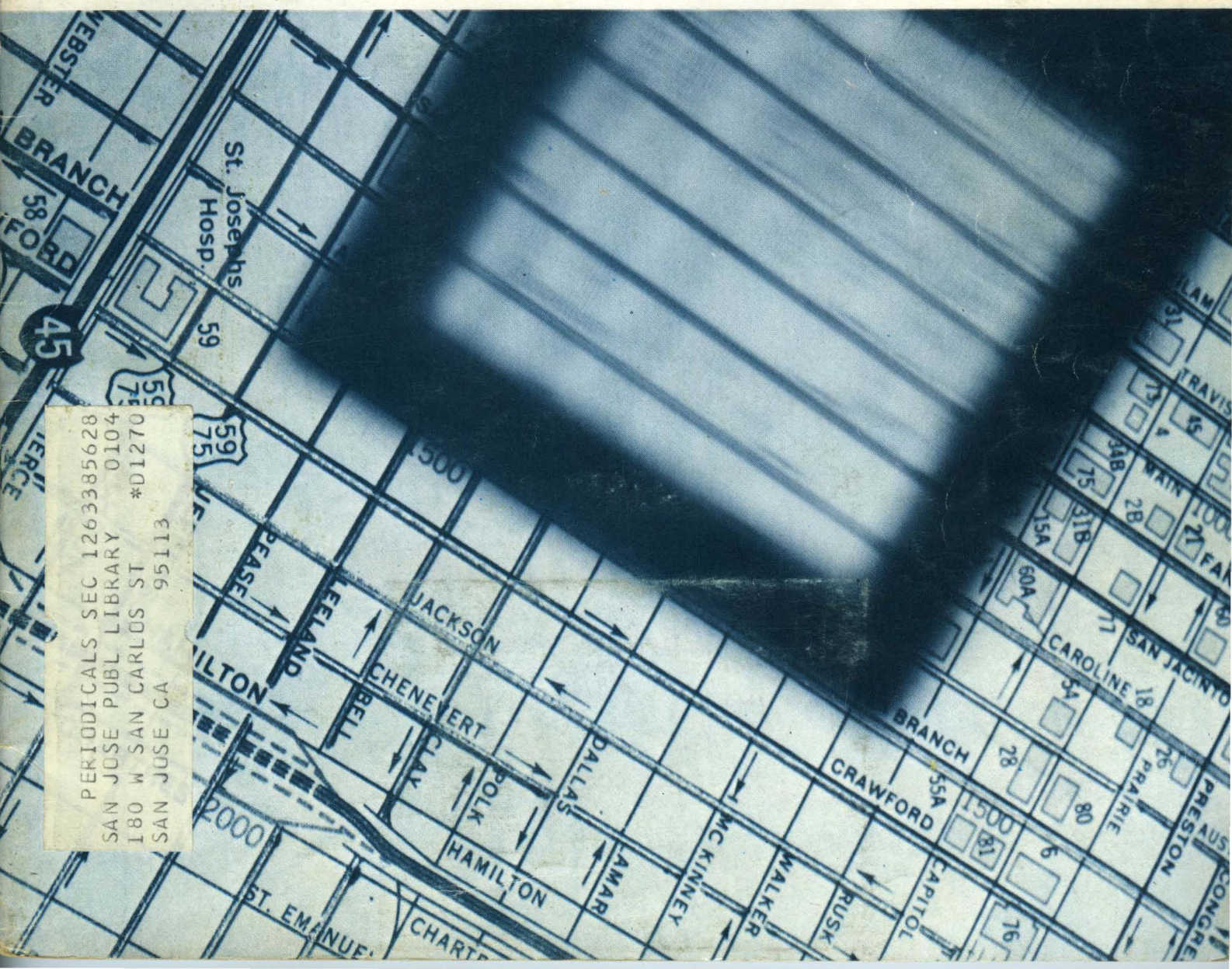
SCIENCE & TECHNOLOGY
February, 1970
Vol. 19, No. 2

computers and automation

Computer-Coded Filter Reveals "Hidden" Patterns



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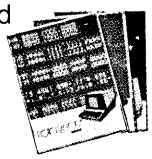

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FEBRUARY 1970

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Xerox Corp.	Patel
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Comsec, Inc.	Decil
Information Displays, Inc.	Digit
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[1] Admin. Exec.
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SHOW WORLD, INC.

Letters To The Editor

For Minicomputers

After reading "Brainiac's" and enduring five years in the U.S. Navy (during which time I learned a Control Data computer), I am now a Customer Engineer for I.B.M. and a subscriber to **Computers and Automation.** I find it a small world to see you're the editor. Count me among those who experiment with and build mini-computers and anxiously await the day that not only the processor **but also the I/O gear** will cost less than $2000.00 for a reader, punch, and printer and half a meg of memory (bytes).

Please consider this letter a fond "Hello" and a goad to continue your efforts in the field of lower cost, higher efficiency computers. My fondest regards.

RIX E. DOBBS
4300 S.W. 95th Ave.
Miami, Fla. 33165

Needed: New Short Words

As you would be the first to recognize, I'm sure, there is no reason why computers should not help us in the tasks of devising the new words we need — not just for new drugs as is already done — but also for the new species of evolving artifacts which proliferate rapidly.

We need some new short words for such mouthfuls as: "automatic pattern recognition" and "artificially intelligent devices".

I have been working for years on an acronym for the first, but such horrors as "autoparec" or "autopar" result. For the second, may I suggest a good old Anglo-Saxon sounding term: a "feignbrain". (As we begin exporting these, senators can point to the unpatriotic feignbrain drain.) Or, if one insists on brevity, use the term "itwit".

In social conversation it's much quicker to say, "Oh, I do the itwit bit", than to go into a lot of details.

On second thought, maybe we should simply call an automatic recognition device simply a "spotwhat", which would undoubtedly be corrupted to "spotwot".

Hopefully, this may inspire your readers to invent some more useful and efficient terms. I will gladly collect and publicize them.

