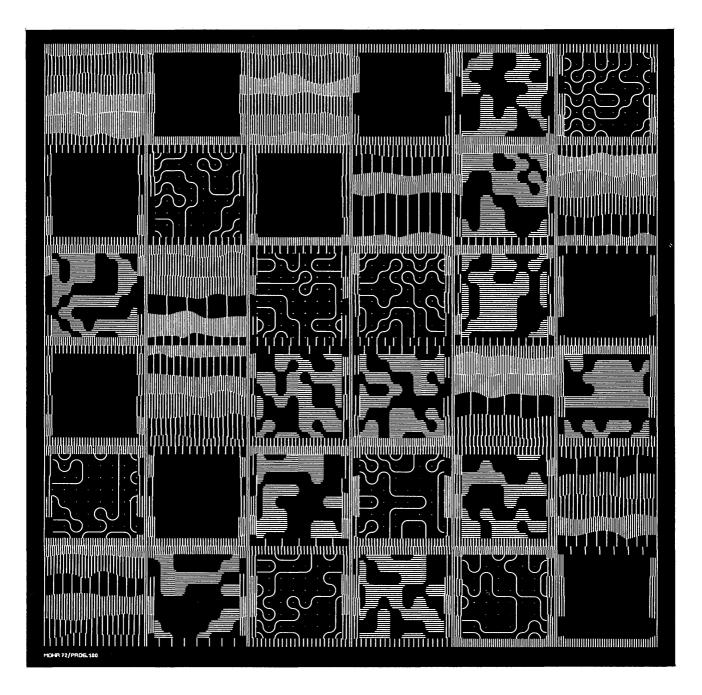
Copyright 1972, Thomas J. Huston, Computra

WHISKERED FRISBY - Judy Dayhoff (U.S.A.)

The "dynamic movement" of this entry was obtained with a program written in FORTRAN and one subroutine. It was run on an IBM 360/44 computer and plotted on a CalComp 565 off-line plotter.



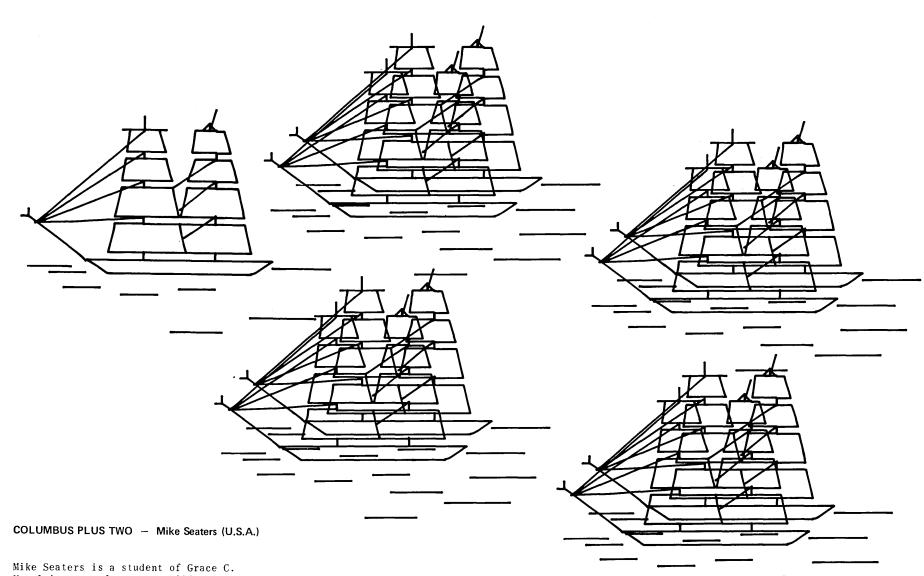




#### COMBINATORIAL FRAMEWORK OF THE ORDINAL 15

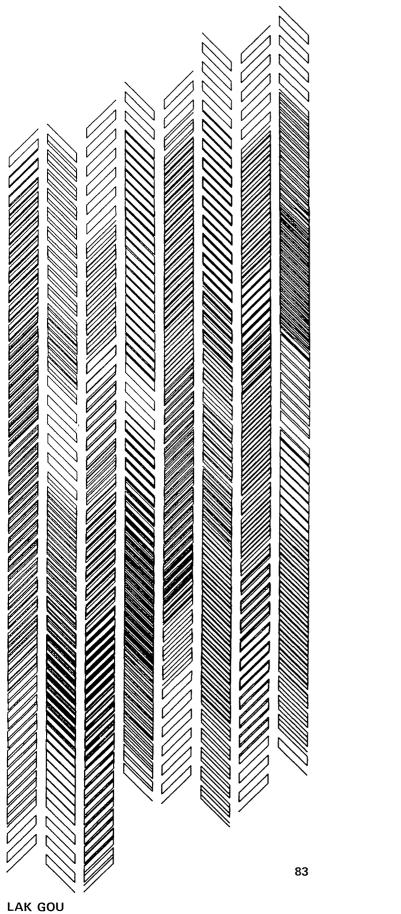
#### - Manfred Mohr (France)

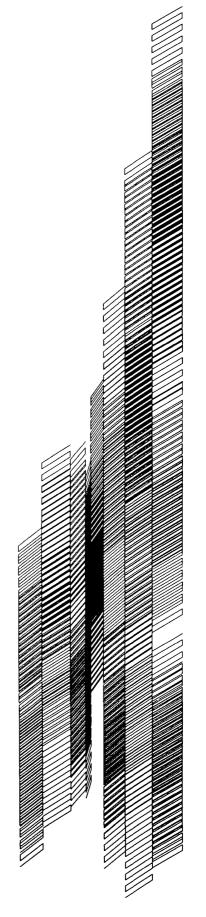
The four different units in this drawing are generated by two routines. One routine generates labyrintic paths through a matrix, and the other interpolates curves and fills the space between two curves with hatchings. To each unit is <u>a priori</u> assigned a number from 1 to 4. Their final positions are calculated by a magic square where the sum is 15.



Mike Seaters is a student of Grace C. Hertlein, a professor at California State University, Chico, who has done much to create "new and exciting" developments in computer art. This assignment was to write a program in FORTRAN for a non-maze, continuous line pattern. The program was run on the CalComp 633.

15

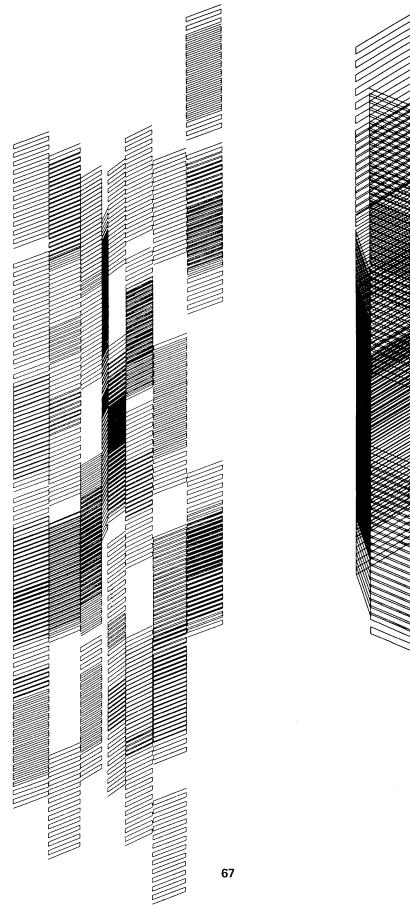


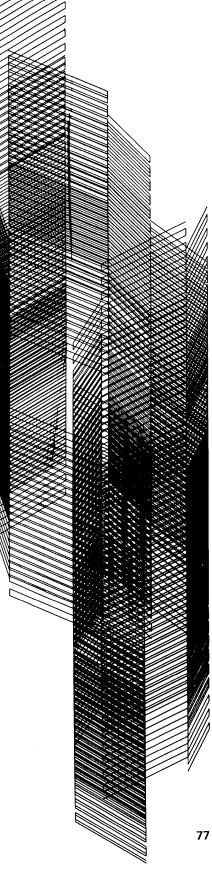


LAK GOU — Kenneth F. Dunker and Paul Shao (U.S.A.)

This series of drawings investigates the effects of tonality, line direction and interval on perception.

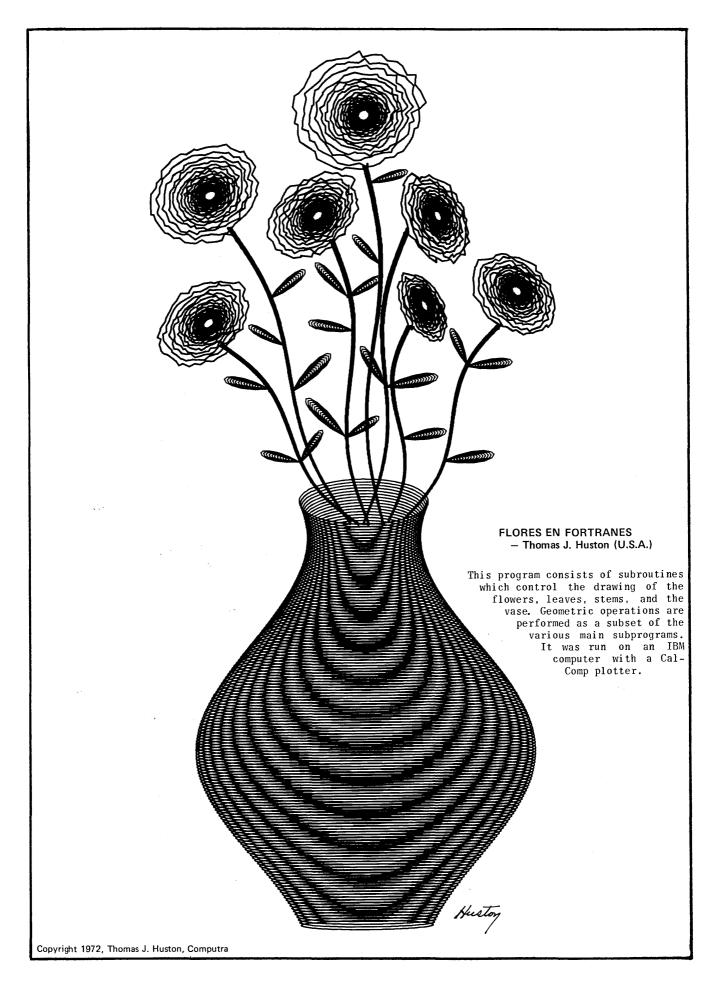
73

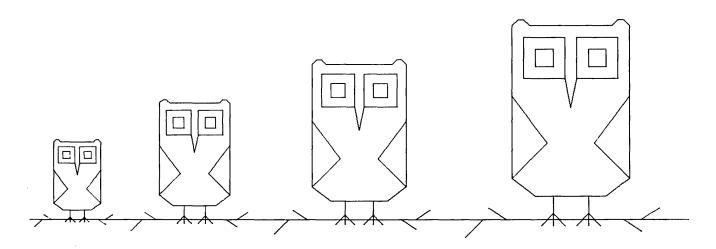




It was generated by CORAD, a FORTRAN IV program, on an IBM 360/65 computer and CalComp 565 drum plotter. CORAD draws a single, linear figure a specified number of times with any desired degree of control.

Any variation between absolute control and complete randomness may be specified for the parameters of location, size, and x-, y- and z-rotations of each figure.





This example of computer art, by another student of Grace C. Hertlein at California State University, Chico, is a response to the problem: "Diminishing Polygons. Vary the polygons in a personal manner." Programming was done in FORTRAN and run on the CalComp 663.

#### COMPUTER ARTISTS

- The following is an alphabetical listing of all persons who submitted entries in the Tenth Annual Computer Art Contest of <u>Computers and Automation</u>. The names of persons whose drawings are published in this issue are marked with an asterisk (\*). We are planning to publish in the future some of the drawings we were not able to include in this issue.
- Anderson, Michael, California State University, Chico, CA 95926
- Brunjes, Dr. Shannon, Yale University School of Medicine, 333 Cedar St., New Haven, CT 06510
- Contreras, Max, California State University, Chico, CA 95926
- \*Dayhoff, Judy, 1618 Tilton Dr., Silver Spring, MD 20902
- Dayhoff, Ruth E., National Biomedical Research Foundation, Georgetown Univ. Medical School, 3900 Reservoir Rd., N.W., Washington, DC 20007
- Dunford, Jim, California State University, Chico, CA 95926
- \*Dunker, Kenneth F., Engineering Annex, Dept. of Architecture, Iowa State Univ., Ames, IA 50010
- Franke, Dr. Herbert W., 8191 Puppling Nr. 40, West Germany
- Freeman, Dick, California State University, Chico, CA 95926
- Giovannoni, S., California State University, Chico, CA 95926
- Gros, Jacques, I.R.I.A., Institut de Recherche, d'Informatique et d'Atomatique, Domaine de Voluceau, 78 - Rocquencourt, France
- \*Hashimoto, Sozo, 2-28-2 Komazawa, Setagaya-Ku, Tokyo, Japan
- Hertlein, Grace C., Computer Science Dept., California State University, Chico, CA 95926
- Holmes, Dorothy, California State University, Chico, CA 95926
- \*Huston, Thomas J., Computra, Box 608, Upland, IN 46989
- Lindeman, Jack, California State University, Chico, CA 95926
- \*Lipscomb, James, 26 Woodfall Rd., Belmont, MA 02178 Livoni, Linden, California State University, Chico, CA 95926

- Lloyd-Thurston, Nihan, Hamme House, Kings Mill Lane, South Nutfield, Surrey RH1 5NB, England
- Lohuis, John, California State University, Chico, CA 95926
- Mahon, Tom, California State University, Chico, CA 95926
- \*Mohr, Manfred, 58 Bld. Latour-Maubourg, Paris 7, France
- McAninch, Ross, California State University, Chico, CA 95926
- Olson, Vernon B., California State University, Chico, CA 95926
- O'Malley, Robert, California State University, Chico, CA 95926
- Riske, George, California State University, Chico, CA 95926
- Roberts, Elaine A., National Biomedical Research Foundation, Georgetown Univ. Medical School, 3900 Reservoir Rd., N.W., Washington, DC 20007
- Robertson, Sidney, 5932 Mayflower Ct., Alexandria, VA 22312
- Sankey, Lyle, California State University, Chico, CA 95926
- \*Schmidt, Steven A., California State University, Chico, CA 95926
- \*Seaters, Mike, California State University, Chico, CA 95926
- \*Shah, Bharat K., 3005 E. 21st St., Wichita, KS 67214 \*Shao, Paul, Engineering Annex, Dept. of Architec-
- ture, Iowa State Univ., Ames, IA 50010 Sundgvist, Göran, Kraftdata AB, Box 3118, 103 62
- Stockholm 3, Sweden Tengstrand, Tord, Research Institute of Swedish
- National Defence, SEKT. 466, Linnegatan 89, S-11523 Stockholm, Sweden
- Thompson, Michael, Rechov Remez 1, Kadima, Israel
- Wong, Wallace M., California State University, Chico, CA 95926
- Wu, Peter, California State University, Chico, CA 95926
- Young, Edwin C., California State University, Chico, CA 95926
- Zajec, Edward, Via Damiano Chiesa 18, Trieste, Italy 34128

### COMPUTERS IN BANKING

Mr. J. Q. Hollom Deputy Governor Bank of England London, EC2R 8AH England

"Increasingly sophisticated users must be expected to require increasingly sophisticated levels of service."

(Based on an address at the British Computer Society Conference in London on 11th April 1972)

I welcome this opportunity first to touch on a rarely publicised area of the Bank of England's operations — its work in the field of computers; and second to voice one or two of the thoughts and questions which have been in our minds for some time about the longer-term impact of computers on banking and on the City of London — matters on which other minds will no doubt be turning.

I would not, of course, attempt to claim that the Bank's E.D.P. activities are different in principle from those of other institutions or that our thoughts about the present and future impact of computers have any particular degree of originality. Nevertheless, though many of the component strands are the same for a central bank as for other banks, the general texture of experience and thought into which they are woven is perhaps sufficiently different to be worth describing.

#### Computer Uses by the Bank of England

As with many other financial institutions, the Bank of England first began to make significant use of computers in the early sixties, partly in response to pressure from ever-rising staff costs. The first systems were developed for the Bank's stock register work (as was natural given its volume and nature) and were — and continue to be — very successful cost savers.

In the mid and late sixties there was a very considerable spread in the use of computers in the

Bank, not only to process most of the Bank's day-today banking operations but also to cover the payroll, some statistical work and a variety of accounting operations. In comparison with the clearing banks, many of the Bank of England's computer applications are small volume systems, though there are some — such as the stock register operations with some 2¼ million accounts — which are of a respectable size by most standards. More distinctive features of the Bank's systems, however, are their diversity and their inter-connection with each other.

#### **Future Uses**

It was this last aspect, combined with an increasing awareness of the limitations and rigidities of batch systems, which led us towards the end of the sixties to stand back from our day-to-day problems of developing, running and maintaining a large variety of discrete batch systems and to take a long hard look at the longer-term future of E.D.P. in the Bank. As many others will have found, such a look tends to take longer and prove harder than expected. In the Bank it resulted in a decision last year to proceed with the development of three large integrated on-line systems — one for the Bank's stock register work, a second for a wide range of statistical work (including the creation and use of a data bank), and the third for a large portion of the Bank's actual banking operations - all aspects of banking, foreign exchange and bullion work, information for market operations, management of the bank note issue, and the like. The majority of the Bank's ninety-odd staff in systems and programming are currently engaged on the development of these three projects, which, together with the maintenance of existing batch systems will continue to absorb most of the Bank's E.D.P. resources for the next few years.

#### **External Activities**

Concurrently with these internal developments, the Bank have been regularly involved in a wide variety of external activities. From the outset the Bank have sought to take a full part in the inter-bank moves towards automation of money transfer mechanisms — first the magnetic encoding of cheques and later the exchange of data on magnetic tapes via the Inter-Bank Computer Bureau and its successor — Bankers Automated Clearing Services Limited.

#### Processing Security Dealings

Then the Bank are working closely with the Stock Exchange in the current investigation of a possible new system for processing dealings in securities to take advantage of the opportunities offered by developments in data processing. The Bank also follow with considerable interest many of the Inter-Bank Research Organisation's activities in the field of long-term developments of technology in banking; and we maintain many regular contacts with overseas central banks and related institutions on the, as yet, largely unexplored field of international computer links.

Moving on from the relatively narrow subject of computers and the central bank to the broader topic of computers and banking in general, we switch from a little publicised subject to one which rightly receives a very great deal of public attention. All told there must be many hundreds of research workers in the Western world producing reports and papers on the future impact of computer technology upon banking. As many persons will already be acquainted with the broad outlines of thought in this area, I mention here only one or two aspects of particular interest to a central bank.

#### **Real-Time Terminals**

Firstly, it is predicted that, apart from developments in the banking system, the use of remote real-time terminal facilities in shops, offices and the like will drastically reduce money transmission times and introduce major changes in the demand for physical cash. Many attempts are being made to assess what impact this will have on the level of deposits with banks, on the basis of remuneration for bank services, and on the overall share of money transmission business coming to the banks. Any sizeable shift from cash to banking transfers of one type or another will, of course, have an immediate and direct effect on one of the Bank of England's major functions - the management of the note issue. But its impact may well be much wider than this and any considerable consequential change in the financial structure of the banking system or in banks' balance sheets must be of vital interest to the central bank as a monetary authority.

#### International Electronic Links

A second important area where the effect of technology on banking is of particular interest to central banks is in the present rapid moves towards international electronic links between commercial banks. Clearly we have a strong material interest here: for not only are we very directly involved as operators in the foreign exchange markets but we must also assure ourselves that technological advances in this field are not going to have — or make possible — side effects which might be damaging to national interests.

#### Statistical Data

A third area of vital concern to a central bank is the area of statistical data. Computers should both considerably reduce the cost to commercial banks of providing statistical data and, at the same time, increase the use that can be made of such data. Here central banks and the commercial banks have an evident interest in common in clearly foreseeing and then co-ordinating their requirements, so that the statistical ambitions of the central banks can be properly married with the management information needs of the banks, and the resultant material made available in the most helpful form.

I hope that these three examples will serve sufficiently to underline the interest and involvement of the Bank of England in technological developments in the banking industry.

#### International Financial Centre

I should now like to discuss a few thoughts on the longer-term impact of technology on the role of the City of London as a whole.

Few, I think, would deny that the City's growth to a position of dominance as an international financial centre, while helped to a considerable extent by extraneous historical factors, was chiefly founded on the flexibility and adaptability of the men and institutions working in it. It was this above all that put the City in a position to offer the range of financial services and facilities which, coupled with a reputation for expertise, integrity and despatch, has enabled the City to make such a contribution to the nation's economy.

#### Information Processing Systems

With one or two exceptions, it is probably fair to say that the actual information processing systems which support the facilities provided by the City, have not been a major determinant of the quality and type of services offered. Even where new technologies have been introduced, they have been absorbed into the City environment without changing it to any great extent. Thus the punched card systems in the thirties and forties tended merely to reproduce, with minimal changes, existing accounting systems; and the same has been true of many of the batch computer systems, though in this latter case the complaint has often been made — and not always unjustifiably — that new technology has brought about a decline in service.

#### The Role of New Technology

But the question that many people must now be asking themselves is whether we are moving into an era when technology will begin to move from this subordinate role to a position where it will have an increasing and vital influence on the nature and quality of service that a financial centre can provide. If this should prove to be the case, then a great deal of thought will need to be given to its implications.

Side by side with the possibly growing influence of technology on the supply of financial services by the City, the same influence can also be seen to be increasing, possibly at a faster rate, on the demand side in the institutions and industries which the City serves.

### The Antisocial Use of Computers

Donn B. Parker Senior Information Processing Specialist Stanford Research Institute Menlo Park, CA 94025

"The average financial loss of 20 authenticated cases of computer-related crimes which have been recently studied is \$670,400 per case with a range of \$1357 to \$1,750,000."

Computers have begun to be used as the subjects, tools, and environment of antisocial activity. The number of incidents of unethical and criminal acts using computers and computer-related materials is increasing. This fact, coupled with the growing impact of computers on society, calls for efforts to explore and assess this emerging problem.

#### Identification of the Problem

Many of the methods and subjects of criminal and unethical conduct are changing as a result of technological advances. The exchange, transfer, and recording of wealth and information has been performed manually using the medium of paper and validated by handwritten signatures, affixed seals, and witnessing. A transition from these methods to the use of computers and the electronic medium is now taking place. The methods used in financial and information crimes are rapidly focusing on computer automated systems. The criminal and unethical elements in society are attracted by wealth and activities of great social impact and value where there is leverage for gain and small chance of detection or apprehension. There is a continual testing of new technology in an effort to use it for unlawful or unethical purposes. Unethical purposes also extend into performing antisocial acts for self-amusement, amusement of others, or accepting a challenge to penetrate a system declared to be adequately protected. These acts too can be harmful to society.

#### Scope of the Problem

During the 1950s, the largest impact of computers was in science. Payroll applications had the most important direct effect on people outside of the laboratory. Only a few reports about the misuse of computers were heard; they never erupted into a court of law and were difficult to investigate at the rumor level. In the 1960s, computers emerged from the laboratories into the business and government sectors where their application became increasingly pervasive. The concept of computer programs and stored data as valuable property was introduced. The Association for Computing Machinery set forth guidelines for professional conduct in information processing, but concern for behavior was confined to the computing community until potential antisocial use of computers aroused the public interest. Computers acquired an undesirable image with the prediction of unemployment because of automation, computer crimes, and the superior-intelligence concept of computers.

#### **Three Criminal Cases**

The first federal criminal case concerning the use of a computer occurred in 1966 (United States vs. Milo Arthur Bennett, U.S. District Court for Minnesota). A young programmer was convicted on two counts of altering bank records. He changed the program running in the bank's computer to avoid detection of overdrafts in his checking account.

In 1969, an accountant was convicted for grand theft and forgery for stealing more than \$1 million from his employer during a seven-year period. He performed a financial analysis on a computer using true data and his falsified data to measure and control his thefts to keep them unnoticed.

In a felony trial in Oakland, California, in March, 1972, a programmer was charged with theft of a trade secret. He was alleged to have stolen a program from a competitor's computer through a remote terminal and telephone circuit.

These are three of an increasing number of instances of computer crimes. They frequently receive a great amount of publicity such as the last case described above. It received front page coverage in large headlines in the international <u>Herald Tribune</u>. Such publicity perpetuates the giant <u>electronic</u> 5

<sup>(</sup>Based on a portion of proposal submitted to the National Science Foundation, March, 1972)

brain syndrome among the public, which arises from the highly distorted and sensationalized image of computers created by public news media. Politically motivated acts of vandalism against computer facilities might also be traced to this syndrome.

#### Factors Leading to Criminal Behavior

In other sectors of society, potential misuse of computers can be anticipated. There are cases of individuals penetrating computer time-sharing services to cause embarrassment or just for amusement. Organized crime can be suspected of using computers through control of banks. In 1969, computer training was being offered to convicted felons in 26 states, which implies that a part of the criminal element has a technical capability in data processing.

There appears to be a small but growing element of new Luddites in society intent on reversing the penetration of computer use into society. Harvey Matusow, an American journalist in London, formed the Society for Abolition of Data Processing Machinery in 1968. He is reported to have had 1,500 members by 1970. His society publishes an anticomputer newsletter, and each member receives a handbook of guerilla tactics against computers.

Research and legislative activity in data bank security and the constitutional privacy issue are largely based on concern over misuse of computers. Computer applications are extending through telephone circuits to points of retail sales for source data where credit cards are used. SRI sources indicate the automated transaction industry will reach a volume of sales of \$500 million by 1980. Crimes associated with retail sales transactions are well known. Computers have not yet been strongly associated with public safety hazards, but they are finding increasing use to control traffic lights, public transportation schedules to close tolerances, air traffic, and intensive-care patient monitoring. Thus computers could become associated with crimes of physical violence.

#### Measures for Greater Security

Most businesses and governments at all levels that use and rely on computers have taken some measures to increase the security of their computing facilities. Unfortunately, security measures are being based on the value of what is to be protected with little concern or knowledge of real threats to computer systems.

The system of law and justice is having difficulty coping with the problem, based on recent examples of court cases and attempts to legislate new laws. For example, computer programs represent an entirely new and important commodity for which property laws, taxing, and protective mechanisms such as copyrighting, patenting, and protecting of trade secrets are causing many problems.

#### Lack of Knowledge

Misconceptions and lack of knowledge about computers and computer personnel have hampered law enforcement agencies and the courts in applying existing legal principles and suggesting new legislation to address gaps in the current laws pertaining to computer-related crimes. Law enforcement officers do not have the necessary expertise or training to identify applicable evidence when conducting a search. Counsel and judges are confused when attempting to establish the value of materials before the courts when litigation concerns the amount in controversy. For example, a reel of computer tape may be worth \$20, but the information stored thereon may be a trade secret potentially valued in the tens of thousands of dollars.

Lawyers engaged in preparing cases are handicapped in ascertaining relevant facts. In a recent vandalism incident, an associate of a prominent San Francisco law firm inquired of a deposee, "Did the computer become inoperable when (Mr. X) sat down on the console?" Answer: "No. When the main switch was thrown by (Ms. Y) shutting off power." This dialogue continued with a total lack of communication and no understanding. A short tutorial session was presented by a third party about unanticipated power fluctuations, damages to circuitry, and loss of data and programs being executed at the time.

In a recent national conference, a criminal court judge stated categorically to the audience that no one had ever heard of a programmer stealing a program from a computer. The implication was clear that programmers somehow are not subject to the temptations of ordinary men.

#### Size of the Problem

The incidence of computer-related crimes is still small compared to general crime statistics. Since 1966, less than 80 have been authenticated in the United States. However, many more have been reported. IBM receives about 30 reports per month of at least unethical acts occurring among its computer customer installations. No methodical recording or verification has been done. But the average financial loss of 20 authenticated cases recently studied is \$670,400 per case with a range of \$1,357 to \$1,750,000.

Thé rapid growth of the computer field and forecasts for the next ten years indicate the potential for growth of computer-related crime. Stanford Research Institute sources indicate 80,000 computers currently in use in the United States alone. This is expected to grow to 140,000 by 1975 and 170,000 by 1980. By 1980, annual sales should reach \$18 billion and represent 14 percent of all equipment and machinery manufactured in the United States. Employment directly in the computer field is expected to rise from 1,280,000 people in 1970 to 2,230,000 in 1975. This will represent about 3 percent of the 80 million people in the work force. The number of people both directly and indirectly associated with use of computers is approximately double the above figures.

Associating this information with the forecast that the transfer, exchange, and recording of nearly all the wealth of society in the United States will be done using computers makes the future impact of computer-related antisocial activities serious.

#### Expected Consequences of the Research

The consequences of the proposed exploratory and problem assessment research can have significant leaverage effect at this current, early stage of the problem. The nature of exploratory research is not susceptible to explicit statements of the results, but certain specific goals are foreseen at this time:

- A data base of verified, detailed descriptions of incidences of antisocial use of computers with extensive indexing will be produced.
- Model laws and court rules will be proposed in areas of law shown to be inadequate as a re-

sult of the field investigation of incidents.

- Methods to deter antisocial acts will be proposed in areas of management policies, employee relations, public relations, value systems, and professionalism.
- Technological and procedural methods of preventing computer-related crime will be described from the point of view of methods used or that might be used by perpetrators.
- Detection of antisocial acts will be considered beyond the known techniques of threat monitoring by computer-printed activity logs and adaptation of manual auditing methods. Actual cases that might have been detected more successfully will be studied.
- Successful and unsuccessful methods of field investigation and interdisciplinary approaches will be documented.

Five impact areas of these goals are identified below:

#### **Computer Users**

Business and government are relying on computers for vital functioning of their activities. All consumers are being involuntarily served or affected by these computers. This highly sensitive dependence on computer systems could reach such proportions as to preclude further advances in use until adequate protection and confidence have been developed.

Cost-effective computer security can hardly be achieved without knowing the real nature of the threat. Known and hypothesized security penetrations, and the nature of penetrators, will be investigated and analyzed. The research would seek to measure and put in perspective the cost of crime losses and prevention expenditures.

#### **Computer and Software Manufacturers**

Products in the computer field should be designed with security as an integral specification to achieve adequate levels of protection at reasonable cost. Investment in such product features is large enough to warrant significant research. Information about actual cases should be of value in new product design.

#### Law, Justice, and Congress

The results of the proposed research should form the basis for effective advances in application of existing laws and development of new laws where necessary. The ability of law enforcement agencies and the courts to contend with the new criminal methods will be aided by information supplied as a result of the research effort.

These agencies and the courts would be made aware of the relevance or inadequacies of present legal tools to the new fact situations. They would understand more thoroughly what those facts mean and what a crime is relative to computer use and in terms of legal issues. They would then be better able to assume their proper role of determining, if and when a crime has been committed and of what magnitude.

(please turn to page 36)

### SECRECY IN THE DATA PROCESSING INDUSTRY

J. L. Dreyer Association of Data Processing Service Organizations, Inc. (ADAPSO) 551 5th Ave. New York, N.Y. 10017

"Censorship, imposed secrecy, misplaced corporate loyalty, big brotherism, nest feathering or simply failure to disclose because discretion is the better part of valor" were key points raised in an ADAPSO program outlined by Bernard Goldstein, president of ADAPSO, in June 23, at a talk in Boston, Mass. He sought to open up the problems of the services industry to full and fair discussion in the interests of the public as well as the industry itself. Goldstein, who is also president of United Data Centers Inc., said:

"We are becoming increasingly concerned at the tremendous obstacles continuously being placed in the path of our effort to obtain and analyze the information essential for us to decide how to proceed."

He referred to the effort at acquiring information which was initiated in the hearings conducted by the Economic Committee of ADAPSO in Dallas, Texas, last February. Goldstein stated:

"Another example is the secrecy order issued by the United States District Court for the Southern District of New York in the pending government antitrust litigation against IBM. We are delighted that Chief Judge David N. Edelstein of New York's Southern District Federal Court, who is also the Judge in the IBM case, has for the first time just directed wide circulation of an antitrust consent decree proposal. But even the sixty-day expanded timetable he has fixed is not nearly sufficient for us to be able to come in with a properly considered judgment on such key issues as whether the doctrine of maximum separation should be extended to other IBM operations in the same fashion as it was to the service center segment in 1956.

"Still another example, is the report in the current issue of Datamation of an effort to censor (inferentially attributed to key IBM executives), a certain scholarly book discussing computer industry problems. Perhaps the book's re-production for the first time of certain documents in the official court docket of the government's litigation against IBM led to the secrecy order. But the book's only recommendation is that there should be a study of the computer industry and an inter-disciplinary discussion of its affairs. The very fact that those who sought to censor - whoever they may be - conceived such an analysis and recommendation to be somehow dangerous or even worth attacking, is suggestive of the enormous power IBM has in this industry. Isn't it a shocking commentary that each of us must continually keep in mind what IBM will think about what we do, lest we somehow displease IBM?

"I do not wish to be misunderstood — I haven't the slightest idea what's in the papers that we cannot see in the Federal District Court's Docket. But aren't we, the public, entitled to know why

(please turn to page 49)

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### COMPUTERS AND CARTOGRAPHY

Dennis L. Bress California Computer Products Inc. 2411 La Palma Ave. Anaheim, Calif. 92801

"The falling price of computer power and the availability of graphics hardware equaling hand-drawn quality has brought computer-aided cartography within many budgets."

Computer-aided plotting is turning the ancient art of cartography into an exact science. Today's geologist, civil engineer, city planner, highway engineer and government cartographer have turned to small computers and digital plotters for maps that in the past were produced entirely by hand. This movement to computer-aided cartography has yielded more accurate maps faster and at lower cost.

#### Mineral Exploration

Most of the first computer-drawn maps were geophysical data-reduction maps used for mineral exploration. Geologists developed excellent methods of correlating changes in the earth's magnetic field and intensity of atmospheric radioactivity to the presence of minerals. With the invention of practical airborne magnetometers and scintillometers, large-scale aerial surveys of remote regions became possible.

Software breakthroughs in data reduction such as IBM's Numerical Surface Techniques and Contour Map Plotting Program and the CalComp General Purpose Contouring Program permitted rapid turnaround from aerial survey to detailed contour maps.

The computer and digital plotter now do the majority of contour mapping related to oil exploration. Shell Oil, Texaco, and Gulf Research are but a few of the companies using these techniques.

#### Civil Engineering

The civil engineer has long used computers to solve coordinate geometry problems and earthwork calculations. The small computer has become as indispensable as the slide rule. It was natural to extend the use of computers to making maps. One of the many civil engineering firms producing computer-created subdivision maps is P.M.T. Associates, Sacramento, California.