OTIS N. MINOT
Lexington Research
10 Muzzey St.
Lexington, Mass. 02173

computers and automation

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computers and automation

Vol. 19 No. 2 — February, 1970 *The magazine of the design, applications, and implications of information processing systems.*

Special Feature

Software and Programming

Regular Features

Editorial

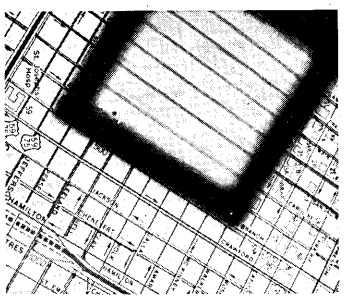
The Profession of Information Engineer and His Bridges to Society

C&A Worldwide

Jobs and Careers in Data Processing

Ideas: Spotlight

Multi-Access Forum



The front cover picture shows an experimental, computer-produced filter placed over a street map of Houston, Texas. The filter reveals hidden patterns in photos, charts, and other graphic material; and could be used by aerial photo analysts, seismologists, medical researchers, and quality control engineers to recognize graphic patterns that might not otherwise be detected. For more information, see page 50.

NOTICE

Who's Who in Computers and Data Processing is to be typeset by computer. As a result, it should be possible to include new entries (and to modify previous entries) CONTINUOUSLY — especially since **Who's Who** will be published periodically.

Consequently, if you have not yet sent us your up-to-date filled-in **Who's Who** entry form, PLEASE SEND IT TO US QUICKLY — the chance is good that your entry can be promptly included. Use the entry form on page 7 of this issue, or a copy of it.

Departments

"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, two-thirds 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. Berkeley
Editor

AS WE GO TO PRESS

CLOSE TO 10,000 PERSONS ATTENDED COMPSO-EAST, the first regional Computer Software and Peripherals Show which was held at the New York Hilton, Jan. 19-21. The Show attracted about 95 exhibitors and utilized 150 booths. Lines of visitors were still waiting to get into the exhibits just an hour before the Show closed. More than 1000 registrants attended one or more of the six seminars conducted under the direction of Dr. Ned Chapin, a pioneer data processing consultant with InfoSci, Inc., Menlo Park, Calif. The seminars were aimed at management applications of data processing, rather than the technical aspects, but included a session on buying computer stocks. The Show was designed for, and largely attended by, business managers.

One unique feature of the Show was the use of computer technology to enable exhibitors to better identify their prospective customers among the many persons who visited their booths, and to facilitate visitor follow-up.

COMPSO-East for 1970 was an experiment with a new idea -- to hold a regional show for the growing number of management men concerned with data processing operations. It seems clear that this first COMPSO Show should be regarded as significantly successful.

COMPSO-East for 1971 has been scheduled for Feb. 8-11, and will be held at the New York Coliseum.

SCIENTIFIC CONTROL CORPORATION (SCC) MAY BE ABLE TO RESUME OPERATIONS, if a proposal by the Great Southwest Corp. (a subsidiary of Penn Central Co.) is accepted by the bankruptcy court and SCC's creditors. SCC filed for bankruptcy in December. Early in January the Great Southwest Corp. offered to provide $2 million for working control of the company, and to guarantee $580,000 of SCC's $11 million debt.

SCC was founded in 1964; by the end of 1968 the company had 500 employees. But although sales figures for the firm showed steady increases, a reported lack of manufacturing know-how and cost control caused losses to increase faster. In addition, since last summer, SCC had undergone several changes in top management.

THE NATIONAL CASH REGISTER COMPANY (NCR) HAS ANNOUNCED A NEW PRICING PLAN FOR EDUCATIONAL SERVICES offered to users of the company's Century Series of computers. Under the new plan, all educational courses are priced separately. Each user will, however, receive a basic educational allowance as part of the rental or purchase price of his system, and will pay extra only for educational services above that allowance.

This announcement is the second made recently by NCR in regard to computer pricing. The same separate pricing approach was announced for systems support last fall, and is expected to be applied to software in the near future.

Who's Who in Computers and Data Processing

Who's Who in Computers and Data Processing will be published jointly (as an annual publication) by The New York Times Book and Educational Division and Computers and Automation. The fifth edition is scheduled to be published in three volumes in hard cover in early 1970, and will include upwards of 8000 capsule biographies.

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Consequently, if you have not yet sent us your up-to-date filled-in Who's Who entry form, PLEASE SEND IT TO US QUICKLY -- the chance is good that your entry can be promptly included. Use the entry form below, or a copy of it.

WHO'S WHO ENTRY FORM
(may be copied on any piece of paper)

1. Name? (Please print)_____
2. Home Address (with Zip)?_____
3. Organization?_____
4. Its Address (with Zip)?_____
5. Your Title?_____
6. Your Main Interest?

Applications	( )	Mathematics	( )
Business	( )	Programming	( )
Construction	( )	Sales	( )
Design	( )	Systems	( )
Logic	( )	Other	( )
Management	( )	(Please specify)	

_____
_____

7. Year of Birth?_____
8. Education and Degrees?_____
9. Year Entered Computer Field?_____
10. Your Present Occupation?_____
11. Publications, Honors, Memberships, and other Distinctions?_____
_____
_____
(attach paper if needed)
12. Do you have access to a computer? ( )Yes ( )No
    a. If yes, what kind of computer?
    Manufacturer?_____
    Model?_____
    b. Where is it installed:
    Manufacturer?_____
    Address?_____
    c. Is your access: Batch? ( ) Time-Shared? ( )
    Other? ( ) Please explain:_____
    d. Any remarks?_____
    _____
13. In which volume or volumes of Who's Who do you think you should be included?
    Vol 1. Systems Analysts and Programmers
    Vol 2. Data Processing Managers and Directors
    Vol 3. Other Computer Professionals
14. Associates or friends who should be sent Who's Who entry forms?
    Name and Address
_____
_____
_____
_____
(attach paper if needed)

When completed, please send to:

Who's Who Editor, Computers and Automation,
815 Washington St., Newtonville, Mass. 02160

c.a

MULTI-ACCESS FORUM

"PEOPLE AND COMPUTERS" — COMMENT

V. J. Maruska
12467 Pine Rock Lane
Houston, Tex. 77024

Your regular dissertations on "truth" combined with Lord Robens' article in your November, 1969 issue ("People and Computers", page 53) aroused my interest and this response. There are many reasons for unemployment but very little evidence that computers and/or automation have made any significant contribution. However, I have observed that two major causes of unemployment receive little if any publicity. Since you are interested in "reliable factual data, not false, misleading, nonrepresentative, or lying data", I think the comments stated herein are pertinent.