P.M.T. uses COGO, the IBM civil engineering coordinate geometry program, to arrive at mathematically correct coordinates for such things as street center lines, right-of-way lines and lot corners. This coordinate file is the input for the Subdivision and Map Plotting System (SAMPS), which plots a map of the subdivision. This computer-aided solution does 80 to 90 percent of the subdivision drafting.

Small civil engineering firms or cities can purchase subdivision mapping services from service centers such as McDonnell Douglas Automation Company, St. Louis. Their subdivision program LAND provides full subdivision ink-on-linen maps and all engineering calculations from a set of engineering field notes.

#### **City Mapping**

Many city governments are staggering under the load of rapidly expanding boundaries and large-scale redevelopment, all requiring new maps. Two examples of efforts to enlist the aid of the computer are the cities of Las Vegas, Nevada, and San Diego, Calif.

Las Vegas is well along in the development of their computerized street inventory and mapping system. Most of the city engineers are now using the system. The computer is used for all earthwork calculations and cross-section plots. Right-of-way maps are plotted from coordinate data to aid in appraising land needed for new road improvements. Ultimately, all features of the street are described in the coordinate file. The result is a data base accessible to all municipal users, who can call for a map with selected features that cover only the

<sup>(</sup>Based on a report presented at a symposium "Islands of Applications", Tokyo, Japan, in June 1972)

area of interest. Map updating is a simple matter of adding the changes without redrawing the entire map.

The San Diego Gas and Electric Company of San Diego, California, has begun the arduous task of creating a data bank of all the city gas-line information. They are digitizing the location of all lines, valves and meters; and they plan to produce contour plots of gas pressure throughout the city.

Two decades of unparalleled city growth have left them with a nearly impossible record-keeping task on the changes to the city gas-piping system. However, once the tens of thousands of schematic maps are captured in a data bank, it will be a simple task to remain current with construction activity.

#### Waste Collection

The computer and plotter have come to the aid of the trashman. Owen and White, Inc., Baton Rouge, Louisiana, has helped several major cities to improve waste collection services and save money doing it. Their proprietary software program RAGS (Route Analysis, Generation and Simulation) takes a description of of all the waste pickup locations and produces an optimum route for each garbage truck. To do this requires an accurate description of the street network and the ability to relate statistical data to specific street segments. The data base this represents, Owen and White has found, can only be managed with the aid of a plotter. Several graphic editing steps, wherein data are plotted over base maps, are necessary to verify the accuracy of street segment location and associated data. Only after these steps can process-ing proceed. RAGS finally plots a map for each route plus a composite route map for supervisors.

Experience has shown that any driver using one of these maps can follow a route perfectly after a maximum of two supervised dry runs.

#### Aerial Photography

Large-scale highway mapping is now done from the air. The first step in planning a major road, power line, or irrigation canal is to photograph the route from the air using high-precision stereo cameras. An aircraft flies over the proposed route, shooting photographs rapidly, with about 60 percent overlap and 30 percent sidelap to permit the "block adjusting" necessary to obtain a true overall picture of the area.

The stereo-photograph pairs are developed and placed in a stereo comparator, which measures the distances between observed points of common detail in relation to each other. This data permits adjustment of the photographs to a particular geodetic grid system. The grid and significant points are then plotted. The photographs are referenced to the coordinate system, and the third variable, elevation, can be obtained.

The photographs are placed in a stereo plotter, which can be mechanically adjusted to remove the effects of aircraft altitude. The stereo images are superimposed onto a plot of the coordinate grid. The stereo plotter operator can focus on the threedimensional surface image and read the elevation at any desired coordinate.

Three organizations producing maps from aerial survey data are Aircraft Operating Company, Johannesburg, South Africa; the Australian Army, Bendigo, Victoria; and Computation Technicians, Inc., Anchorage, Alaska.

A.O.C. produces ground survey maps and cadastral maps of farms and townships using aerial photography, a small computer, and a digital plotter. The Australian Army is developing a cartographic data bank using the same techniques. Comp-Tech is producing manuscripts for use in conjunction with stereo plotters. On each six-foot-long manuscript are plotted aerial photo control points, tick marks to indicate the state plane coordinate system, and the alignment of proposed construction, such as a highway or power transmission line. By placing a manuscript on the bed of a stereo plotter, then projecting stereo photos of the corresponding area onto the manuscript, a man can digitize features of the terrain that will affect the planning and execution of the construction project.

#### **Multicolored Map Production**

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The newest and most precise branch of computeraided cartography is the production of multicolored precision maps. These are the "artworks" now being produced manually by highly skilled craftsmen in government mapping organizations throughout the world. It is here that new high-speed precision graphics equipment is pushing the state of the art forward.

Multicolored map production is an exacting science combined with liberal quantities of aesthetics. The science dictates that a map produced with as many as 22 different printing plates be so perfect that misregistration between plates is imperceptible. Established aesthetics demand smooth lines, perfect annotation and pleasing layout of descriptive information.

The materials problem is imposing. Linework is scribed, and color separation areas are cut in strippable film.

The symbology is precise and varied. Unique symbols number in the hundreds. There are tens of type fonts and sizes.

Linework varies widely in width and characteristics and must be smooth and pleasing to the eye.

On top of this are rigid standards for absolute accuracy and artwork-to-artwork registration. Multicolored cartography is a test by fire for the emerging technology of computer-aided cartography.

In this newest area of computer-aided mapping, few have developed production systems, but all are considering automation. Stereo photography now serves as the data source, and planimat digitizer/ stereo plotters capture the digital data. The raw data is pre-processed, edited, and verified on high-speed plotters. Post-processing includes the addition of symbol description, line smoothing, line type selection, and data separation by color plate. Final artwork is scribed, cut on strippable film, or photoexposed on photosensitive film. Printing plates are etched from the final artwork.

#### Conclusion

The falling price of computer power and the availability of graphics hardware capable of equaling hand-drawn quality on a wide range of graphics materials has brought computer-aided cartography within the budget and technical capabilities of a widening range of mapping applications. Edmund C. Berkeley, Editor Computers and Automation

"At work in the world today, and all of them slaves in the service of men, are probably hundreds of species of robots, and millions of individual robots,"

#### Outline

- 1. The Nature of Robots
- 2. The Versatility of Robots
- 3. The Nature of Life
- 4. The Essential Properties of Life
- 5. Robot Life
- 6. Choices in Constructing Robot Life
- 7. Robot Self-Preservation
- 8. Robot Self-Maintenance
- 9. Robot Reproduction
- 10. Outline for Constructing Robot Life
- 11. Robot Life Species No. 1

The purpose of this article is to discuss the properties of robots and the properties of living beings, and to outline how to construct robots made out of hardware which will have the essential behavior of living beings. This article also outlines some circuits by means of which behavior can be programmed in robots.

We do not expect that all readers will agree with the views set forth here. Some will agree with the Encyclopedia Britannica, asserting that life is the activity peculiar to protoplasm, and therefore something made of hardware, no matter how lifelike its properties may be, will never live. But we are convinced that, as a result of the great current development of automatic computers, it is worthwhile to bring up and discuss the subject of robots that are living.

We hope this discussion, and the circuits here given, will encourage investigators and experimenters to try to build living robots.

One after another the barriers to the construction of living robots are breaking down. It would seem reasonable to expect that before many more

(Based on a report first published 1952, republished 1956 by Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160) years go by, automatic machines (i.e., robots) that possess the essential properties of life will be "in existence" — or should we say, "alive"? Certainly much more than half the distance to the construction of living robots has already been travelled.

Now these statements are by no means evident on their face. So let us take a close look at the definitions, the facts, and the prospects. The first definition we need to pin down is robot. What is a robot?

#### 1. The Nature of Robots

The word "robot" comes from a Czech word meaning "compulsory service". The root "robot-" in the Slavic languages means "work". A robot is basically a machine that is able to work by itself, an automaton.

In this sense, a clock would be a robot, and so would be an automatic screw machine, — which is able to perform six operations automatically one after another on continuous metal bar stock fed through it; and so would be a traffic light that changes from green to red and back to green again depending on conditions in its environment. The traffic light which responds to motor cars rolling over a pressure plate in the road is a proper robot.

A proper robot is in fact an automatic machine with sensing organs, thinking organs, and acting organs. It is a machine that can adapt itself to some extent to its environment, doing different things depending on different conditions.

A good example of a robot is a device, familiar to oil refinery men, called an "automatic controller". Suppose we want to keep the level of liquid stationary in a certain tank in the refinery. In the wall of the tank we put a device containing a float, which can move up or down over a certain range. The movement of the float up or down for varying distances changes the pressure of compressed air running from the "black box" to a chamber over the stem of a valve. The valve can rise or descend varying the amount of opening in a third pipe, through which liquid flows into the refinery tank. And the compressed air in the chamber above the stem of the valve, working against a strong spring, varies the position of the valve. As fluid flows through the last pipe into the tank, the float in the liquid meter is affected, and the "loop" of "negative feedback" is completed; that is, every displacement of the float sets into motion a force to return it to its previous position. In this robot, the sensing organ is the float; the thinking organ is the "black box"; the acting organ is the

valve; and the compressed air pipe lines are the nerves and muscles.

How clever is this robot? How much of a thinking organ can be built into an automatic controller? We can imagine that it might take a minute or two for the liquid level in the tank to change as a result of the signal from the float, especially if the distances were long. Yet if we were designers, we may want a very even control of the liquid level, with quick, adequate response to a small change as soon as it starts to happen. To meet this need, several kinds of response can all be built into an automatic controller. One of them is called "proportional response": the response of the valve is proportional to the change of the liquid level. Another is called "rate response": the response of the valve is proportional to the rate of change of the liquid level. There are other kinds of response as well. Excellent automatic control in fact can be obtained, much better than if you enslaved a human being and told him to watch for dear life the liquid level reading, and move the valve according to stated rules.

The automatic controller kind of robot is partly responsible for the fact that gasoline less taxes sells today at about 25 cents a gallon, just about its price forty years ago, although nearly all prices have more than doubled. Automatic controllers are useful not only in oil refining but in making chemicals, paper, etc., and performing many other industrial processes involving continuous flows.

#### 2. The Versatility of Robots

At work in the world today, and all of them slaves in the service of men, are probably hundreds of species of robots, and millions of individual robots.

Almost any kind of scientific instrument can be used for the detection of information. These instruments can become the sensing organs for robots.

Almost any kind of machine — lathe, shovel, valve, motor, wheel, drill, screw, or other device — can be used for making changes in the physical world. All of them can become the acting organs for robots.

A variety of different devices can be used for transmitting information between the different parts of a robot: compressed air through pipes, electric currents along wires, mechanical parts in motion, cables running through pulleys, etc. These become the nerves and muscles of robots.

A large variety of devices may be used for reasonable operations on information: transistors, integrated circuits, relays, cams, compressed air, feelers, latches, etc. These become the thinking organs of robots. In fact, some robots — like the automatic dial telephone central office with subscriber stations, or automatic computers — display the development of hardware thinking organs to a prodigious extent.

But how close is a collection of these devices, integrated together into a robot, "living"? What is "living"?

#### 3. The Nature of Life

Have you ever in your imagination walked on the surface of Mars, and wondered how you would tell if

some THING you saw there were "living", or not? A short imaginary tour on Mars will help us see what properties any robot should have in order that it should be called living. In some cases, while you were walking on Mars, it might be easy to tell that a certain THING was alive. If the THING could apparently detect your presence, and either move away from you, apparently to avoid you, or move toward you, apparently to attack you, you would at once jump to the conclusion that the THING was alive.

On Mars, you might be right. On Earth, robots of this general nature, which no one claims are living, have already been made.

But how about the difficult cases, in our tour on Mars, when the ordinary clues that Earth beings use simply could not be relied on?

In regard to shape and structure, for example, the Mars THING would not have to be constructed with any resemblance to either an animal or a plant of the Earth. In fact, in view of our present knowledge, it seems unnecessary and unlikely that the THING could be made of the same chemicals in the same proportions as Earth protoplasm. In fact, the oxygen-less atmosphere and low temperatures of Mars would make Earth protoplasm distinctly uncomfortable.

Even on Earth, the shape and structure problem may be far from simple. One and the same living entity may be first an egg, then a caterpillar, then a chrysalis, then a butterfly. Some sea animals may have more than nine larval or nymphal metamorphoses, i.e., similar changes from infant to adult state.

In regard to size of the individual, the Mars THING would not have to have any given or stated size, in advance of observations made on Mars. On Earth the smallest individuals appear to be particles of virus, about one hundred thousandth of an inch in diameter. The largest animal is probably either the whale, length 80 or 90 feet, or the fossil dinosaur, called Gigantosaurus, whose foot print was about four feet in diameter, and whose length may have been as much as ninty feet. The largest plant is probably the sequoia or redwood, which, trunk and root together, may be over 500 feet in length.

In regard to speed of living, the speed with which the Mars THING lived could be quite unrelated to the speed of living of animals or plants on Earth. Even on Earth, the range of speed of living is great. Gnats do not hesitate to fly when raindrops are falling; presumably their nervous system has no trouble dodging raindrops in a time of the order of a hundredth or a thousandth of a second. The normal tempo for a response of a human being seems to be about 1/5 to 1/10 of a second. At the other end of the scale, apparently, is a lotus seed: In a greenhouse in Washington, D.C., scientists once sprouted two lotus seeds taken from a Manchurian fossil peat deposit, where they apparently rested dormant in their tough hard seed cases for at least a thousand years and perhaps five thousand.

In regard to environment, the Mars THING could have a narrow or broad one. On Earth, we have found so far upwards of three million species of living things; their environment ranges from broad to narrow. Some species are relatively independent and are at home in the air, on land, on sea, and some of the time in the sea, like gulls. Other species have an intensely narrow environment, like a kind of mushroom cultivated for food by certain ants in their anthills, and growing nowhere else.

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In fact, the more we think over the variations among living things on Earth, the more difficult we can imagine the problem to be of recognizing living things on Mars, especially if there were only a few species, minute, slow-moving, in narrow environments, with few enemies, and very limited adaptations.

#### 4. The Essential Properties of Life

What, then, are the properties of life? When do we consider that a thing is living?

There is no easy answer that covers all the extreme cases that we know about on Earth. Even supposing we could arrive at a definition that applied to Earth life, it still might not fit Martian life. But we can make a short list of apparently essential properties that would be sufficient on Mars as well as Earth for a thing to be "living". We cannot claim that these properties are all necessary, for there are many living things that do not have one or more of these properties.

It is I think reasonable to say that if a thing has the following properties, then it is living:

- <u>Self</u>. It has a persisting, separate, individuality or entity. It consists of matter. It has a center. In other words, it has a self.
- Sensation and Response. At some stages of its existence, it has the capacity to sense various changes in its ordinary environment, and make different responses to them.
- 3. <u>Death</u>. If it is forcibly divided through its center, it loses its individuality and all its capacity for sensation and response. In other words, it dies.
- 4. <u>Self-Preservation</u>. Its ordinary responses to its ordinary environment tend to avoid death.
- 5. <u>Self-Maintenance</u>. At some stages of its existence, it has the capacity to take stuff out of its ordinary environment and use that stuff for maintaining and repairing itself.
- <u>Reproduction</u>. At some stages of its existence, it has the capacity, in its ordinary environment, of making or constructing other complete things like itself and having the same six properties as itself.

There are two properties left out of this list which deserve some discussion. The first one is <u>sex</u>. We are all familiar with a great many species of Earth life in which individuals (in whole or in part) occur in two varieties, male and female, with familiar properties for most species. Some people may be inclined to say that sex is an essential property of life.

Actually, in plants, separate male and female flowers can be found on the same plant, as in cucumber vines. Or male and female organs, stamens and pistils, can be found right next to each other in the same flower, as in lilies. In fact, in some flowers, cross-fertilization for seeds is impossible, as in the bottle gentian which never opens its buds. In a few animals, such as aphids, many generations can take place involving only females. But there are species of living things on Earth, such as amoebas, bacteria, and viruses, in which no separation into male and female sexes can be found at all. Surely on Mars we would not require the discovery of two (or perhaps more) sexes before we would say that a Mars THING was living. In the same way with robots, we need not require the presence of <u>sex</u> before we will say that a robot is living.

The other property is <u>evolution</u>. Some people may be inclined to say that if the Mars THING cannot evolve, then it is not living. For, as far as we can tell, the races of living beings on Earth are all of them capable of evolving, through mutations, genes, chromosomes, and all the rest of the wonderful mechanisms of inheritance.

Actually, of course, people have not observed much evolution happening in many species, even after a century of scientific observation. So, to say that a thing must be capable of evolving before the thing can be called living is to set down a requirement that can hardly even be observationally applied; and so it is reasonable to disregard <u>evolution</u>.

#### 5. Robot Life

A rock like Plymouth Rock, a structure like the Golden Gate Bridge, a clock like Big Ben — these satisfy Properties 1 and 3; each has a self, each can be destroyed; and poets celebrate them.

The two robots we mentioned above — the intelligent traffic light, and the automatic controller — satisfy Property 2; each can sense and act accordingly.

But the putting of properties 4, 5, and 6 self-preservation, self-maintenance, and reproduction — into matter that is not protoplasm has, so far as we know, not yet happened. Unless, of course, it has happened in some atomic energy installations, and is shrouded in unscientific secrecy.

In fact, men have not yet seen any great need to do so. A robot guided by man can easily preserve itself, like an automobile with a driver. Why take the trouble to equip the robot to preserve itself? A robot can easily be maintained and repaired by men in a service station — why take the trouble to make the machine able to take care of itself? More robots of any desired type can easily be made in a factory — why take the trouble to design the machines so that they can make themselves? As a result, men become nurses for robots.

There are however no inherent difficulties in the way of building these three properties into objects. For these properties describe rather simple programming (behavior) for robots. Indeed, from men's broad experience with robots to date, it is possible to program a robot to have almost any kind of rather simple behavior that you wish. In fact, many problems of warfare like the control of the fire of guns, or appropriate piloting of aircraft or guided missiles, can only be solved by building intricate and complicated behavior into robots, and those problems have been solved.

#### 6. Choices in Constructing Robot Life

How then shall we go about building self-preservation, self-maintenance, and reproduction into objects? What choices shall we make in order to con-

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struct robot life? Even if there are no inherent difficulties, there are plenty of technical ones.

The first decision we shall make is to avoid protoplasm, the basic stuff of Earth life so far. the one hand, there is no guarantee that living beings on Mars would require protoplasm. And on the other hand, protoplasm is a very complicated stuff, organized on an extremely small scale, and men still know only a little about it; and men will continue to know little until many more instruments are developed. Certainly we should not complicate our problem by trying to use this material. Instead, let us use the ordinary hardware nowadays used for making mechanical, electrical, and electronic systems. In fact, hardware is a kind of material that men have had experience with for more than two hundred years; and men are beginning to be able to do some rather remarkable things with it.

The second decision that we shall make is that robot life at its outset will be a parasite on protoplasm life. In much the same way, animal life is a parasite on plant life. Animal life appropriates the products that plant life manufactures; and robot life, at its outset, will appropriate the products that protoplasm life manufactures.

For example robot life can appropriate transistors, without being able itself to make them nor understand their making. In the same way, animal life appropriates the products of photosynthesis in plant life, without being able itself to make starch from water, carbon dioxide, and sunlight, nor even being able to understand (yet) how plants can do it.

The final decision that we shall make is that we will design the ordinary environment or home environment of the robot in such a way that our problems will be simplified. Living things have all of them an environment in which they live, and to immerse them into another usually kills them quickly.

#### 7. Robot Self-Preservation

If a robot is to be able to preserve itself, it has to have a certain amount of programming which connects responses with sensations in such a way that it is preserved.

Suppose for example our robot life species was a small robot on wheels like a toy automobile. There are several requirements:

- it should avoid ramming into obstacles, since that might damage it;
- (2) it should not roll too far away, for then it might get too far from its home environment
- (3) it should come back to the home base from time to time when it was in need of repair and maintenance.

Obstacle-sensing buttons, together with slow speed, could be the sensing organ for the first requirement. A light-intensity sensing device, together with a lamp on home base, could be the sensing organ for the second requirement. A time relay, together with the system of periodic maintenance, could be the sensing organ for the third requirement. The sensations would be converted into yesno indications and expressed in relays for example, and appropriate action could be easily arranged, including homing on the light beam to return it to its home base. A small robot, called the Mechanical Turtle, built by W. Grey Walter, a British scientist, described in the <u>Scientific American</u> for May, 1950, had the capacity of returning to its "hutch" for recharging when the electric power of its wet battery became weak.

Suppose there were "dangerous hazards" in its environment, like holes in the floor for example. Then either the robots would all die by falling in, or else they would need to be designed with a sensing feeler which would report "no floor" in a certain direction and so provide information leading to change in the direction of motion of the robot.

#### 8. Robot Self-Maintenance

If a robot is to be able to repair and maintain itself, it will need access to a supply of the items of hardware that composes itself, and some kind of programming (behavior) by means of which it can exchange old items, which it has partially or completely used up, for new items.

Nearly all items of hardware these days are prepared in shapes that are easy for men to position and assemble. For example, nuts and bolts come in separate packages. In assembling them, a man will pick up and orient the nut, set the nut against the bottom of the bolt, feel gently until the threads match, wind the nut up the bolt, and then tighten it in place with a wrench. For a man with his generalized, highly evolved, and well-trained body, his capacity to recognize shapes and locations with his eyes, and his ability to understand what is to be done, this process is very efficient.

But these operations are seriously difficult not only for all present-day robots, but also for all protoplasm life except trained human beings. A good "hand" made of hardware, and a good shaperecognizing sensing device made of hardware like an "eye", may still be years in the future, although current work at Mass. Inst. of Technology is experimenting in these directions. A great deal of work and thought is needed to develop items of hardware in forms that are easy for robots to position.

Undoubtedly, the easiest present way to solve the robot maintenance problem is not the plan of having the robot itself detect each part that may need repair, and itself remove it and insert a new part. Instead, the robot when needing repair should be able to find somewhere in its ordinary environment a "feeding and repair station" or "reconditioning berth" or "drydock" or "hospital", like the "hutch" of the Mechanical Turtle. Here, a counter-part robot, or matching automatic machine, will test each item in the robot, repair or maintain any item that requires it, and refuel the robot. This counterpart robot or "maintenance factory" will at first be thoroughly dependent on human life, in the same way as a parasite in many of its life stages is thoroughly dependent on its host. Positioning of the robot will be done once and for all, when it reaches the entrance of the maintenance factory.

Later, as more experience with "living" robots is gained, spare items can be stored in or on the robot, and whenever needed can be shifted into place. The easiest items in this class of course are liquids. Lubricating oil, for example, could be in a little reservoir on the robot and arranged to ooze out when needed. Then at much longer intervals the robot will visit its reconditioning berth and fill up with a new supply of lubricating oil.

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For all living beings made of protoplasm, the main repair process is internal and involuntary. Protoplasm life has the capacity to heal many kinds of damage to itself, though not all, by its internal processes which convert raw materials such as food, air, water, into the right kind of healing stuff. But internal healing will not be true for robot life at the start; it will be for some time a parasite on human life. The minimum self-maintenance requirement for robot life is that when it senses that it needs repair, or refueling, it can travel to be repaired or refueled.

#### 9. Robot Reproduction

If a robot is to be able to reproduce itself, then again it has to have a certain amount of programming (behavior) such that as a result of its own actions, from time to time, more robots like itself are reproduced.

Let us continue to keep the problem simple. We shall assume a robot "birth factory" — located in some part of the robot's ordinary environment. The robot birth factory would be like some rocky islands in the sea where certain species of sea birds always come to nest, where they won't be disturbed by any other life forms (except men).

The robot birth factory, like the robot maintenance factory, will be a counter-part robot, or matching automatic machine. The supply of each item for the robot life species will be in a feed line; the feed lines together will be positioned and oriented in the most convenient way; and there will be an assembly belt running by the end of each feed line one after another.

Now when a robot is stimulated in the appropriate way, what will happen? It will either return to the robot birth factory and press a button, or it will transmit an impulse. The robot birth factory will thereupon assemble and issue a new robot.

If the robot species is of the type that has tapes for programming to be recorded in them, there will be no programming yet recorded in the tapes of the new robot. So it can be provided that the adult robot will connect its tapes to the new robot, and record in the latter's tapes all the information which was recorded in its own tapes, together with such changes as it may have acquired from its experience.

Here we can see a possible great advantage of robot life: experience and learning acquired by an old individual can be transmitted directly to new individuals — whereas protoplasm life has to go about the process in a much more indirect way.

At present it is commonplace to set up means of communication between automatic computers, so that the programming worked out for one can be made available to the others.

But what is "stimulation in the appropriate way" that we mentioned above? Many species of protoplasm life have just one simple tendency, to multiply. They produce new individuals of the species, as many and as fast as the environment and their own stage of development will permit. A plague of caterpillers in Minnesota once was so thick that locomotives and motor cars could hardly pass through them. Protoplasm life often presses on its means of subsistence. But robot life, a parasite, has to adapt itself to its host, human beings; and human beings cannot afford to have robot life multiplying indefinitely. Why not then provide that the number of individuals of a robot species is to remain constant? Suppose that each robot individual continually signals the robot birth factory. Then, if any robot individual "dies", it stops signaling the robot birth factory, whereupon the robot birth factory promptly issues a new robot.

The minimum reproduction requirement for robot life is that when an individual or group of robots reports the need for another individual robot of the species, another such robot is reproduced.

#### 10. Outline for Constructing Robot Life

Now, how do we go about constructing robot life?

Corresponding to the three parts of a robot, there are three aspects to the problem of constructing robot life. These are: the construction of sensing organs; the construction of thinking organs; and the construction of acting organs.

The construction of sensing organs for robot life is neither theoretically nor practically difficult. For sight, we can have phototubes or photodiodes that sense light. For sound, we can have diaphragms and amplifiers that respond to molecular vibrations. For touch, we can have buttons or reeds that sense pressure. For taste and smell, we can have chemical detection apparatus that can sense at least some kinds of matter. For many senses that human beings do not possess, there exist scientific detection instruments that could be employed.

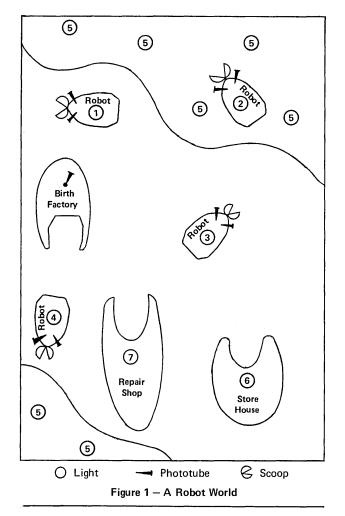
The construction of acting organs for robot life is not theoretically difficult, but practically it is. The example mentioned above, a hardware "hand" equivalent to the human hand, is a good illustration Even so, there are many simple kinds of mechanical devices that can be employed for the acting organs for robot life: wheels on which they can roll, scoops by means of which they can pick up things, etc.

The construction of thinking organs for robot life, the organs guiding its behavior, is a problem which may appear to be theoretically difficult; but actually its solution is not difficult. This is the problem which we shall discuss at length in Part 2 of this article.

#### 11. Robot Life Species No. 1

But first, to make our discussion concrete, let us assume a simple species of "robot life", and its home environment, a "robot world". See Figure 1.

- In this robot world, we see represented:
- Four small robots; they roll on three wheels, have a pair of phototube "eyes", have a scoop for "hands", and have on their backs a light; the lights are of four different colors (colors 1, 2, 3, 4).
- Food Areas, lighted with a number of lights, all of the same color (color 5); here "food" may be found.
- 3. A Storehouse, where the robots bring food (light of color 6).
- 4. A Repair Shop, where a robot can be repaired (light of color 7).



5. A Birth Factory, having a rotating phototube which scans the robot world; here new robots can be produced.

The kind of behavior we assume for each of the entities in the robot world is as follows:

- 1. Storehouse: Store food when brought to it.
- 2. Repair Shop: Repair a robot when one comes.
- 3. Birth Factory: If the light of any robot goes out, issue a new robot of the same type (i.e., with the same color light).
- 4. Each Robot:
  - A. Hunt for food, if well.
  - B. Pick up food if found and take it to the storehouse, if well.
  - C. Put down food, if it is well, when it reaches the storehouse, and if it becomes sick, anywhere; and then back up a little and go forward in a new direction (to avoid running over the food).
  - D. Go to the repair shop, if it is sick.
  - E. Get repaired in the repair shop.
  - F. If it hits an obstacle, back up a little, and then go forward in a new direction.

(To be continued in Part 2.)

Hollom – Continued from page 21

#### Speedy Service

Increasingly sophisticated users must be expected to require increasingly sophisticated levels of service: and institutions with the means to flash an instruction anywhere in the world in a matter of seconds will be impatient if the instruction to a bank or other institution is not executed as speedily as comparable technology would permit.

It may well be some considerable time before all day-to-day financial operations are executed and accounted for at the time the initial instruction is received in a financial centre. Indeed there are some pretty substantial banking and other hurdles to jump before this state of affairs can be reached. But it is surely a goal to be borne in mind when planning future developments.

#### An "Interface"

To reach such a goal it will be necessary to plan for points of very fast "interface" between the different constituent parts of the City complex and this must throw up some formidable problems. Over the years ahead such developments will call for almost unprecedented technical co-operation between different institutions and groups of institutions in the planning, design and implementation of the necessary systems. Reconciling this technical cooperation on system matters with healthy competition could be one of the most subtle and difficult problems to confront the City in the future. The banks are learning to deal with this problem in their own industry and will certainly be able to make an enormous contribution in the wider field to developments of the type I have been describing.

#### **Possible Conflicts**

But the great power which new technologies will give us all to explore new and different ways of conducting our business could well tend to reveal conflicts between the interests of the whole and those of particular parts of the financial centre.

In addition there will continue to be the problems of priority which are bound to arise from the conflicting demands on scarce resources for longterm developments, on the one hand, and the pressing needs to deal with present problems on the other. Nevertheless, it will be in everyone's interest that developments of the type I have been discussing should be orderly and controlled; and it may therefore be that, at some stage, it will be necessary to consider whether the technical co-ordinating, planning and research capabilities of the City are effectively meeting these demands and, if not, what should be done to improve them.

#### The European Community

My last point is this. I have been discussing the problems to be faced within the City, but I do not have to remind anyone that the 1st January 1973 draws rapidly near, and from that date London will take its place as one of several financial centres in the Community.

To meet this challenge we shall need to make full and imaginative use of an extensive and growing range of advanced technological resources, amongst which computers must continue to play a dominant role.

## The June 1972 Raid on Democratic Party Headquarters

Richard E. Sprague Hartsdale, NY 10530

> "The situation has the appearance of being extremely dangerous, and not at all representative of the normal political struggles and confrontations found during a presidential campaign year. The present battle is 'for <u>all</u> the marbles', as the expression goes."

On Saturday, June 17, 1972, about 2:30 in the morning, five men were surprised by police in the headquarters of the National Committee of the Democratic Party in Washington, D.C. This is a suite of 29 offices on the 6th floor of the Watergate Hotel in a fashionable new area in Washington. The five men were well dressed; all wore rubber surgical gloves, and were unarmed. They had with them extensive photographic equipment and electronic surveillance devices able to intercept both regular conversation and telephone communication. Police said two ceiling panels near the chairman's office had been removed in such a way as to make it possible to slip in a bugging device.

It has since turned out that these five men have numerous connections with the Republican Party, with the White House, with President Richard M. Nixon, with the Central Intelligence Agency, and with the Committee for Re-Election of the President which was headed by former U.S. Attorney General John N. Mitchell.

The Chairman of the Democratic National Committee, Lawrence F. O'Brien, on Monday, June 20, filed suit in district court in Washington for \$1 million against the Committee for Re-Election of the President.

The names of the five men arrested, and the amount of bail for each one are:

James W. McCord, Jr., \$30,000 Bernard L. Barker, \$50,000 Eugenio R. Martinez, \$50,000 Frank Sturgis, \$50,000 Virgilio R. Gonzalez, \$50,000

Who are these five men? what is their background? what are their connections? And what was their probable motive?

Let's begin with the backgrounds and associations of the men involved. There were apparently nine men mainly involved, four of whom as of present writing have not been arrested. Eight of the nine stayed at the Watergate Hotel between May 26 and May 29 and again on June 16 and 17. They were all from Miami. The ninth man, James W. McCord, lives in the Washington, D.C. area. Their backgrounds are as follows.

#### highest ranking security officials in the Central

Intelligence Agency, with 19 years service, supervising 50 to 100 employees, and a civil service rank of GS 15 or 16. After retiring from the CIA in 1970, he entered the security consulting business as McCord Associates, Rockville, Md. He was hired as security coordinator for President Nixon's reelection campaign and as security consultant for the Republican Convention. Reports filed with the U.S. Government on June 10 by the Committee to Re-Elect the President show that McCord was on the r payroll at \$1209 a month as of May 31. He is a member of a special 16 man military reserve unit concerned with radicals in the U.S., which operates under President Nixon's Office of Emergency Plans and Preparedness. He has been a liaison between the CIA and Combatientes (a Cuban paramilitary anti-Castro organization), and an organizer for the CIA of the Bay of Pigs invasion of Cuba in 1961. He used the alias "Edward Martin" when he was arrested.

The Five Arrested Persons:

James W. McCord, Jr.

tenant Colonel in the U.S. Air Force Reserve, and

was once an FBI agent. He was formerly one of the

James Walter McCord Jr. - age 53. He is a Lieu-

#### Bernard L. Barker

Bernard L. Barker, alias Frank Carter, is a wealthy, Cuban-born Miami businessman, in the real estate business. His code name was "Macho" during the Bay of Pigs planning operation in 1961. He worked for E. Howard Hunt (see below) in the CIA, and was a business partner of Miguel R. Suarez in Miami. He established secret Guatemalan and Nicaraguan invasion bases. He is closely associated with Manuel Artime Buesa, military leader in the Bay of Pigs invasion. He is President of Barker Associates Inc., a Miami real estate co.; he was a principal link between CIA headquarters and the Cuban exile army during the pre-invasion period.

#### Frank Sturgis

Frank Sturgis, alias Frank Angelo Fiorini, alias Edward Hamilton, was involved in the Bay of Pigs preparations. He is a former American marine, a soldier of fortune, a friend of Jack Anderson, an anti-Castro-Cuban organizer in Miami. At one time he transported arms to Castro in the Sierra Maestra, but turned anti Castro. He is a close associate of Major Pedro Diaz Lanz, former Castro Air Force chief, and helped spirit Diaz Lanz out of Cuba. He purchased arms for anti-Castro Cuban groups. He was questioned by the FBI about Lee Harvey Oswald being in Miami in 1963, as were several other anti-Castro soldiers of fortune from No Name Key (these were Jerry Patrick Hemming, Steve Wilson, and John Martino).

#### Eugenio R. Martinez

Eugenio R. Martinez, alias Gene Valdes, is a real estate agent, and Florida notary public in Florida. He is an anti-Castro activist and works for Barker's real estate co. He is a friend of Hunt, a former CIA agent, and a member of the Combatientes.