Americans have historically been hard working people with much initiative. A "20 hour week" would have been foreign to their religious convictions and ethics such as: "For even when we were with you, this we commanded you, that if any would not work, neither should he eat." (II Thess. 3:10) Jesus taught many parables on the virtues of hard work and dedication to noble purposes.

Somewhere along the way our ancestors abandoned these principles and started feeding those who "were not of the faith" and who absolutely refused to contribute. Today we are reaping a whirlwind where hundreds of thousands of individuals intentionally refuse to work because they know the rest of us will provide them their basic necessities. Until we own up to this truth and take effective measures to reverse its trend, we will experience an ever increasing number of individuals becoming professional freeloaders.

Still, there are millions of people who want to work but cannot find or have not found employment that provides sufficient compensation for them to adequately provide for their families. Why? Is there a true shortage of employment for which these people are qualified? I think not, but it will take some serious and honest soul searching to arrive at the solution. Computers can certainly be of assistance in such an investigation.

I believe Lord Robens may have brought to light a characteristic of the American people which is generally ignored: our selfish greed to acquire things! As an example, consider the family breadwinner (generally the father) who has sufficient income to support several families with regard to the basic necessities but whose spouse is also employed so that they "can afford" those little extras. The extras include items listed by Lord Robens plus, in addition, the third automobile, the second home, and other wasteful extravagances.

My computations indicate that such a second income of several hundred dollars per month tends to look rather small when expressed on an hourly basis after FICA and FIT. Meanwhile, neither spouse is able to care for and properly supervise their children, be as effective in bettering their community, etc. Most people agree with these points but they indulge anyway. This is why I choose to call it selfish greed.

Not only does this selfish greed feed inflation, but I believe it is responsible for much if not most of our unemployment as described in my fourth paragraph. As a rule, the second job is a category which is notorously underpaid. A breadwinner must pass it by because he feels that the compensation is not sufficient to support his family. The pay remains low because the spouse who does not actually need the additional income except for extra luxuries is willing to take the job at a meager pittance.

There certainly are other causes of unemployment and I have no single solution which would please all people. The problem truly is people and people are complex. I responded with this letter because I have observed so many computer professionals joining this greedy rat race. Upon final analysis, I see America's unemployment problem being akin to our going to the moon—once we decided that we really wanted to go, we quickly found a way! □

COUNTER CONFERENCE TO ACM 1971 MEETING IS SCHEDULED

I. From Daniel D. McCracken
7 Justamere Drive
Ossining, N.Y. 10562

A group within the Association for Computing Machinery (ACM), unhappy with the ACM's decision to hold its 1971 conference in Chicago, will hold a simultaneous "Counter-Conference" Aug. 3-5, 1971, at the Harvest House Motel, Boulder, Colorado.

The Counter-Conference will be in the standard professional format, and technical referees are already being recruited, according to Professor Joseph Weizenbaum of M.I.T., a spokesman for the Counter-Conference group.

Attendance at the Counter-Conference will be limited to four hundred. Organizers include Professors Jerome Feldman, Edward Feigenbaum, and R. W. Floyd of Stanford; Dr. John C. Reynolds of Argonne National Laboratory; Professor William C. Dorn of the University of Denver; and Professors Robert R. Fenichel, Robert M. Graham, J. C. R. Licklider, Marvin L. Minsky, and Joseph Weizenbaum of M.I.T.

II. Letter from the Editor to Daniel D. McCracken

Please put my name on the mailing list to receive information about the Counter-Conference. I plan to go. I think it is unfortunate that attendance is to be limited to 400; I would like to see all those ACM members who protest a conference in Chicago able to go to the Counter-Conference. Perhaps some compromise can be worked out.

It may be time to split the ACM into conservatives and liberals. □

"MOTION PICTURE ANIMATION BY COMPUTER" — COMMENTS

I. Letter from Charles A. Vaughn, Executive Vice Pres., Storer Studios Inc., 3700 Oakcliff Rd., N.E., Atlanta, Ga. 30040, to Stephen A. Kallis, Jr., Public Relations, Digital Equipment Corp., 146 Main St., Maynard, Mass. 01754

I was very interested in your article on computerized animation published in the November issue of **Computers and Automation** ("Motion Picture Animation by Computer", page 30); however, Storer Studios was not in your list of computer systems available on the market today.

I am enclosing a copy of an article that appeared in CLIO Magazine last March which describes our system in somewhat broad form. Since you are familiar with the other systems available, I think that probably the best way to describe our system would be to say that it is an on-line system which encompasses many of the advantages of the off-line system and at the same time avoids most of the disadvantages of both systems.

We at Storer Studios are critically interested in computer animation, as you might suspect, and I would be happy to let you examine our system if you are ever in this neck of the woods. We hope to market it beginning next year.

I hope you will excuse the barb but those of us who have worked on the system here at Storer Studios feel that we are entitled to be considered pioneers in the field and we think that perhaps we've been able to bring computer animation up to what the animator really needs. For example, our system controls all four peg tracks, rotation, north, south, east, west, zoom, as well as all camera controls, capping and automatic stepping routines. It does all these simultaneously or any of the combinations or sequence.

You might also be interested in knowing that we are currently adapting our program on a proportional feedback arrangement to be used on optical printing devices.

We did enjoy your article and we feel that any system available to aid the animator is very definitely welcome.

II. Letter from Mr. Kallis to Mr. Vaughn

Thank you very much for your letter calling attention to your computer animation system. Actually, I do not consider your comments a "barb," but rather, additional information in a field that is still in its infancy and consequently not very well documented.

With regards to my article in **Computers and Automation,** please note that I refrained from naming any actual installation and only alluded to those I mentioned. This was due expressly to the magazine schedule. I had insufficient time to contact facilities for clearance before the article deadline from the time I was able to start writing the article.