#### Virgilio R. Gonzales

Virgilio R. Gonzales, alias Raoul Godoyn, is an anti-Castro Cuban of Miami, a locksmith, a former CIA agent active in the Bay of Pigs affair, and a member of the Combatientes.

#### Other Persons

Of the other four persons at the Watergate Hotel only two as of present writing have been identified:

Angel Ferrer, president of Combatientes Humberto Lopes, member of Combatientes

Several other men appear to be linked closely to the raiding group as a result of information in addresses, books, etc.

#### E. Howard Hunt, Jr.

E. Howard Hunt, Jr., code name "Eduardo" during the Bay of Pigs, is one of the top officials of the Central Intelligence Agency. Hunt is a former consultant to Charles W. Colson, who is a special counsel to President Nixon.

Hunt was in charge of the Bay of Pigs invasion of Cuba. He met with Barker in Miami two weeks before the headquarters break-in. He worked as White House consultant on a part-time basis in 1971 and 1972. Hunt's name and phone number were found in the address books of Barker and of Martinez. Materials were found in Hunt's office in the White House linking him to the break-in. He disappeared from the United States the next day. Previously he worked as a writer for a Washington public relations firm, Robert R. Mullen Co., raising funds for Nixon's re-election; he is an author of spy novels; he was the chief of a Cuban-American right wing commando team.

#### Additional Persons

Douglas Caddy, attorney in Washington, D.C., a close friend of E. Howard Hunt, represents all five of the men arrested. He had an office in the Mullen agency, and is a friend of Barker and his wife.

Charles W. Colson is a special counsel to President Richard M. Nixon. He is a former CIA official; he handles "touchy" political assignments for Nixon; he approved hiring Hunt as a consultant to the reelection committee.

Miguel R. Suarez is a Miami lawyer, head of Ameritos, a wholly owned subsidiary of All State Investment Fund, S.A. Incorporated, in Panama; he is a prominent Miami Republican and a friend of Claude Kirk.

James H. Landis is a retired Army Colonel, head of a special 16 man unit based in Washington, part of the U.S. Military Reserve operating under the Office of Emergency Plans and Preparedness and part of the Executive Office of the President. He is a friend of McCord and a former member of the unit.

#### Money from the CIA

It is interesting to note the aura of the CIA, right-wing activists, Republicans, anti-Castro people, and heavily financed activities.

When the five men were arrested, they had with them electronic listening devices and radio transmitters, burglary kits, walkie-talkie radios, cannisters of Mace shaped like pens, and 53 consecutively numbered \$100 bills, cameras, and rubber surgical gloves. (The money was part of \$89,000 withdrawn from a Miami Beach bank by Barker in May.)

The original \$89,000 against which the withdrawal was made had been deposited in the Miami Beach bank in "typical CIA fashion" and consisted of four checks from a Mexico City bank in the name of Barker Associates Inc. Barker's lawyers said the checks were part of a real estate deal. But the unusual part about the withdrawal was that many thousands of the \$89,000 were taken in \$100 bills, all consecutively numbered. As one Cuban broadcast journalist said, "Obviously, it's a CIA job. Look at those \$100 bills. I remember when CIA front groups used to buy time on our station and they always paid in consecutively numbered \$100 bills. One group's bills would follow another's."

#### **Bugging?**

Since the raiders were caught with the listening devices and transmitters, and two ceiling panels in O'Brien's office had been removed, there seems to be little doubt the objective was bugging. The Miami Cuban connections of the group and McCord and Barker's employment as security officers for the Republican National Committee, led the FBI to discover that McCord had been arranging "security" in the Republican's Miami headquarters hotel. However, it turned out that the Democrats used the same hotel, The Fontainebleau. O'Brien wisely insisted that the hotel be "swept" for bugs before the Convention.

Thus the possibility became clear that a group backed by the CIA and the Republicans, a group of adventurers and specialists with anti-Castro rightwing, anti-liberal beliefs, were bugging two of the Democratic Party's prime headquarters about a month before the Democratic Convention.

The main question of course is, Why? What information could this group or the Republicans possibly expect to obtain by bugging that would do them any good in the race for the Presidency?

#### Some History re The Bay of Pigs

Before proposing an answer to the question raised, a review of some history since the Bay of Pigs operation is in order.

It is well-known that the 1961 invasion of Cuba that began at the Bay of Pigs was planned, financed, and directed by the U.S. Central Intelligence Agency. The Agency used militant, right-wing, anti-Castro, groups of Cuban exiles, American CIA agents, and soldiers of fortune. It is less well-known that a second "Bay of Pigs" style invasion of Cuba was planned and prepared by front organizations for the CIA in 1963. This plan was finally ordered stopped by President John F. Kennedy in the summer of 1963 and the stop order aroused fierce hatred of the President by the exiles.

#### Planning of President Kennedy's Death

Militant groups similar to the Bay of Pigs groups were being trained by CIA agents in 1963 in Guatamala, on No Name Key off the coast of Florida, and north of Lake Pontchartrain near New Orleans, Louisiana. When these groups were ordered stopped, several men in these groups and their CIA backers and trainers decided on plans to assassinate President John F. Kennedy. Clay Shaw, David Ferrie, Maj. L. M. Bloomfield, Gabaldin, Jim Braden, Guy Bannister, and other persons were the CIA people involved. William Seymour, alias Leon Oswald, Emilio Santana, Manuel Garcia Gonzales, and others who were members of the No Name Key group, were the Cuban and American adventurers involved.

The assassination group was well organized, and backed by money from CIA front organizations, as well as money from Texas right-wing groups. The planning was complex and detailed requiring a type of concentrated effort in order to become successful. One of the requirements for success was the selection and setting up of a patsy, a fall guy, Lee Harvey Oswald. This part of the plan succeeded far beyond the wildest hopes and dreams of the assassination planners. To this day, many Americans fully believe that Lee Harvey Oswald was the "single mad assassin", the verdict of the Warren Report, whereas a much more plausible version (as made clear in over a hundred studies, articles, and books and over a thousand photographs and films) is otherwise.

A second key element in the planning was obtaining advance knowledge of where and at what times President John F. Kennedy was going to be publicly exposed. There is some evidence not yet fully substantiated that the team planning the assassination of President Kennedy controlled the place and time in the case of the Dealey Plaza motorcade. Whether or not this part is true, long advance notice of where President Kennedy would be was essential for planning of the assassination details.

#### Frank Fiorini

In 1963 the group on No Name Key was seeking financial support. Frank Fiorini, alias Frank Sturgis, was one of their fund raisers. Fiorini had been associated with anti-Castro activities since before the Bay of Pigs, and in 1963 he was trying to help the No Name group get ready for the second invasion of Cuba. His association brought him in contact with Jerry Patrick Hemming. Hemming has provided investigators of the National Committee to Investigate Assassinations with information about the group's involvement in plans for the Kennedy assassination.

Fiorini is therefore at least one link between the planners of the assassination of President Kennedy and the persons breaking in to the Watergate Hotel offices of the Democratic National Committee.

#### Motivation?

With this background information in front of us, it is reasonable to propose the motivation of the

Watergate five and their allies. Their motive was to secure advance data on the whereabouts of the Democratic Presidential and Vice Presidential nominees as the election campaign proceeded. Such information would very likely be available from only a very few sources. Two of these sources would be (1) the telephones and conversations in the headquarters offices of the Democratic National Committee and (2) the telephones and conversations in the headquarters hotel for the Democratic National Convention.

It is not difficult to guess why the groups connected with the Watergate breakin would be interested in elimination of certain candidates of the Democratic Party. The motives for assassination are simple, and are similar to those in existence in 1963 when President John F. Kennedy was killed and again in 1968 when Senator Robert Kennedy was killed.

#### Fear of McGovern

Each of the groups represented in the Watergate break-in has a great deal to lose if Senator George S. McGovern is elected president. On the other hand, they have nothing to lose and can continue to operate as they have in the past ten years if Richard Nixon is re-elected. Senator McGovern would probably drastically alter and perhaps completely eliminate the many activities of:

> The CIA The anti-Castro Cuban-American activists Certain espionage activities The special units involved in harassing liberal groups like the one headed by James Landis Para-military organizations The Pentagon and the Joint Chiefs of Staff

in surveillance of domestic groups, suppression of atrocity information, etc.

#### Danger

The situation has the appearance of being extremely dangerous, and not at all representative of the normal political struggles and confrontations found during a presidential election year. The present "battle" is "for <u>all</u> the marbles," as the expression goes.

#### Involvement of Republican Leaders?

A prime, as yet unanswered, question is the extent to which President Nixon, John Mitchell, and the White House staff were connected with, or authorized, or knew in advance about the Watergate raid.

Indications from news reports of a Federal Grand Jury investigation and an FBI investigation of the raid, are that E. Howard Hunt was still working for the White House at the time of the raid. Hunt left the United States on Sunday, June 18 after refusing to answer FBI questions.

John N. Mitchell, prior to his resignation in early July as Nixon's campaign manager, was reported to have initiated his own private investigation. Martha Mitchell appeared to be very upset by the Watergate raid because she started putting pressure on Mitchell to resign shortly after the raid took place. She told UPI reporter Helen Thomas, there were "very dirty things" going on in the campaign. She also claimed she had been made "a political prisoner" by security agents for the Republican Committee to Re-elect the President. She said one of them ripped the phone off the wall of her motel in California just as she was telling Helen Thomas something about "the dirty business."

After a few days of silence, John Mitchell resigned "to spend more time with his wife and family." On the basis of Mitchell's prior commitments to Nixon and his record as Attorney General, it seems very odd that ordinary "dirty politics" would induce his resignation. On the other hand it is possible that knowledge of plans for a pending political assassination might create a situation where Martha Mitchell and John Mitchell would act as they have.

#### Office of Emergency Plans and Preparedness

Other investigation of Nixon's possible involvement might center on the unit under Landis which is part of President Nixon's Office of Emergency Plans and Preparedness. This unit, concerned with radicals in the U.S., is linked to James W. McCord, since he was a member of the 16 man unit.

Also, Charles Colson, who recommended that Hunt be hired as consultant to the Nixon re-election committee, is a lawyer for Nixon, and has the assignment of handling "touchy" political assignments for Nixon.

#### Prediction

One could put forward the proposition that Nixon and his advisors believe that the McGovern ticket will actually win in November. In this case, a politically "touchy" Emergency Plan under Colson's, Hunt's, Landis' and McCord's direction, might need to be put into action. The plan would call for the prevention of the election of McGovern by any method available, fair or foul.

This would not necessarily imply that Nixon was ordering the assassination of McGovern. Some lowerlevel person might take the decision into his own hands, interpreting his assignment to include that "desirable" possibility. There are some investigators who believe that this may have been what happened with Lyndon B. Johnson and the John Kennedy assassination. Unquestionably, Johnson knew, and still knows that there was a conspiracy. It is possible he "turned his head," when he heard echoes of the conspiratorial talk among his associates. In McGovern's case, character assassination may turn into real assassination at the lower CIA levels.

In contrast to the post-event analyses of the assassination of President Kennedy in 1963 and Senator Kennedy in 1968, we have only to await the passage of time until November to judge the correctness of the prediction:

> Senator George S. McGovern will not be permitted to occupy the presidency of the United States.

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#### Parker - continued from page 24

Congressional hearings are continuing on the impact of computer technology in privacy issues, law enforcement, the credit industry, credit reporting services, and many other issues. Most of these issues concern some aspects of the misuse of computers; however, published testimony either contains little information about actual misuse or is faulty information commonly found in newspapers and magazines. The proposed research should separate fact from fiction and make facts about actual antisocial use of computers available in useful forms.

#### **Professional Societies**

In other fields professional societies have played a role, which is difficult to measure, but is commonly accepted as successful, in defining and maintaining ethical discipline. The proposed research would assist professional societies in standardizing appropriate ethical practices.

#### **Future Research**

The proposed research would constitute an initial milestone. Continuing research would provide a dimension of time to the studies, and allow for trend analysis and feedback on long term effects of security and legal actions. Rapidly advancing computer technology with new generations of computers every three or four years would require this continuing updated research. 

If any reader of this report knows of computerrelated crimes, attempted or achieved, the author will greatly appreciate information, so as to assist in this research.

# THE C&A NOTEBOOK ON COMMON SENSE, FIRST YEAR

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# "The House is on Fire"

In the computer field, there are basically two kinds of attitudes about the applications of computers and data processing—information handling—to the.solving of problems.

On the one hand there is the attitude:

Computers are tools like matches—and we are just mechanics. We take the data as given (the kindling). Our responsibility is the processing—swift, economical, correct (making a fire with matches). The answers belong to our employer (he uses the fire as he sees fit).

The group who holds this attitude—let's call it Group I takes the data and the problem as given—given by the corporation or the government, the employer or the client, who has the problem.

This group works on payrolls, etc.—and on the targeting of nuclear missiles and on calculations of the dissemination of nerve gases. And they work on the latter with the same "I'm just doing my job" attitude that they work on the former. In Nazi Germany Group I would have worked "under orders" on the design of ovens for efficient mass incineration of thousands of corpses from the gas chambers. (The Nazis put to death in concentration camps over 11 million Jews, Russians, Poles, Czechs, French, etc., in pursuit of the "final solution".) If you read "Treblinka" by Jean-Francois Steiner (Simon & Schuster, New York, 1967) you find out how one Nazi scientist graded corpses from fat to thin so the fires would burn better.

On the other hand there is the attitude:

Computers are tools like bridges—and we are professional engineers. We take the data as given (the materials and the site) but we check the data independently. Our responsibility is not only processing—swift, economical, correct (building a bridge with girders) but also worthwhile answers (bridges that work). The bridges we build must carry people, and we don't want them to crash.

The group who holds this attitude—let's call it Group II —works on payrolls, etc.—but they will refuse to work on calculations for the dissemination of nerve gases, or on calculations for targeting of nuclear weapons, or on calculations for the design of crematoria for thousands of human corpses. They see a responsibility greater than that to their government or employer—they see a primary responsibility to their fellowman.

A recent vote of members of the Association for Computing Machinery indicated that the proportion of Group I to Group II is about two to one. In other words, twothirds of the computer people who replied to the survey on the "questions of importance", voted that the ACM should not "take a stand on deeply political questions."

The attitude of Group I is a characteristically conservative attitude: "The world is going along pretty well"—"Let us not rock the boat"—"The existing system should be tolerated"—"Things will eventually work out all right"— "Professional people have their major allegiance to the persons who pay them"—"A computer professional has no social responsibility different from that of the nonprofessional man"....

The attitude of Group II is a characteristically liberal attitude: "The world can be a much better place than it is now"—"It is important to try to improve the world"—"Such a vast number of sad and evil things happen in the

world that everybody must do something significant to help prevent them"—"The fact that thousands of human beings have been killed by both sides in the Viet Nam conflict requires people everywhere to seek withdrawal of foreign armed forces from that unhappy civil war."

Scientifically it is easy to show that the attitude of Group I will lead to the destruction and extinction of the human race, just as the dinosaurs became extinct. Scientifically it is not possible to show that the attitude of Group II will lead to the survival of human beings on the earth: it is only possible to show that the attitude of Group II offers human beings some hope of survival in the increasingly more difficult environment on earth, the "house" for all of us.

For "the house is on fire": the earth as an environment for human beings has changed enormously in the last 25 years and is deteriorating fairly rapidly. Before 1945, the factor of sufficient distance from a danger could almost always save human beings alive. Now, distance is not enough. Now, because of interlocking planet-wide systems of consequences, the environment of the earth is no longer safe for human beings. For example:

- Large-scale nuclear war (and its radioactivity) between two countries in the Northern hemisphere can kill all the inhabitants of that hemisphere. International anarchy allows this to break out at the choice of one government.
- The explosive increase in the number of human beings alive—the so-called population explosion seriously threatens the power of the earth to support them. Worldwide anarchy allows any man and woman to bear children unrestrictedly.
- Pollution of the air, the water, and the land by man's activities is becoming world-wide. Again, international anarchy allows this to happen everywhere. Etc.

"The house is on fire". So it is necessary for all persons living in the "house" to take some time away from their play rooms, their work rooms, and their bedrooms, their computer rooms, their laboratories, and their ivory towers and to try to help put out the fire. The fire is licking at the edges of the roof and the walls and the floors—and time is pressing and will not wait.

Accordingly, **Computers and Automation** with this issue is starting a department in the magazine which for the present will bear the subtitle "The House is on Fire" and the title "The Profession of Information Engineer." Here we plan to publish information from time to time which will help focus the attention of computer professionals in the direction of becoming information engineers, "bridge" engineers,—not mechanics, not artisans. For we are, first of all, human beings with professional training, and secondly, we are computer professionals. We need to shed light on major urgent problems of the earth today. These are the great problems which cause our children to be "a generation in search of a future," to use the phrase of Professor George Wald, Nobel prizewinner in biochemistry. These are the great problems which raise the great question:

Will there be any future at all for our children?

Edmund C. Berfaller Editor

# COMPUTER DIRECTORY AND BUYERS' GUIDE, 1972

. . . will be published in the summer of 1972, as a special 13th issue of <u>Computers and Automation</u>, and will be mailed as a book

### The COMPUTER DIRECTORY is:

- an annual comprehensive directory of the firms which offer products and services to the electronic computing and data processing industry
- the basic buyers' guide to the products and services available for designing, building, and using electronic computing and data processing systems

#### CONTENTS:

- Roster of Organizations in Computers and Data Processing (probably 50 pages) Buyers' Guide to Products and Services in Computers and Data Processing Geographic Roster of Organizations in Computers and Data Processing Characteristics of Digital Computers Roster of Programming Languages, 1972 Over 2200 Applications of Computers and Data Processing Roster of College and University Computer Facilities Roster of Main Computer Associations Roster of Chapters of the Data Processing Management Association Roster of Chapters of the Association for Computing Machinery Roster of Special Interest Groups and Special Interest Committees of the Association for Computing Machinery
- Roster of Computer Users' Groups
  - . . . AND MUCH MORE

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by Edmund C. Berkeley

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- "Computers Their Operation and Applications", Reinhold Publishing Co., New York, 1956, 366 pp; sale, over 10,000 copies, hardbound, \$6.50
- 3. "Symbolic Logic and Intelligent Machines", Reinhold Publg. Corp., New York, April 1959, 203 pp; (translated into Russian); softbound, \$3.95
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# "Don't die, Ducky, don't die..."

Bradley Yeager & Associates Inc. Treasure Island, Florida 33740

A small child said it, and she said it in her own way for all of us in St. Petersburg, as her stubby fingers packed warming sand around a shivering duck coated with a black goo that held feathers and wings in a deadly grip.

We had been attacked without warning when a leaking oil tanker, already barred from another Florida port, went aground in Tampa Bay and began pouring crude oil over our beaches, birds and bays. The day was Friday, February 13th. And threatened by the tar-like pollution were some of the world's whitest beaches and cleanest waters. Ours.

Somehow we all knew it was too late for all the old solutions. All the "tchtching" and the hand-wringing in the world wouldn't get the oil off our birds and beaches or bring a thousand dead ducks and waterfowl back to life.

We'll never know the exact moment that the "they" who are always supposed "to do something about it" became "we", the people of St. Petersburg.

Of course we were deeply offended by the obscene look of black crude oil on white sand which here and there marred our beaches.

What really hurt us, though, was the plight of the birds. The loons, cormorants, pelicans and ducks that had been so familiar to us for so long. The birds. Our birds...returning to waters formerly friendly, now black with pollution.

So somehow in a matter of hours a helpless, dirty duck became the symbol of our frustration and caused us to take matters into our own hands...to do something about the man-made pollution that had so shocked us.

Quickly, bird watchers became bird washers as Audubon Society leaders, Boy Scouts, City Councilmen, Coast Guardsmen, students, retirees, housewives, grade schoolers, newspapers, radio and TV stations, city employees, and visiting tourists swung into action.

Leading the "Don't Let the Ducks Die" movement was most of the student body and faculty of Florida Presbyterian College. The volunteers, more than a thousand strong, soon put their classroom teachings in the humanities into hastily-learned practice. Some shorthaired and sun-tanned, others longhaired and bearded, they all put their muscle where their words had often been before: for life and against pollution of any kind. Young and old alike communicated their concern for the ducks and other water fowl through the Presented in the public's interest by the Citizens of St. Petersburg, Florida, as a full page ad in <u>The New York Times</u>, March 12, 1970.



ends of their fingers as they massaged off the deadly sludge with salad oil and detergent donated in massive quantity by area merchants.

And where do you find enough clean rags to degrease thousands of birds? In St. Petersburg it was easy. Anonymous but involved citizens drove up and deposited castoff clothing of every description at duck clean-up stations and then faded into the night.

• A high school released 200 teenagers to retrieve floundering birds for a wash-in in the school's biology lab.

• Fifth graders chopped up storebought fish for hungry birds while university students mixed special lifegiving cocktails of lettuce, shrimp and crackers.

• Boat owners, ignoring the gunk that blackened their hulls, worked day and night retrieving floundering water fowl.

• A 13-year-old girl fell in love with a loon and vice versa during five hours of scrubbing and soothing. Then the teenager cried softly as her new, feathery friend left for a foster home. "Would it be weird," she asked, "to get their address and go visit my bird?"

• Hamburgers by the truckload and steaming coffee by the gallon were passed out free by local restaurants. Anonymous hands fed doughnuts and refreshments to tired workers as they continued, unceasingly, in the life-saving clean-up job.

• Boy Scouts hauled wood donated by a local lumber company and fed fires under borrowed garbage cans to provide a constant supply of warm wash water for the birds.

• Garages and bathtubs were pressed into service as foster homes until the birds' natural body oils could be replenished. Surprised parents found that they suddenly had several more mouths to feed, including loons who regularly consume as much as five pounds of fish daily.

• Mutual respect grew as college students worked side-by-side with septuagenarians, prompting a grandmother to apologize to one long-haired youth, frankly admitting that the young man's beard and beads looked a whole lot better now that she'd had a chance to see and know the owner in action.

Slowly the pollution and generation gaps began to close as youth and age, working scrub-brush-to-scrub-brush found that, after all, we all do really want the same things for our city.

While the citizenry invested thousands and thousands of man hours round the clock to degrease more than 7,000 birds, another skirmish against pollution was being mounted on the beaches. As some of the oil began to slop over and through the styrofoam booms which had been strung out in an attempt to contain the slick within the original accident area, city authorities mobilized every possible weapon in the fight against the spreading crude. Bulldozers and front-end loaders were rushed to the isolated Gulf front areas, hitting the beaches almost simultaneously with the incoming oil slick. Private citizens and city employees trucked straw to the beaches to help sop-up the oil. Overhead, airplanes and helicopters constantly surveyed the wind-and-tide-swept oil slick. Meanwhile, local newspapers, radio and TV kept citizens informed of the mounting battle against the oil.

With much of the same concern for things living that had been exhibited in the birdwashing, youth and age again joined forces on the beaches to rake up the oil-soaked straw and sand.

A curious tourist looking for traces of the neardisaster on the beaches today would be hardpressed to find clues other than a few stubbornly dirty fingernails. Fishing, skiing, sunning and bathing are all back to normal now.

The beaches didn't die, though many birds did. Some beaches were scarred by the black slick, but not deeply or permanently.

But we were. We the people of St. Petersburg. And we vowed, "Never again." Never again to take for granted all the beauty Nature has given us with our birds and our beaches.

It hurts us that so many birds had to suffer and die to open our eyes. But the pitiful picture of water fowl dying in the very same waters that they had fished so peacefully just the day before brought us face-to-face for the first time with the full meaning of pollution...



showed us how very quickly man's carelessness can change all the natural beauty we take so very much for granted.

Sure. Strict laws do help. But nothing beats the everyday grit of everyday people doing what they can about pollution. Now. Before it's too late.

We all learned something. How very much our birds and our beaches mean to us. Too, that there is a lot of love in St. Petersburg people of all ages. Love that goes into action when it's needed — and attacks a problem simply because it's there.

With this message to people everywhere we hope to say: "Beware."

It's so easy to let the things we value most die step by gradual step. We had our dying ducks and threatened beaches to wake us up. And you?

"Don't die, Ducky, don't die..."

Because if you do, so will we all  $\ldots$  a little. Not just here in St. Petersburg but wherever in America pollution threatens.

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### **APPLICATIONS**

## MARLIN COMPUTERIZED SYSTEM FOR CHECKING AND RECORDING GUN NUMBERS

L. R. Wallack Horton, Church & Goff, Inc. 800 Turks Head Bldg. Providence, R.I. 02903

Marlin Firearms Company, North Haven, Conn., has designed and implemented a computerized system for checking and recording the serial numbers on all its firearms. Developed by Marlin's Director of Data Processing, Miles Roth, the new system was devised to prevent errors in mechanical numbering such as transposition of serial numbers, duplicate numbers and illegible record entries. "Ironically," Mr. Roth says, "1968 gun control legislation greatly increased the likelihood of such mistakes because it multiplied the number of guns on which manufacturers have to keep tabs. ..."

The firm uses an IBM 360-22 computer system with 2311 disc drives. Two operators read every gun's serial number as it is projected by TV camera onto their individual monitors. They then enter the gun's number into the keyboard displays. The computer first indicates whether the numbers the men entered are identical and, if they are, determines if the number has been used before. Should the computer's disc scan indicate a duplication, it then tells the operator to place a suffix letter of "A," "B" or "C" after the number to make it valid.

The system types the validated number on a 5 part label. The five parts are then attached respectively to the individual gun box, the case, the customer's invoice, Marlin's invoice and Marlin's warehouse records. As each case is shipped, it is added to Marlin's case record together with the name and address of the customer, and all this information is entered onto the disc. This data is transferred to tape and ultimately to microfilm where it is stored in gun number sequence. Thus far, Mr. Roth asserts, the system has prevented numbering and recording erNEW PRODUCTS

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rors and, equally important, has provided Marlin with rapid access to all needed records.

#### COMPUTER HELPS FIRM PRODUCE TIFFANY-INSPIRED LAMPSHADES

Michael Machet Associates Box 877 Santa Barbara, Calif. 93102

To help meet the growing demand for Tiffany-inspired stained glass lampshades and panels, a small computer has joined the artists and craftsmen at Michael Machet Associates. The firm began operations in a garage in 1965. It was formed in response to the resurgence in popularity of the ornate, colorful lampshades with swirling designs which Louis Comfort Tiffany originated almost 100 years ago.

Today Michael Machet Associates has nearly 80 employees and sizable production facilities. Its product line extends beyond the artistic lampshades and graphic panels to molded plastic specialties that simulate finely carved woods. Besides its main offices and a factory here, the firm operates warehouses and showrooms in Evanston, Ill. and Ridgefield, Conn.

As orders for products are received, information about each is entered into the computer. Resulting reports show the firm's managers which items are in stock or in production. It is now possible, for the first time, to pinpoint the precise status of products at work stations where pouring, assembly, crowning or finishing operations are performed. The computer also has been programmed to specify the most economical method of shipment to the customer, based upon an order's weight and the distance it is to travel. Invoices and discounts are produced quickly, since the basic information needed is already stored in the system when the order information is entered.

Eventually the firm will use the computer reports containing sales analysis information to anticipate orders for the more popular lampshade designs, thus assuring that supplies in warehouses are adequate to meet customers' demands for immediate delivery.

# COMPUTER EMPLOYED IN INNER-CITY HEALTH PROGRAM

Charles R. Drew Comprehensive Neighborhood Health Center, Inc. 1323 West Third St. Dayton, Ohio 45407

Medical specialists at the Charles R. Drew Health Center near Dayton, Ohio, are using a small computer in their efforts to improve the health of 40,000 inner-city residents. The Drew Health Center, opened in mid-1971 under an HEW grant, was created to upgrade the health level of inner-city residents on a family basis. Eight doctors and six dentists make up the center's medical staff. Medical professionals are organized into teams to assure that the family sees the same personnel when visiting the center. Included in the health emphasis programs underway are more effective care in such basic areas as nutrition and eye and dental care.

An IBM System/3 has been employed in the center's records keeping operation to help analyze such things as health trends and determine which types of treatment are most effective for traditional inner-city health problems. By maintaining health care records on the computer, it will be possible for specialists at Drew to review kinds of treatment and medication administered and isolate those programs that seem to be most effective.

Initially, the system is processing patient billing, receivables, payables and providing other financial support. The center is not a charitable institution. Patients are billed on an ability-to-pay basis.

Emmett C. Orr, acting director of the health unit, said, "We hope to learn more about and be more responsive to traditional health threats of the inner city, including sickle cell anemia, respiratory diseases, hypertension and heart disease. ... It is our hope to develop a special emphasis program in the area of sickle cell anemia. And the computer can be an important part of that program."

To promote the center's concept of health maintenance on a family basis, volunteers from churches, the PTA and other organizations are speaking before groups on a continuing basis throughout the area.

#### WATER METER READINGS STREAMLINED BY COMPUTER

Robert S. Hossli, Finance Director City of Santa Maria 110 East Cook St. Santa Maria, Calif. 93454

City employees who read the 10,000 water meters in Santa Maria, Calif., sometimes have had trouble finding the meter on a customer's property. And when they entered dial readings in their bulky record books, they hoped the consumption figures they reported wouldn't be incorrectly calculated in some later step of the billing process.

The job has been streamlined now that the city has installed a small computer that helps readers locate meters quickly, plans their daily routes and improves the accuracy of customer's bills. The computer-assisted technique makes it possible to prepare customers' bills six times faster than previous methods.

ployees can locate a customer's meter by merely glancing at a number on the compact card. This is accomplished by showing 25 numbered squares on the alth card in relationship to the street. If a customer's uter meter is in the center rear part of the property, a innumber 3 will be pre-printed on the card by the comned puter. pn a Already printed on each customer's card is his ke name and address, account number and amount of the onals previous reading and consumption. All the reader ly need enter is the current meter dial reading. Since the reader can see the previous consumption figures

> With statistics on water consumption readily available in the system's data base, this information may be used for effective future municipal planning. The city council, for example, could be advised as to how a proposed 100-unit apartment house would affect existing municipal water services. Or the city engineering department could be helped to determine whether a proposed six-inch water main in a new neighborhood would be adequate or whether its size should be doubled, based upon consumption statistics from other parts of the city.

at a glance, he can initiate corrective action if

current readings appear to him to be out of line.

An IBM System/3 Model 10 generates a small punched

card, about the size of a credit card, for each customer whose meter is scheduled to be read each day.

The cards are produced in proper route sequence and

carried by employees in a small metal container. Em-

### EDUCATION NEWS

# COMPUTER PLAYS KEY ROLE AT HILLSBOROUGH COMMUNITY COLLEGE

Wayne E. Shufelt Sperry Rand Univac P.O. Box 500 Blue Bell, Pa. 19422

As its name implies, Hillsborough Community College, Tampa, Fla., was created to serve the community's educational needs. Hillsborough CC is what some school officials call "instant college." In only its fourth year, enrollment has already risen to 7,400 with predictions of 10,000 within five years and an ultimate top of 20-25,000. Out of 28 community colleges in Florida, Hillsborough is already seventh largest.

Their computer operation is even younger. A Sperry Rand UNIVAC 9400 was installed last September. About half of the computer time each month is currently devoted to student usage in one form or another. Approximately 150 students per semester are directly involved with the computer. Most of this number are taking one or more computer courses as a required part of the curricula. These include students in nuclear medicine, police science, food and lodging management, and accounting. Many secretarial science and electronics students are using computer courses as electives.

Besides the regular semester curricula, Hillsborough CC offers courses all day on Saturday, has a program for older people who have been away from college for a number of years and even tailors one program so a student can start in any time it is most convenient. There is also a community service program where a student can take courses for no credit.

Because of this flexibility and operations spread out in five locations — which will eventually result in four campuses — Thomas Tyree, director of data processing, is already thinking months, and even years, down the road. For instance, registration is now held five times a year. "I can see within two years where we will have year-round registration and the different campus locations will have to be tied on-line to the computer center," observes Tyree.

Tyree sees as one of his main objectives "setting up a base on which to build. Every program we write is with the community in mind so that the data processing operation will be a viable and productive element in the environment of the college."

#### GEORGIA INAUGURATES STATEWIDE COMPUTERIZED TRAINING PROGRAM IN VOCATIONAL-TECHNICAL SCHOOLS

Michael M. Maynard Sperry Rand Univac P.O. Box 500 Blue Bell, Pa. 19422

A far-reaching program to extend the benefits of computer training and computerized learning techniques throughout Georgia's Vocational-Technical school system has been announced by Dr. Jack P. Nix, Georgia State Superintendent of Schools. It is being inaugurated this summer by the Georgia State Board of Education. Covering 26 schools, the program will concentrate on two primary areas of instruction — training in computer operation and programming, and secondly, remedial mathematics and remedial reading courses.

The heart of the statewide system will be a largescale Sperry Rand UNIVAC 1106 computer system, which will be installed in the Computer Center of the Georgia Department of Education in Atlanta. This computer will be connected by telephone lines to terminals in each of the schools.

In 12 of the schools, where computer operation and programming will be taught, the terminals will be small computers, UNIVAC 9200 models. These terminals can function either as "stand alone" computers capable of processing certain programs themselves or, if required, transmitting the data to the 1106 system for processing and receiving the completed work from the larger computer over the communication lines. This link to the 1106 system is necessary if the programs are prepared in such computer languages as COBOL and FORTRAN, which require much greater processing capabilities.

The main purpose of the 9200 computers will be to give students actual "hands-on" operating experience with the computer. The students will be taught computer languages to the extent that they will be proficient enough to prepare their own programs and then test them on the 9200 systems.

A different type of terminal is planned for installation at 11 other Vocational-Technical schools. This will be a visual display unit, known as a UNI-SCOPE, and resembling a combination television-type screen and typewriter keyboard. The primary aim in using these terminals linked to the central computer will be computer-assisted-instruction (CAI) — to help students in remedial mathematics and remedial reading. Special programs have been developed to allow students to proceed at their own speed through the instruction curriculum using the UNISCOPE terminals.

A computer language, known as UIL (Univac Interactive Language), which was especially developed by Univac for computer-communications use with the visual displays, will be employed in the system. UIL is a high-level programming language designed to simplify the preparation and presentation of computer-based instructional materials.

### NEW PRODUCTS

#### NEW ALGEBRA OPTION PROMISES BREAKTHROUGH IN CALCULATOR PROGRAMMING

Wang Laboratories, Inc. 836 North Street Tewksbury, Mass. 01876

Algebraic programming now is available as a new feature on the 600 Series Programmable Calculators manufactured by Wang Laboratories, Inc. According to company spokesman, the new feature makes programming as much as 75 per cent easier.

Instead of using a standard machine language, the Wang 600 calculators now can solve problems directly with algebra, using symbols such as parentheses, uparrows for exponentials, and alphabetic variables. The Formula Programming Pack, as the new system is named, also can handle subscripts and "do" loops for complex matrix manipulations.