For your information, I am enclosing a copy of my previous article on this subject which features an off-line system that has been in commercial operation for over three years. This system has been used primarily for the production of animated commercials.

Another system, which is fully on-line and uses a PDP-8, has been used for more than two years by the National Film Board of Canada for animating their films. The system recently won an award for technical innovation in Canada.

The thrust of my article in **Computers and Automation** was to explain true film animation by computer to the computer person, not to describe a specific computer system. Quite obviously, any computer system capable of numerical control functions can be used for animation functions, if properly programmed. Previously, most computer people considered a CRT trace recorded by a slaved camera as all there was to computer-animated motion pictures, and I wanted to introduce them to the real world. □

ANOTHER APPROACH TO SOCIAL RESPONSIBILITY IN THE COMPUTER FIELD

I. From T. D. C. Kuch
ADP Management Staff
National Cancer Institute
7554 Spring Lake Drive
Bethesda, Md. 20034

I see on the back cover of the November issue of C&A that Industrial Computer Systems, Inc., advertises that its implementation of APL is "not for sale for unethical or destructive purposes".

As this firm's Boston address is the same as yours, I assume that this is, at least in part, your firm, and it was your decision to restrict the sale of the implementation.

This is, I believe, a new approach to the problem of the social responsibility of computer people, and a potentially quite valuable one. I expected to see an editorial on it, but didn't.

I'm sure your readers would appreciate your views on this step, what you expect to accomplish, how the idea came about, etc., including an explanation of what constitutes an "unethical" purpose (we all know, all too well, what a "destructive" purpose is).

II. From the Editor

The persons who have organized APL Manhattan, APL Boston, APL Philadelphia, APL Washington, etc., under the general aegis of Industrial Computer Systems, are Karl Korn and James Lamb, who are authors of articles published in *Computers and Automation* in the past. It was their choice to put into their notices of doing business and their advertisements "not for sale for unethical or destructive purposes". I like this business policy very much. They asked me in August to become a Director of Industrial Computer Systems, and I have become one.

When ICS was looking for office space for APL Boston, I noticed suitable space available in the same office building where we are located; and so it was natural to locate APL Boston in the same building.

The policy "not for sale for unethical or destructive purposes", together with its actual implications in specific real situations, is being worked out. When the appropriate time comes, i.e., when enough factual information is at hand to make some worthwhile and interesting statements of experience, I hope we shall have a letter in Multi-Access Forum or an article in the magazine describing and evaluating this policy. □

IIA PROPOSES FCC STUDY OF THE POTENTIAL OF LOW COST DELIVERY OF INFORMATION VIA COMMUNITY TELEVISION ANTENNA SYSTEMS

Paul G. Zurkowski, Executive Director
Information Industry Association
1025 15th St. N.W.
Washington, D.C. 20005

The Information Industry Association (IIA) recently asked the Federal Communications Commission (FCC) to create a separate study of the potential community antenna systems (CATV) and related broadband communications technologies for low cost delivery of information products and services.

These technologies offer the prospect that within the decade, the cost of delivering information at the rate of a page per second, tailored to the particular needs of individuals using low cost terminals in their homes, schools, or offices, will be competitive with current postal rates. The IIA feels that the economic and social implications of such modern information services involve issues significantly different from those involved in other current FCC proceedings.

The IIA filing included the following subjects: distinctions between computer switching services in communications networks, and applications of computer technologies in pre-processing, searching and retrieving information products from automated storage systems; information products and services which will be profoundly affected by broadband delivery capabilities; requirements for compatibility of television display and facsimile recording systems; traffic and marketing problems in broadband communications; needs for privacy; and, the nature of the regulatory environment and the need for proprietary rights concepts suited to these technologies.

Members of the Information Industry Association are commercial firms engaged in the application of advanced information technologies to the creation and marketing of information products and services for particular audiences. Copies of the IIA filing can be obtained for a $5.00 fee from the address above. □

"INTERNATIONAL ASSOCIATION OF COMPUTER PROGRAMMERS" BECOMES ACTIVE

Richard T. Lynch, Executive Vice Pres.
International Association of Computer Programmers, Inc.
P.O. Box 57
Sycamore, Ill. 60178

Th International Association of Computer Programmers (IACP) was incorporated on Oct. 27, 1969 as a non-profit professional organization for computer programmers and personnel. The Association is designed for, and depends upon, the personal involvement and participation of the professional programmer in local, national, and international activities.

Plans of IACP for 1970 include: publication of a monthly magazine containing articles and departments of interest to the computer programmer; formation of local chapters; development of scholarships, loans and work-study programs for continuing education in the programming profession; and sponsorship of educational seminars, lectures, and exhibits.

Anyone interested in obtaining additional information about IACP is invited to write me at the address above. □

MARTIN LUTHER KING MEMORIAL PRIZE CONTEST — SECOND YEAR

(Please post this notice)

Computers and Automation has received an anonymous gift and announces the annual Martin Luther King Memorial Prize, of $300, to be awarded each year for the best article on an important subject in the general field of:

> The application of information sciences and engineering to the problems of improvement in human society.

The judges in 1970 will be:

> Dr. Franz L. Alt of the American Institute of Physics; Prof. John W. Carr III of the Univ. of Pennsylvania; Dr. William H. Churchill of Howard Univ.; and Edmund C. Berkeley, Editor of *Computers and Automation.*

The closing date for the receipt of manuscripts this year is April 30, 1970, in the office of *Computers and Automation,* 815 Washington St., Newtonville, Mass. 02160.

The winning article, if any, will be published in the July issue of *Computers and Automation.* The decision of the judges will be conclusive. The prize will not be awarded if, in the opinion of the judges, no sufficiently good article is received.

Following are the details: The article should be approximately 2500 to 3500 words in length. The article should be factual, useful, and understandable. The subject chosen should be treated practically and realistically with examples and evidence — but also with imagination, and broad vision of possible future developments, not necessarily restricted to one nation or culture. The writings of Martin Luther King should be included among the references used by the author, but it is not necessary that any quotations be included in the article.

Articles should be typed with double line spacing and should meet reasonable standards for publication. Four copies should be submitted. All entries will become the property of *Computers and Automation.* The article should bear a title and a date, but not the name of the author. The author's name and address and four or five sentences of biographical information about him, should be included in an accompanying letter — which also specifies the title of the article and the date.

"Many people fear nothing more terribly than to take a position which stands out sharply and clearly from the prevailing opinion. The tendency of most is to adopt a view that is so ambiguous that it will include everything and so popular that it will include everybody. . . . Not a few men who cherish noble ideals hide them under a bushel for fear of being called different."

"Wherever unjust laws exist, people on the basis of conscience have a right to disobey those laws."

"There is nothing that expressed massive civil disobedience any more than the Boston Tea Party, and yet we give this to our young people and our students as a part of the great tradition of our nation. So I think we are in good company when we break unjust laws, and I think that those who are willing to do it and accept the penalty are those who are a part of the saving of the nation."

> — From *"I Have a Dream" — The Quotations of Martin Luther King, Jr.,* compiled and edited by Lotte Haskins, Grosset and Dunlap, New York, 1968.
>
> Reverend Martin Luther King, Jr., was awarded the Nobel Peace Prize in 1964, when he was age 35.
>
> He was in jail in the United States more than 60 times.
>
> He was assassinated in Memphis, Tennessee, April 4, 1968.

NEW ASSOCIATION OF BUSINESS FORMS MANUFACTURERS IS ORGANIZED

Association of Business Forms Manufacturers
4344 East-West Highway
Washington, D.C. 20014

A new and completely independent association of business forms manufacturers has been organized. Under the leadership of John Randall, President of Specialized Printed Forms, Inc., the group has adopted the interim name of Association of Business Forms Manufacturers.

The primary objective of the association, according to Randall, is to do the types of things that will help the industry member in his efforts to grow and prosper. Other officers of the association include: Vice President — John E. Pfeiffer, President of Pfeiffer Business Forms; Secretary — Richard A. Schilffarth, President of Dataforms, Inc.; and Treasurer — Roger Trunkett, Director of Marketing, Unit Printing Corp.

The first annual meeting of the association will be held February 12-14, 1970 at the Monteleone Hotel in New Orleans. Mr. Richard O'Brien, Vice President and Director of Research for Moore Business Forms, will be a featured speaker at the meeting. □

IBM, THE PATENT OFFICE, AND THE SMALL SOFTWARE COMPANY

The Emergence of an Industry

Perhaps the most secretive commercial business in the world is that of computer programming. The lack of meaningful patent or copyright protection for computer programs, and the inability to compete effectively with IBM and other computer manufacturers for the general purpose program market, has forced most software companies to emphasize development of complex, special purpose programs. These programs, often prepared for only one, two or at most a handful of users, typically are protected by keeping them under lock and key. This atmosphere has stifled growth of the software industry, limited competition, caused unnecessary duplication of programming effort, and increased cost to computer user and the public.

The recent "unbundling" announcement by IBM that it would no longer sell programs together with their computers, but would license programs independently, and recent indications that the Patent Office and the courts will allow patent protection for computer programs, combine to present the beginning of a new era for the small software company.

The following two articles offer: (1) an apocryphal view of the emerging computer programming industry; and (2) a hypothetical interview between the president of a small software company and a patent attorney specializing in protection of computer programs.

THE TALE OF CRAZY FREDDIE

John Ambrose, President
Scientific Experiments, Inc.
3707 Bagley Ave.
Los Angeles, Calif. 90034

"The dramatic economic question in 1984 is: Will the Federal Government force Crazy Freddie to charge a separate price for the computers it now supplies free as a part of its total service software package?"

Once upon a time in 1960 there was a company that made shoes and it was called the Shoe Company Incorporated. It had a president by the name of Mr. Shoe and 100 happy employees.

Shoe and Socks

One day Mr. Shoe was having lunch with his old friend, Mr. Socks, who owned the Socks Company Incorporated. Mr. Socks told Mr. Shoe that Socks Co. was so up to date that it had a computer. Mr. Shoe felt envious of Mr. Socks but Mr. Shoe was not the type of man to waste money just to keep up with the Joneses; so Mr. Shoe called in a salesman from the computer company, KM Co.

"Will a computer save me money?" asked Mr. Shoe.

"Oh, my, yes!" said the salesman. "You won't have to have all those people doing clerical work any more!"

"Is KM Co. the only computer company?" asked Mr. Shoe.

"I've never heard of any others," answered the salesman.

"Do we need any special personnel?" asked Mr. Shoe.

The salesman smiled and patted Mr. Shoe on the head. "Don't worry," he said, "KM Co. takes care of everything."

So began the empire called the Shoe Company's Data Processing Department. It was small at first but then it grew and grew. By 1965 it was so big it had 15 employees. It was led by Sam, Supervisor of Data Processing, who used to be the chief accountant. Sam made $15,000 a year. Second in command was Herbert, the chief programmer and ex-chief file clerk. Herbert made $10,000 a year and had been with the company 10 years. Also in the Data Processing Department was Jack Smart who made $9,000 a year.

"What! $9,000 a year for a kid one year out of high school!" screamed Mr. Shoe, when Sam told him he wanted to hire Jack. "We have to pay that much to get someone with experience", stated Sam.

Mr. Shoe was angry with his Data Processing Department; he was paying $10,000 a month for his accounting reports that used to cost him $3,000; not only that but he still wasn't getting his reports on time and he hadn't seen the KM Co. salesman since he had sold Mr. Shoe his last computer. Mr. Shoe consoled himself with the thoughts that he was getting a lot of new things off his computer that he didn't have before, and that Mr. Socks was having trouble too.

After graduating from Loyola University first in his class in mathematics in 1960, John Ambrose went to work as a scientific systems engineer for IBM. During this period he published a number of papers on specialized aspects of computer programming. Beginning in 1963, Mr. Ambrose worked as a patent examiner in the computer division of the U.S. Patent Office and attended the Georgetown University Law Center. He was admitted to the California Bar in 1967, and served as a deputy Los Angeles District Attorney until 1969 when he formed and became president of Scientific Experiments, Inc., a computer software company. He is also presently serving as a special consultant on computer applications in the field of criminology for the Los Angeles District Attorney's Office.