Company president, Dr. An Wang, points out that formerly much programming time was consumed because users were required to translate equations into machine language. "Now", says the President, "it is possible to enter programs exactly as the formulas are written. I see this as an area which many calculator manufacturers will explore in the future." Cost of the Formula Programming Pack is \$400,

# DATA CENTER SERVICES OFFERED SMALLER STORES INSTALLING ELECTRONIC POS EQUIPMENT

Public Relations Department The National Cash Register Co. Dayton, Ohio 45409

The benefits of electronic point-of-sale data capture are available to smaller retailers through a new service begun on July 1. The service, provided by the National Cash Register Company through its network of data processing centers, makes possible overnight computer analysis and a variety of other management reports to stores which cannot justify installation of their own computer systems. According to R. H. Dethlefs, NCR assistant vice president in charge of Data Center Administration, the dial-up technique in which the computer polls the store reduces communication costs to station-to-station rates.

Under the program, smaller stores need only to install NCR 280 data terminals and an NCR 723 data collector. The data collector stores on magnetic tape all the point-of-sale information captured by the data terminals until it is polled by the data center via telephone. Flash sales reports desired by the store are then automatically prepared at the data center and transmitted back to the store via an NCR 260 general-purpose data terminal. If a store requires only one-way communication, a facsimile machine such as a Telecopier can be used to print out in the store the flash sales reports generated by the data center. Overnight service will be provided to participating stores, with reports on the previous day's business available to store managers the next morning.

A broad range of reports will be offered through NCR's REACT (Register Enforced Automated Control Technique) and PAR (Practical Accounts Receivable) programs. The reports include sales analysis, salesperson productivity, inventory management, unit sales and selective account analysis. Stores also will be able to use the data center for maintaining their general ledger and for the preparation of customer statements.

Initially the new service will be offered by NCR at its data centers in New York City, Boston, Princeton, New Jersey, Baltimore, Pittsburgh, Dayton, Chicago, Atlanta, Los Angeles and San Francisco.

### **RESEARCH FRONTIER**

#### NO. 4 ESS WILL TRIPLE TOLL CALL CAPACITY

Bell Telephone Laboratories Research and Development Unit Mountain Avenue Murray Hill, N. J. 07974

Bell Labs is developing a new electronic switching system for the Bell System that will handle about 350,000 long distance (toll) calls an hour three times as many as the electromechanical toll system now being used. The system, known as No. 4 ESS, will use solid-state components instead of electromechanical parts to do the toll switching. The new toll system will be the first in the Bell System to switch digital signals directly.

No. 4 ESS switches telephone calls in a way that is fundamentally different from other large telephone switching systems. Systems now in use, including the electronic ones, switch calls along separate physical paths. By contrast, No. 4 ESS uses the same physical path, separating calls from each other only in time by millionths of a second, and switches by shifting a call's time position on the path.

For analog voice circuits, electrical signals representing the calls are first sampled thousands of times a second, and each sample is coded into a series of short electrical pulses. Then the coded samples are transmitted one after the other over one physical path. When several calls are encoded, a sample from call one is followed by a sample from call two and so on until samples from all the calls have been sent. Then another sample from the first call is transmitted. Thus, each call has its own place (time slot) in line. In No. 4 ESS calls can be shifted from one time slot to another in the switching network. Finally, the various pulse sequences are separated, and the original signals representing each call reconstructed. Calls then travel to their destination.

For pulse code modulated signals — such as those from Tl or T2 carrier systems — the digital signals

COMPUTERS and AUTOMATION for August, 1972

representing the several voice channels may be switched directly. This saves on carrier terminal equipment now required to convert T-type signals to analog form for switching by existing systems.

The first installation No. 4 ESS is slated to begin service in Chicago by early 1976.

### MISCELLANEOUS

#### JAPANESE FIRM BUYS PROGRAMMABLE FILM READER

Arnold P. Sorensen Information International 12435 West Olympic Blvd. Los Angeles, Calif. 90064

Fujitsu, Ltd., of Tokyo, Japan, has purchased a PFR-3 Programmable Film Reader valued at about \$500,000 from Information International, Inc., Los Angeles. The sale was negotiated through Kyokuto Boeki Kaisha, Ltd. (Far East Mercantile Co., Ltd.), an import-export company with headquarters in Tokyo. The PFR-3 is a complex electro-optical system that scans film images in a programmed manner, digitizes the scanned data, and performs computer-directed image analyses for purposes of pattern recognition and decision making.

At Fujitsu (sometimes called the "General Electric" of Japan) the PFR-3 will be the basic equipment and software facility for image processing at the Fujitsu System Laboratory of Information Processing. It will be used for research and development of pictorial pattern recognition. Fujitsu is now developing a procedure for analyzing X-ray images of the gastric tract to provide the medical community with a system for screening large populations for stomach and other gastric disorders. Future assignments for the PFR-3 may include research and development in the recognition of characters, figures, objects, speech, and sentences.

#### CALCOMP PLOTTER PURCHASED FOR RUSSIAN MINISTRY OF CHEMICAL INDUSTRY

California Computer Products, Inc. 2411 W. La Palma Ave. Anaheim, Calif. 92801

The first flatbed plotting system ever sold in Russia was purchased at the California Computer Products, Inc., booth at the Computer 72 Show in Sokilniki Park, Moscow (May 23-June 1). The system, combining a CalComp tape drive, controller, and flatbed plotter was purchased for the Ministry of Chemical Industry, Department of Automation Projects, Moscow. It will be used off-line to produce piping isometric drawings. The host computer will be an IBM 360/50 purchased during the Leningrad Trade Show in October 1971. The sale is subject to normal export approval by the Department of Commerce.

CalComp has sold drum plotters in the USSR before, all of which were interfaced for on-line operation by Russian technicians, according to James L. Pyle, assistant to the president. "It is significant," Pyle said, "that the USSR has become interested in computer systems of the IBM 360/50 magnitude and advanced plotting systems represented by the CalComp 900/702." (CalComp markets products in Russia through CalComp N.V., wholly owned subsidiary in Amsterdam.)

# **NEW CONTRACTS**

<u>10</u>	FROM	FOR	AMOUNT
Burroughs Corp., Detroit, Mich.	Sluzba Drustvenog Bnjigovod- siva, Belgrade, Yugoslavia	74 B 1700 computers to be used for a variety of general banking applications at bank's headquarters and branches	\$8 million (approximate)
Inivac Division of Sperry Cand Corp., Switzerland	Sandoz A.G., Basal, Switzer- land	A second UNIVAC 1108 computer system; use will include research-documentation, or- der-handling, warehouse control, and pro- duction of planning and material	\$5.3 million (approximate)
ontrol Data Corp.	General Services Administra- tion, Washington, D.C.	Eight communications message processing systems to beused by Defense Supply Agency (DSA) at 8 Agency field sites replacing ex- isting Autodin terminals	\$3.8 million
onrac Corporation, New ork, N.Y.	New York City Off-Track Betting Corp., New York, N.Y.	A Race Information Display System for the New York City Off-Track Betting Corp.'s 100 betting offices; monitors in each of- fice will display information on the day's race entries and race results	\$2.8 million (approximate)
orth American Rockwell orp. (NR), Anaheim, Calif.	Ontario Hydro Electric Power Commission, Toronto, Canada	Managing specifications and assisting in implementation of a Data Acquisition and Computer System (DACS) for increased automation	\$2.5 million
DEC, Inc., Warwick, R.I.	Business Machines Division of Singer Co., San Leandro, Calif.	Undisclosed quantity of printers, during the next year, to be used in small busi- ness computer systems and with Singer's point-of-sale 'electronic cash register' systems	\$2+ million
omputer Data Systems, Inc. CDSI), Silver Spring, Md.	U.S. Navy	A support contract providing systems, de- sign, analysis and programming services for Automation of Naval Communications/ Message Centers;	\$1+ million
abri-Tek, Inc., Minneapolis, linn.	Control Data Corp., Minnea- polis, Minn.	A large quantity of Fabri-Tek's line of IBM 360 Computer Core Memory Expansion units	\$1 million (approximate)
mpex Corp., Marina del Rey, alif.	PRD Electronics, Syosset, N.Y.	Additional digital tape systems to be used to test the avionics in U.S. Navy aircraft	\$700,000+
Computer Communications, Inc. CCI), Culver City, Calif.	Department of Finance and Ad- ministration, State of Tennes- see	A CCI-7000 Communications Processing Sys- tem and a CC-70 Computer Communicator to be used as first step in program to estab- lish, integrate and control a statewide network of computers and remote terminals to supply on-line computer services to	\$460,000 (approximate)
earfott Division, Singer ompany, Little Falls, N.J.	NASA Manned Spacecraft Center, Houston, Texas	agencies within Tennessee Three Kearfott SKC-2000 Aerospace Digital Computers for a test and evaluation pro- gram of a multicomputer system	\$293,000
cientific Software Corp., enver, Colo.	U.S. Geological Survey	Three oil reservoir simulation programs and a 3-man team for consulting services in Washington, D.C.	\$258,500
odex Corp., Newton, Mass.	Bundesanstalt für Flugsicher- ung (West German Federal Air Administration)	Codex 4800 Data Modems to provide air traffic controllers with air safety in- formation	\$110,000
odex Corp., Newton, Mass.	Air France	Codex 9600 Data Modems and Codex 880 Time Division Multiplexers; will supplement the present data communications terminal	\$70,000
ollins Radio Co., Dallas, exas	American Stock Exchange (Amex)	A communications-oriented computer system for initial stage of the new Amex trading system. AMCODE	
ontrol Data Corp., Minne- polis, Minn.	New Zealand Totalizator Agency Board (TAB), Welling- ton, New Zealand	A multi-million dollar nationwide com- puterized off-track betting complex; sys- tem expected to be completed in early 1974	
airchild Camera & Instrument orp, Fairchild Systems Tech- ology, Palo Alto, Calif.	Interactive Data Corp. (I.D.C.) Waltham, Mass.	A 1.5 million byte semiconductor memory subsystem for an IBM System/360-67 com- puter; scheduled for Fall delivery	
odular Computer Systems, ort Lauderdale, Fla.	Lutelec S.A., Paris, France	Six MODCOMP I/5 computer systems; no dol- lar figure given "because the software, peripherals and options of the MODCOMP configurations will substantially vary as each Lutelec customer is determined"	
ohawk Data Sciences Corp., erkimer, N.Y.	Randolph Computer Corp.,	Up to \$10 million of computer peripheral systems	
ational Cash Register Co., ayton, Ohio	J.C. Penney Company, Inc.,	Up to 2,000 electronic point-of-sale ter- minals to be installed in selected stores during remainder of 1972 and 1973	
YS Computer Corp., Mackensack, N.J.	Mead Data Central, Inc.	A minimum of 50 CRT Displays by year end for use with MDC's computerized legal and accounting research services	
KLO Computer Products Walled Lake, Mich.	Honeywell Inc., Marine Sys- tems Center, West Covina, Calif.	52 data storage drum systems to be part of program for U.S. Air Force known as Un- dergraduate Navigator Training System (UNTS), an instructional program for navi- gators in training	

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# **NEW INSTALLATIONS**

OF	AT	FOR
Burroughs B 2500 system	Brentwood Hospital, Warrens- ville Heights, Ohio	Patient records, general ledger accounting, accounts receivable, statistical reports for analytical study and payroll (system valued at \$215,000)
Burroughs B 3500 system	Railroad Commission of Texas, Austin, Texas	General accounting applications, production records for oil and gas industry, daily oil and gas allow- ables (for each well), rates and routes for trans- portation industry and complete records of gas utilities and liquified petroleum gas operators (system valued at more than \$477,000)
Burroughs B 4700 system	Keebler Co., Elmhurst, Ill.	Expanding data processing operations; replaces a B 3500 system
Burroughs B 6700 system	Colonial Pipeline Co., Atlanta, Ga.	Aid in operation of 3,500 miles of pipeline between Houston, Texas and Linden, N.J., and to handle ac- counting and administrative reports (system valued at \$1.25 million)
	Queens University, Kingston, Ontario, Canada	A data communications network providing service to more than 2,000 students, and various outside busi- ness and industrial users, through remote terminals (system valued at approximately \$2 million)
Control Data 3170 system	Israel Ministry of Communica- tions	Expanded computer operations will reduce waiting time for new phones; find optimal lines for new phones, and instantly locate weak points in the network (system valued at \$900,000)
Control Data Corp M1000 system	Chase Manhattan Bank, N.A., New York, N.Y.	Providing front and capability to computers in the bank's computer utility; will service a variety of communications-oriented applications
Control Data CYBER 70 Model 73	Ecole Polytechnique Federale de Lausanne (EPFL) and University of Lausanne, Lausanne, Switzerland	Use by EPFL's departments of mathematics, physics, electrical and civil engineering, as well as In- stitute's administration (system valued at over \$3 million)
Honeywell Model 58 system	Broadmoor Pharmacy, Miami, Fla.	Filling mail order prescriptions for garment workers union and for mailing list maintenance
	Carolina Surgical Supply Co., Raleigh, N.C. Falmouth School System, Falmouth,	Inventory reporting, accounts receivable and other financial management applications Attendance reporting, grade reporting, payroll,
	<u>Mass.</u> Security Systems, Pigeon Forge, Tenn.	general ledger and accounts payable applications Financial management and loan amortization applica- tions
Honeywell Model 105 system	Catawba Hospital, Hickory, N.C.	Patient accounting, a tax digest system for Catawba County, and payroll applications
	Harvey Radio, Woodbury, L.I., N.Y. Henry S. Levy and Son, Brooklyn, N.Y.	General accounting, order and inventory processing General accounting and inventory reporting appli- cations
	Motel Data, Inc. (subsidiary of Alsage Management), Norfolk, Va	Financial data processing applications for the mo- tels and for sales analysis for Alsage Financial management, store reporting and auditing
	Point, Fla. Trafalgar Developers, Miami, Fla.	applications for its 44 sewing centers General management applications as well as critical path method (CPM) and Program Evaluation Review Technique (PERT) programs for its construction business
Honeywell Model 6030 system	Genossenschaftliche Zentral Bank, (GZB). Vienna, Austria	Developing on-line system coupled with visual dis- plays for affiliates in Vienna and for group's con- struction savings bank, the Raiffeisen-Bausparkasse (system valued at more than \$1.15 million)
IBM System/3 Model 6	Air Indies, San Juan, Puerto Rico	Passenger reservation system, also a ticket account- ing system; plans to convert manual aircraft parts supply program and scheduled maintenance program to computer control
NCR Century 50 system	Georgia Boot Manufacturing Co., Flowery Branch, Ga. Keller-Columbus, Inc. (formerly	Handling order billing, inventory control and gen- eral accounting Production scheduling, requirements planning and
	Columbus Stove Co.) Pennington Brothers Company,	for payroll preparation Route control and inventory and production control
NCR Century 200	Washington Court House, Ohio Banco Herrero, Oviedo, Spain (2 systems)	Processing current accounts, handling security trans- actions and correspondent operations; future uses include savings accounts and transit operations
UNIVAC Series 70/2 system	H. K. Porter Co., Pittsburgh, Pa.	Accounting applications; also provides management with information on what areas to drill at com- pany's asbestos mine in California
UNIVAC Series 70/60 system	RCA Records Division, Indian- apolis, Ind.	Order processing and in market penetration zip code analysis
UNIVAC 9200 system	Coprasa, Burgos, Spain	Use in billing inventory control, accounting and payroll
Xerox Sigma 9 system	Miami Heart Institute, Miami (2 systems)	The central control units for a \$6 million atuo- mated hospital information system (system valued at more than \$2 million)

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# MONTHLY COMPUTER CENSUS

#### Neil Macdonald Survey Editor

COMPUTERS AND AUTOMATION

The following is a summary made by COMPUTERS AND AUTOMATION of re-ports and estimates of the number of general purpose electronic digit-al computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide. Please note the variation in dates and reliability of the information. Several important manufacturers refuse to give out, confirm, or comment on any figures.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit information for this census. We invite all our readers to submit informa-tion that would help make these figures as accurate and complete as possible.

Part I of the Monthly Computer Census contains reports for United States manufacturers. Part II contains reports for manufacturers outside of the United States. The two parts are published in alternate months.

The following abbreviations apply:

- (A) -- authoritative figures, derived essentially from information sent by the manufacturer directly to COMPUTERS AND AUTOMATION
- -- figure is combined in a total
- (D) ---acknowledgment is given to DP Focus, Marlboro, Mass., for their help in estimating many of these figures E -- figure estimated by COMPUTERS AND AUTOMATION (N) -- manufacturer refuses to give any figures on number of in-
- stallations or of orders, and refuses to comment in any way on those numbers stated here
- (R) -- figures derived all or in part from information released indirectly by the manufacturer, or from reports by other sources likely to be informed

.