Crazy Freddie Gets Turned Down

Around the corner under a garage lived another company called the Crazy Freddie Service Bureau Company Inc. It had a president by the name of Crazy Freddie and he was the only employee and he wasn't very happy.

One day Crazy Freddie came to see Mr. Shoe but Mr. Shoe wasn't in to Crazy Freddie; so Crazy Freddie talked to Sam, the Supervisor of Data Processing. "I will do all your programming for your new KM Co. computer you have on order, for $30,000," said Crazy Freddie. "$30,000! No wonder they call you Crazy Freddie," screamed Sam. "Why should I hire you when I have programmers of my own?" "You're a shoe company, I'm a computer company!" screamed back Crazy Freddie, and walked out.

One day Crazy Freddie got an idea; why not write a program that everyone can use, and sell it at a discount? It was a good idea, and Freddie sold the program to 4 users who agreed to keep the program secret. The other users in his area that needed a program like that but didn't have the right computer were sold time on Freddie's computer. One manufacturer paid Freddie to write the program for his machine. Some manufacturers wrote their own. Freddie made $10,000 on his program.

In July of 1968 the United States Patent Office issued a patent on a computer program.

Jack Smart came into Sam's office. "I want a raise," said Jack.

"But you make $13,000 a year." exclaimed Sam, "You make as much as Herbert, who has been here almost 15 years." "I'm five times as good as Herbert!" demanded Jack; but he knew he could never make five times what Herbert made and so he began to look for a job.

On June 29, 1969, KM Co. announced that it would charge monthly fees for all of its programs and would protect its programs with patents.

Crazy Freddie sat in the bar at the top of the building his main branch was in. Crazy Freddie was now doing pretty well: 3 branches each having a computer in house, 12 employees, 4 programmers, 6 keypunchers, and 2 salesmen. Still Freddie felt unfulfilled. Sure, he had gotten a lot of new business from the unbundling announcement, but he wasn't called Crazy Freddie for nothing.

It was 1970 now. "Send in Sam!" demanded Mr. Shoe. The Shoe Company was doing very well in gross sales and had over 200 employees. Jack Smart had left, none knew to where. The cost of the Data Processing installation was at an all time high and seemed to be working more poorly than ever. "Sam, when will you finish that Sales Analysis Program I wanted?"

"We're only slightly behind schedule, Mr. Shoe," said Sam, "about 4 more months."

Mr. Shoe Gets Smart

Mr. Shoe didn't ask Sam how much that programming would cost; he could figure it for himself. His eyes fell back to an ad in the Wall Street Journal:

Choose from
18 Sales Analysis Packages
37 Payroll and Labor Distributions
14 Inventory Control Packages, plus many more
One to fit anyone's need
$50.00 per month each — Pat. Pending
CRAZY FREDDIE INTERNATIONAL

Mr. Shoe called the telephone number listed in the ad.

Jack Smart wouldn't normally take a sales telephone call, but he felt a certain pride in going back to his alma mater. He could still remember telling Sam that he was worth five times what Herbert was making; now at last he was making five times Herbert's salary and more.

"You see, Mr. Shoe," Jack began, "the reason we can offer you such value is that the cost of our programs is almost nothing. We hire the best programmers there are; we pay them a salary higher than a doctor or lawyer and watch them produce. We have found this to be the most economical way to operate. A program which requires a man months to produce at a cost of $5,000 is leased to over a 1,000 customers. This brings our total programming cost down to less than 10% of the first month's royalty."

Mr. Shoe learned a lesson from Jack Smart; and soon things were happier at The Shoe Company. Mr. Shoe still had his computer but the headaches were gone. Sam was still in charge of the Data Processing installation but he spent most of his time in accounting. Herbert took over an administrative job which made use of the knowledge he had gained about the company.

Every time Mr. Shoe would see a Crazy Freddie commercial on TV, he would thank his stars that he had bought Crazy Freddie stock in the 1970's, now that it was the largest industry in the nation.

KM Co. Loses Its Head

KM Co. didn't seem so big any more. That might have satisfied the stockholders but it made the President, Mr. Townsend, rather jealous. "I'm sick of the tail wagging the dog," fumed Mr. Townsend. "I'm going to challenge Crazy Freddie."

Somehow KM Co. had never been the same, since they couldn't get a decent share of the packaged program market. It seemed that good programmers were more the bearded, pot-smoking, colored-sweater type than the ivy-league, white-shirted, no-smoke, no-drink type. In any case KM Co. lost its head.

KM Co. put all of its resources into an attempt to smash Crazy Freddie. KM Co. knew that it did not have to announce its machine language until it announced a new machine. So Mr. Townsend put all of KM Co.'s programmers on programming applications for its to-be-announced Series 27 computer. At last came the announcement of hardware and software together. It would be a real coup. KM Co. knew that it would take months for Crazy Freddie to duplicate KM Co.'s packages, even though KM Co.'s programs were twice the price of Freddie's current price. It would surely take Freddie a long time to effectively compete.

But that proved the end of an epoch. What KM Co. had overlooked was that hardware was so cheap anyway that hardware improvements weren't as dramatic as they were in the old days. Since software cost more than hardware anyway, a new computer with a software tag of twice the old price just wouldn't make it. And so KM Co. went into reorganization under Chapter 987654321B, and its stock price slipped down and down and down. . . .

And that's the background behind the dramatic economic question of the year, now 1984. Question: Will the Federal Government force Crazy Freddie to charge a separate price for the computers it now supplies free from its subsidiary, KM Co., as a part of its total service software package?

Suits have been filed by other software firms claiming that giving away free computers in one package with the software is unfair competition. Informed observers muse, however, that it will be hardware manufacturers that will really benefit if Crazy Freddie is forced to unbundle since they have a very difficult time selling hardware when Crazy Freddie gives it away.

And so they all lived happily ever after.

(P.S. This ending is only for those who really think this is a fairy tale.) □

A HYPOTHETICAL INTERVIEW BETWEEN THE PRESIDENT OF A COMPUTER SOFTWARE COMPANY AND A PATENT ATTORNEY SPECIALIZING IN PROTECTION OF COMPUTER PROGRAMS

Howard A. Silber
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Fullerton, Calif. 92631

"Some kind of patent coverage for computer programs is imperative if we are to maintain some sanity in the software industry."