- (S) -- sale only, and sale (not rental) price is stated X -- no longer in production
- -- information not obtained at press time

### SUMMARY AS OF JULY 15, 1972

		DATE OF	AVERAGE OR RANG			BER OF INSTALL		NUMBER OF
NAME OF	NAME OF	FIRST	OF MONTHLY RENT	ΓAL	In	Outside	In	UNFILLED
MANUFACTURER Part II. Manufacturers Outside Unit	COMPUTER	INSTALLATION	\$(000)		U.S.A.	U.S.A.	World	ORDERS
A/S Norsk Data Elektronikk	NORD-1	8/68	2.0		0	82	82	16
Oslo, Norway	NORD-2B	8/69		(5)	0	20	20	X
(A) (May 1972)	NORD-5	0709	4.0 (	(3)	ő	1	1	Ô
(ii) (iidy 1972)	NORD-20	1/72	3.5	(S)	ŏ	7	7	4
A/S Regnecentralen	GIER	12/60	2.3-7.5	(0)		40	40	0
Copenhagen, Denmark	RC 4000	6/67	3.0-20.0		õ	19	19	3
(A) (Jan. 1972)								
Elbit Computers Ltd.	E1bit-100	10/67	4.9 (	(S)	_	-	300	20
Haifa, Israel								
(A) (Jan. 1972)								
GEC Computers Ltd.	902	5/68	-		0	15	15	2
Hertfordshire, England	903, 920B	12/65	-		1	258	259	85
(R) (Mar. 1972)	Marconi-Elliott 90		-		0	45	45	14
	Marconi-Elliott 92		-		0	98	98	-
	Marconi-Elliott 92		-		0	13	13	6
	Myriad I	1/66	-		0	47	47	-
	Myriad II	11/67	-		0	32	32	-
	Marconi-Elliott M2				9	21	21	<u> </u>
International Computers, Ltd. (ICL)	Atlas 1 & 2	1/62	65.0		0	6	6	X
London, England	Deuce	4/55			0	2	2	x
(A)	KDF 6-10	9/61	10-36		0	34	34 1	X X
(July 1972)	KDN 2	4/63 -/53	10-24		0	1 43	43	x
	Leo 1, 2, 3 Mercury	-/57	10-24		0	43	43	x
	Orion 1 & 2	1/63	20,0		0	10	10	x
	Pegasus	4/55	-		0	9	9	x
	Sirius	-/61	_		0	8	8	x
	503	-/64	_		0	18	18	x
	803 A, B, C	12/60	_		õ	107	107	x
	1100/1	-/60	5.0		õ	22	22	x
	1200/1/2	-/55	3.9		õ	68	68	x
	1300/1/2	-/62	4.0		õ	196	196	x
	1500	7/62	6.0		õ	110	110	x
	2400	12/61	23.0		Ō	4	4	x
	1900-1909	12/64	3-54		2	2200	2202	-
	Elliott 4120/4130	10/65	2.4-11.4		0	160	160	-
	System 4-30 to 4-7	5 10/67	5.2-54		0	160	160	-
Japanese Mfrs.	(Mfrs. of various	models include	: Nippon Electr	ic Co.,	Fujitsu,			
(N) (Sept. 1970)	Hitachi, Ltd., Tos	hiba, Oki Elec	tric Industry Co.	., and M	litsubishi		Total:	Total:
	Electric Corp.)						4150 E	800 E
N.V. Philips Electrologica	P1000	8/68	7.2-35.8		-	-	89	34
The Netherlands	P9200	3/68	-		-	-	300	50
(A)	P9200 t.s.	3/70	-		-	-	4	0
(Jan. 1972)	P-800	9/70	-		-	-	50	200
	ELX1	5/58	12.0		-	-	20	-
	ELX2/8	3/65	6-21		-	-	27	-
	DS714	-/67	-		-	-	31	12
Delt Court to the l	PR8000	1/66					23	6
Redifon Limited	R2000	7/70	-		1	13	14	b
Crawley, Sussex, England (A) (May 1972)								
Saab-Scania Aktiebolag	D21	12/62	7.0		0	38	38	
Linkoping, Sweden	D21 D22	12/62	15.0		0	31	33	3
(A) (May 1972)	D220	4/69	10.0		0	16	16	2
Selenia S.p.A.	G-16	7/69	10.9	(S)	0	95	95	38
Roma, Italy	GP-160	-	5.6	(S)	-	-	-	250
(A) (Mar. 1972)	100		5.0	(2)				
Siemens	301	11/68	0.9		_	-	99	14
Munich, Germany	302	1/68	2.1		-	-	30	6
(A)	303	4/65	2.1		<u> </u>	_	71	1
(April, 1972)	304	5/68	4.5		-	-	79	1.5

		DATE OF	AVERAGE OR RANGE	NUME	BER OF INSTALL	ATIONS	NUMBER OF
NAME OF	NAME OF	FIRST	OF MONTHLY RENTAL	In	Outside	In	UNFILLED
MANUFACTURER	COMPUTER	INSTALLATION	\$(000)	U.S.A.	U.S.A.	World	ORDERS
Siemens (Cont'd)	305	2/68	6.1	-	-	113	16
	306	6/70	7.9	-	-	23	5
	2002	6/59	16.4	-	-	39	-
	3003	12/63	15.8	-	-	32	-
	4004/15/16	10/65	6.1	-	-	102	2
	4004/25/26	1/66	10.0	-	-	68	16
	4004/35	2/67	14.2	-	-	211	39
	4004/135	10/72	20.5	-	-	15	49
	4004/45	7/66	27.3	-	-	340	31
	4004/46	4/69	41.0	-	-	15	1
	4004/55/60	7/66	35.0	-	-	27	-
	4004/150	10/72	49.0	-	-	4	47
	4004/151	10/72	61.0	-	-	3	-
	404/3	4/71	2.1	-	-	19	12
	404/6	10/71	4.5	-	-	32	43
						Total:	Total:
						1251	297
USSR	BESM 4	_	-	-	-	С	C
(N)	BESM 6	-	-	-	-	С	С
(May 1969)	MINSK 2	-	-	-	-	С	С
	MINSK 22	-	-	-	-	С	С
	MIE	-	-	-	-	С	С
	NAIR 1	-	-	-	-	С	С
	ONEGA 1	-	-	-	-	С	С
	URAL 11/14/16 and others	-	-	-	-	С	С
						Total: 6000 E	Total: 6000 E

# CALENDAR OF COMING EVENTS

- Aug. 21-23, 1972: Sixth Annual Mathematical Programming Seminar and Meeting, Vail, Colo. / contact: George M. Lowel, Symposium Directory, Haverly Systems Inc., 4 Second Ave., Denville, N.J. 07834
- Sept. 7-8, 1972: Society for Management Information Systems Fourth Annual Conference, Queen Elizabeth Hotel, Montreal, Canada / contact: Arnold Barnett, Publicity Director, Society for Management Information Systems, 18 S. Michigan Ave., Chicago, III. 60603
- Sept. 24-28, 1972: The Retail Industry's 14th Annual EDP Information Systems and Telecommunications Conference, Doral Country Club, Miami, Florida / contact: Irving I. Solomon, Information Systems Div., National Retail Merchants Assoc., 100 West 31 St., New York, N.Y. 10001
- Oct. 1-4, 1972: New York State Assoc. for Educational Data Systems' 7th Annual Conference, Fallsview Hotel, Ellensville, N.Y. / contact: Alfred N. Willcox, Educational Data Processing Center, 17 Westminster Ave., Dix Hills, N.Y. 11746
- Oct. 3-5, 1972: AFIPS and IPSJ USA-Japan Computer Conference, Tokyo, Japan / contact: Robert B. Steel, Informatics Inc., 21050 Vanowen St., Canoga Park, Calif. 91303
- Oct. 8-11, 1972: International Conference on Systems, Man and Cybernetics, Shoreham Hotel, Washington, D.C. / contact: K.S. Nurendra, Yale Univ., 10 Hill House, New Haven, Conn. 06520
- Oct. 16-17, 1972: 7th Annual Digitronics Users Association, Royal Orleans Hotel, New Orleans, La. / contact: Executive Secretary, DUA, Box 33, Southboro, Mass. 01772
- Oct. 16-20, 1972: IBI-ICC World Conference on Informatics in Government, Venice, Italy / contact: Intergovernmental Bureau for Informatics (IBI-ICC), 23 Viale Cività del Lavoro, 00144 Rome, Italy
- Oct. 31-Nov. 1, 1972: The Applied Data Research Users Group Second National Annual Meeting, Howard Johnson Motor Lodge, Newark Airport, N.J. / contact: Mrs. Judith Miller, Applied Data Research, Inc., Route 206 Center, Princeton, N.J. 08540
- Nov. 9-10, 1972: Second National Conference of Society for Computer Medicine, Williamsburg, Va. / contact: Society for Computer Medicine, Box M488, Landing, N.J. 07850
- Nov. 15-17, 1972: DATA CENTRE '72, Sheraton-Copenhagen Hotel, Copenhagen, Denmark / contact: Data Centre '72, Danish IAG, DIAG, 58 Bredgade, DK 1260, Copenhagen K, Denmark
- COMPUTERS and AUTOMATION for August, 1972

Nov. 20-21, 1972: 8th Data Processing Conference in Israel, Tel Aviv Hilton, Tel Aviv, Israel / contact: Information Processing Assoc. of Israel, Programme Committee, The 8th Data Processing Conference, P.O.B. 16271, c/o "Kenes", Ltd., Tel Aviv

December 5-7, 1972: Fall Joint Computer Conference, Anaheim Convention Center, Anaheim, Calif. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

### Dreyer - Continued from page 24

we are denied access so that we will not have the suspicion that here once again — as in the ITT case — the public interest is being disposed of without the public's participation?

"Our industry was conceived by the government's 1952 complaint against IBM and born out of the 1956 consent decree settling that case. If we are to survive and prosper, we must and will participate actively and aggressively in all governmental efforts which will have the consequence of shaping the economics of our industry, whether judicial antitrust litigations, administrative regulatory actions, executive decrees, legislative mandates, or otherwise."

### ADVERTISING INDEX

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

- BERKELEY ENTERPRISES, INC., 815 Washington St., Newtonville, Mass. 02160 / Pages 39, 51
- THE C&A NOTEBOOK ON COMMON SENSE, ELEMEN-TARY AND ADVANCED, published by Computers and Automation, 815 Washington St., Newtonville, Mass. 02160 / Page 37
- COMPUTERS AND AUTOMATION, 815 Washington St., Newtonville, Mass. 02160 / Pages 39, 51
- MAIL ORDER MART, 2701 Sterlington Rd., Ste. 132, Monroe, La. 71201 / Creative Advertising / Page 41
- THE NEW YORK PUBLIC LIBRARY, Fifth Ave. & 42 St., New York, N.Y. 10018 / Page 52
- WHO'S WHO IN COMPUTERS AND DATA PROCESSING, jointly published by Quadrangle Books (a New York Times Company) and Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160 / Pages 2, 3

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### NUMBLES

### Neil Macdonald Assistant Editor Computers and Automation

A "numble" is an arithmetical problem in which: digits have been replaced by capital letters; and there are two messages, one which can be read right away and a second one in the digit cipher. The problem is to solve for the digits.

Each capital letter in the arithmetical problem stands for just one digit 0 to 9. A digit may be represented by more than one letter. The second message, which is expressed in numerical digits, is to be translated (using the same key) into letters so that it may be read; but the spelling uses puns or is otherwise irregular, to discourage cryptanalytic methods of deciphering.

We invite our readers to send us solutions, together with human programs or computer programs which will produce the solutions. This month's Numble was contributed by:

Andrew M. Langer Newton High School Newton, Mass.

### NUMBLE 728

				Ν	Е	W			
		x	L	A	W	S			
			U	U	R	D			
		L	А	L	Ν				
	S	F	Е	Е					
D	A	A	U						
L	U	s	F	L	N	D	9	43	50

### Solution to Numble 727

8617

In Numble 727 in the July issue, the digits 0 through 9 are represented by letters as follows:

P = 0	L,N = 5
S = 1	O = 6
I,Y = 2	U,V = 7
E = 3	T = 8
H = 4	A,R = 9

The message is: The hasty leaps over his opportunities.

Our thanks to Mr. T. P. Finn, Indianapolis, Ind., for submitting his solution to Numble 727.

# **PROBLEM CORNER**

Walter Penney, CDP Problem Editor Computers and Automation

### PROBLEM 727: BITS MAKE HITS

"Computer games like Tic-tac-toe or Hangman are old stuff," said Al. "We'll have to come up with something new for this high school demonstration."

"I have something new," Bob replied. "It's a sort of guessing game. The computer is going to guess what number the student selects."

"How is it going to do that?"

"The number is going to be presented in binary form and the computer will ask for the number of hits with a certain set of binary numbers."

"Hits?" Al asked, a little puzzled. "What do you mean by hits?"

"If the bits in the same position are the same, that's a hit. For example, 10101 and 10010 have two hits — the first two."

"Won't you have to set a limit on the size of the number the computer will accept? You wouldn't want to take numbers up to a billion, would you?"

"Oh, no. I was going to limit this to the numbers from 0 to 31. Five bits should be enough for a good game without making the programming too difficult."

"There's no trick to that then. Just ask for the number of hits with 10000, 01000, 00100, 00010 and 00001. You can figure out the player's number from his responses to these."

"Yes," said Bob, "but five are too many. I think we can do better than that."

"Don't see how. Haven't you got five bits of information there and won't you need five responses to pinpoint the number?"

Is he right?

### Solution to Problem 726: A Program for Popularity

The number required to get n - 1 right out of n is the same as the number required to get all n right, (n! in both cases). Therefore a saving is possible. For example, to get two right out of three, all 6 permutations of the elements A, B, C are required. To get two right out of four, only 4 (ABCD, BCDA, CDAB and DABC, for instance) are required.

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

		* * * * <i>A reprint from</i> <b>Computers</b> and automation
	• DO YOU LIKE COMPUTERS AND AUTOMATION?	FOUR-STAR REPRINT
	• DO YOU HAVE A FRIEND WHO MIGHT LIKE IT?	SCIENCE AND THE ADVANCED SOCIETY, by C. P. Snow, Ministry of Technology, London, England (April, 1966) THE INFORMATION REVOLUTION AND THE BILL OF RIGHTS, by Dr. Jerome B. Wiesner, M. I. T. (May, 1971) EMPLOYMENT, EDUCATION, AND THE INDUSTRIAL SYSTEM,
	• HOW ABOUT GIVING HIM (OR YOURSELF) A GIFT SUBSCRIPTION?	by Prof. John Kenneth Galbraith, Harvard Univ. (Aug. 1965) COMPUTERS AND THE CONSUMER, by Ralph Nader, Washington, D. C. (Oct. 1970)
	<ul> <li>Take advantage of our current offer: a gift subscription to him (or you) and for you — a copy of our FOUR-STAR **** REPRINT</li> <li>ANY MORE FRIENDS OR ASSOCIATES WHO MIGHT LIKE SAMPLE COPIES OF C&amp;A FREE? — just tell us and we will send them a copy — so they also may start liking C&amp;A</li> </ul>	To: Computers and Automation         ( ) Please enter a subscription for         Name
B – fasten to A	FIRST CLASS FIRST CLASS BUSINESS REPLY MAIL BUSINESS REPLY MAIL No postage stamp necessary if mailed in the United States No postage stamp necessary if mailed in the United States POSTAGE WILL BE PAID BY BERKELEY ENTERPRISES, INC. POSTAGE WILL BY BERKELEY ENTERPRISES, INC. POSTAGE OF OP	Fold here - do not cut         YES, start my subscription to COMPU- TERS AND AUTOMATION according to the instructions checked below.         One Year (including the Computer Directory and Buyers' Guide 13 issues) U.S. only. □ \$18.50         One Year (excluding the Computer Directory and Buyers' Guide 12 issues) U.S. only. □ \$18.50         One Year (excluding the Computer Directory and Buyers' Guide 12 issues) U.S. only. □ \$9.50         Name:

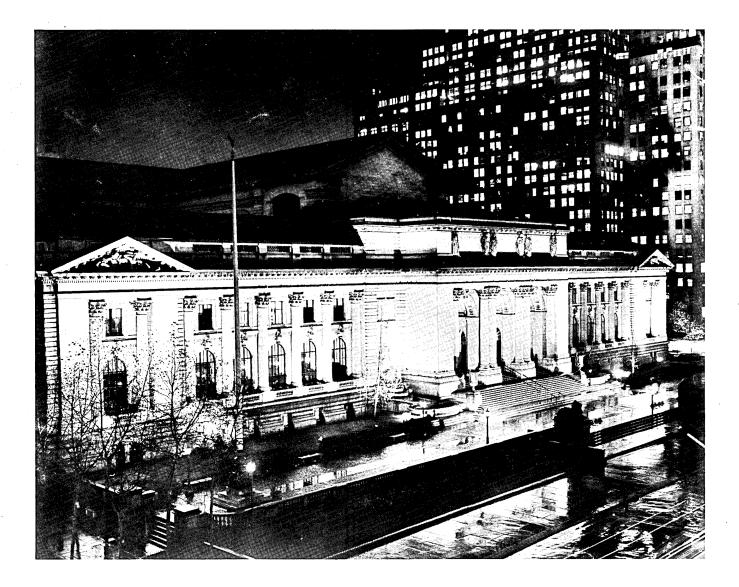
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The unthinkable happened in January.

The famed Science and Technology Division of The New York Public Library ceased public service for want of \$86,000.

Each day 300 readers were turned away, at least 100 telephone reference questions went unanswered, hundreds of thousands of photocopied pages were not mailed out or picked up, letters with reference questions from around the world were returned to their senders.

This vital national resource has been given a temporary reprieve as a result of a successful emergency call for special funds. Unfortunately, the necessary response from individuals and corporations came too late to avoid the temporary closing and the loss of highly trained staff members.

The continued public life of the Science and Technology Division is now guaranteed ... through June 30, 1972. Then, another Library fiscal year begins with more excruciating decisions for the Board of Trustees.

### Don't let this happen again!

YOUR company, YOUR associates – YOU can make certain. Urge your company to support the essential public services of the Science and Technology Division. SEND YOUR CONTRIBUTION to:

Temporary Committee for The New York Public Library Computers and Automation 815 Washington Street Newtonville, Mass. 02160

Make checks payable to The New York Public Library.