Q. In the past, the need for protecting our computer programs by patent has been minimal for two reasons. First, we have stayed out of the utility and general purpose computer program market, because such wide usage programs generally were supplied by the computer manufacturer, and we felt unable to compete effectively in this market. Secondly, the complex, special-purpose programs which we had the capability to provide, and which formed the bulwark of our business, often were designed for individual users or very small groups of users. These programs were well protected by keeping them under lock and key as a trade secret.

Now, since IBM has announced that computer programs will not be supplied with their computers, but will be offered separately at an individual charge under a license agreement from IBM, the picture has changed drastically. Computer users now will shop around to find out where they can get a utility or general-purpose program at the lowest cost. Suddenly a new market has been opened to us. But for such general-purpose programs we feel that trade-secret protection is inadequate, and other protection appears necessary to help us establish a foothold in this new market.

A. I think this is a very significant consequence of the IBM unbundling announcement. Not only is such patent protection necessary to maintain your position in the new market, but indeed if such protection should not be available, it would both take the teeth out of the IBM license agreement, and as you imply, result in chaos in the software industry.

"Unfair" Competition

Q. If I'm now going to be able to sell general purpose computer programs, which may be purchased by many computer users, what kind of protection is available for these programs which might limit potential competition, and prevent a free-for-all market?

A. Well, the better question is not how can you prevent a free-for-all market, since there you are asking me how you can restrain trade, but rather, how can you prevent your competitors from unjustly taking advantage of the time, money and effort you have put into developing your programs and establishing a commercial market for them. You are already familiar with trade secrets. This is a branch of the law of unfair competition, which law has long been available to protect a businessman's reputation and product development effort from being unjustly appropriated by another. The established laws of unfair competition are available for protection of your software business. Moreover, you can copyright your programs, although the protection afforded by copyright is not very meaningful, and there is increasing evidence that computer program patents also will be available.

Q. You speak of unfair competition; perhaps you can describe what my competitor would have to do for me to take legal action against him.

A. In general, you can get injunctive relief and damages against a competitor who fraudulently or unfairly attempts to capitalize on your business reputation, or who attempts to palm-off his own programs as being ones you developed. For example, if you call your company "Crazy Freddie," and Crazy Freddie programs have a reputation for being well written, efficient and cheap, and a competitor tries to sell his own program as a Crazy Freddie program, you can bring suit to enjoin him.

Q. But suppose my company develops a particular program, perhaps at substantial cost, and builds up a market to sell this program and like programs. Then someone else comes along and copies our programs and tries to sell them to others; can I prevent him from doing this?

A. Only under limited circumstances where he acted in violation of some duty not to copy. Thus if his acts were in violation of a contractual obligation to refrain from duplicating or selling the program, you probably can enjoin the copier. For example, if your program lease or sale agreement includes a convenant that the program is not to be copied or otherwise provided to others, you could enforce this contractual obligation. IBM includes this kind of restriction in their lease agreement for computer programs.

You can also enjoin the copier if he appropriates a trade secret, or if he acts in violation of an express or implied confidential disclosure agreement. For example, suppose you provide a potential customer with a copy of the program or flow charts to enable him to evaluate whether it will suit his requirements. If he copies and

Howard Silber received an A.B. in physics from Princeton University, and was employed for six years by National Scientific Laboratories, Inc., Washington, D.C., as a senior project engineer specializing in electro-magnetic interference studies of large-scale computer and digital communication systems. Mr. Silber obtained his J.D. degree in 1964 and was admitted to practice before the California, District of Columbia, and U.S. Patent Office bars. From 1966 to 1968 he was the assistant Patent Counsel at the Autonetics Div. of North American Rockwell Corp., and since 1968 has been a partner in the patent law firm of Hinderstein & Silber.

attempts to sell the program, even though he knew it was provided to him only for evaluation purposes, his action is unlawful and can be stopped.

Trade Secrets

Q. What actually constitutes a trade secret? and when can I enforce it?

A. A trade secret, first of all, must be treated as a secret. As you know from your own practice with large-scale computer programs, these are kept secret by keeping them unavailable to the general public, and making it clear to the program users and their employees that the program is considered to be confidential. Moreover, the trade secret must not be general knowledge. That is, the program must be unique and not one which is generally known to other people working in the computer field. Finally, there must be a breach of an implied or express duty to keep the program secret.

Trade secret enforcement is possible in the situation where you are keeping a program confidential and one of your employees, or perhaps an employee of a computer user who has obtained the program under confidential agreement from you, makes a copy of the program, in dereliction of his duty to keep it confidential, and goes out and tries to sell the copy to another computer user. In this case, you can clearly enjoin him from selling or otherwise disposing of the program. If he already has sold the copy, you can prevent the buyer from using it, at least if the buyer was aware of how the employee acquired the program.

Q. But suppose my company invests considerable time and manpower in developing a particular program and someone legitimately obtains a copy of the program and starts selling it. Or suppose a clever competitor independently develops a program which is very similar, or even identical to mine. From what you have indicated, neither trade secret nor unfair competition nor breach of contract will enable me to stop him from selling his program.

A. True. This is the heart of the problem. Only with meaningful copyright or patent protection for your computer programs can you protect your investment in program development and control or prevent such competition. This is why patents have played such a big role in the development of other fields of technology. They offer an incentive to invest in technological development, by granting a limited monopoly to the person who makes a new and useful invention or discovery. So it is extremely important that meaningful copyright or patent protection be available for computer programs, to enable your company to protect its investment in computer programming time and effort. And as a side benefit, the full public disclosure required by the patent grant enhances development of the programming art generally.

Copyright Protection

Q. You stress the term "meaningful" copyright or patent protection. Why is this?

A. Let's consider copyright protection. The Copyright Office has registered some computer programs, and this kind of coverage clearly is available. However, the value of copyright protection for computer programs is minimal.

Q. What kind of protection do I actually get with a copyright?

A. A copyright protects only the written expression, and not the subject matter that is so written. With respect to a program, what is copyrighted is a series of program steps, either the source program written by the programmer in mnemonic language or the object program which is compiled in machine language from the source program. In either case, it is the specific set of instructions which is protected, not the underlying program concept, algorithm or flow chart.

To infringe, you must actually make a copy of the copyrighted program. That is, if the program is registered in written form, you must make an actual written duplication of the program, for example by obtaining a print-out of the computer memory locations containing the program steps. Although the courts have never ruled on the matter, it is my opinion that a copy of the program on punched cards, or on a magnetic tape or disc would also be a copyright infringement, even though the program steps are punched or recorded in binary or other code, so long as the copy represents exactly the copyrighted program steps.

Q. But suppose I change around some of the program steps. That shouldn't be too difficult to do. Would I still infringe?

A. If you changed around a sufficient number of steps, you are clearly changing the expression and your rearranged program would not be an infringing duplicate or copy of that which is registered, even though the rearranged program may perform the same function, and work just as well as the copyrighted program.

Q. Couldn't I also get around a copyright by rewriting the program in a different computer language?

A. Absolutely. Thus, if the program were written and copyrighted in Fortran, and you took the exact program steps, in the same order, but rewrote them in a different program language, the result would not be a copyright infringement. Incidentally, if the source program were copyrighted, the machine language program which is compiled from the source program and actually used to run the computer itself would not constitute a copyright infringement.

Patent Protection

Q. I can see there are serious limitations to copyright protection for computer programs. What's the situation on patents?

A. The Patent Office has issued several patents on devices or suchlike which resemble computer programs; the patent statutes do not prohibit patenting of computer programs; and the courts have recently specified a few of the conditions for patentability of a computer program. Although this is a grey area of the law, it is my opinion that patent coverage for certain types of computer programs clearly can be obtained, and moreover, that more extensive patent or quasi-patent coverage will be available in the future. We all agree that such coverage is imperative to maintain some sanity in the software industry.

Q. But I thought that only machines, processes, or compositions of matter could be patented and certainly a program is not a composition of matter.

A. Well, if we must cubbyhole, a computer is a machine and a computer program is of no value unless run on a computer. In fact, if one had a special-purpose computer particularly designed to carry out only the operations of a particular program, this clearly would be patentable subject matter. That is, you could get a patent on it as a machine.

Q. So why not try to get a patent on a general-purpose computer programmed to perform a particular program?

A. In effect, this has been done. In at least one patent which issued[1] by the Patent Office, the claim is to a general-purpose data processing system including a

[1]U.S. Patent No. 3,380,029 to M. A. Goetz entitled **Sorting System.**

plurality set of magnetic tape units, a memory, and control and arithmetic units, and a control system for directing the operation of said data processing system including control loop means to accomplish each step by the program flow chart.

Q. But it appears that sale or lease of the program itself would not be an infringement of such a patent. So if I just sell a deck of cards to my customer with the program steps on the cards, I wouldn't infringe that patent. Is that correct?

A. Well, it would not be a literal infringement. To have such infringement would require that the deck of cards be loaded into the general purpose computer, and the machine actually run in accordance with the program instructions. But since there is no other use for the deck of cards which you would sell with the program instructions on them, this sale would probably be a contributory infringement, and you would still be liable as an infringer.

Q. So, in fact, such claim coverage would give my software company some protection?

A. Yes, definitely.

Q. How about claiming a computer program as a process?

A. This should be possible, provided the process claims are not so broadly worded as to cover performance of the program steps by a person using pencil and paper. While the courts have said that process steps need not involve physical operations on substances, they have not upheld claims in which the critical steps could be performed "mentally". But if the process steps are limited to performance by a mechanism such as a general-purpose computer, it would seem that a process patent on a computer program should be allowable, so long as the "process" meets the tests of novelty and unobviousness required for all patents.

The Test of "Unobviousness"

Q. But isn't all of this presentation of machine or process claims just a subterfuge to obtain patent coverage, where the applicant and the Patent Office and the courts all know that they are dealing with a computer program, yet the patent doesn't say it?

A. That is definitely the case, and the Patent Office probably will recognize this and begin to allow claims which in form as well as substance protect a computer program. But the more immediate problem faced by the Patent Office, and hence by the applicant when trying to get a computer program patent, is whether the program meets the statutory requirements of novelty and unobviousness.

Q. I'm not sure I appreciate the problem. Can you give me an example?

A. Certainly. Suppose you had a particular accounting operation which you wanted to computerize. You could give the task to any programmer and he probably could come up with a satisfactory program just by applying his ordinary skill. The resultant program well may be the first of its kind ever written, and thus meet the test of patentable novelty. But since the invention, that is, the new program, was "obvious" to one skilled in the programming art, it does not meet the requirement of unobviousness set by the patent statutes as a prerequisite of obtaining a patent.

Q. In your example you pre-supposed a known accounting operation. But suppose the program uses a unique, newly discovered problem solution method. Would this meet the test of unobviousness?

A. Yes it would. The U. S. Court of Customs and Patent Appeals very recently considered just this problem[2]. There the invention related to analysis of conventionally obtained spectrographic data. The inventors discovered a theretofore unknown relationship in the different subsets of equations relating the spectrographic peak heights to the unknown concentrations of ingredients in the compound being analyzed. They also discovered that by mathematically manipulating the equations in a particular manner, they could determine which subsets of equations yielded least error in data evaluation.

The Court said that a patent (with means-type product claims) covering a computer program to carry out the discovery should be allowed. They pointed out that if before this discovery, a skilled programmer had been given the task of writing a program to evaluate spectrographic data, he simply would not have known what he should program the computer to do.

Q. It would seem that patent protection thus should be available to cover a new algorithm.

A. Yes, and this would be beneficial from another point of view. For optimum protection, it is desirable that the patent claims at least cover the program flow chart. Thus, suppose your competitor's program had a different arrangement of steps from yours (and thus avoided a copyright infringement); then if his program followed the same flow chart, it would infringe your patent. Even better protection is afforded if your patent claims cover the underlying problem solution method or algorithm.

Q. It is fine that patent protection can be obtained when the underlying problem solution method is new, but in a great many instances our programs utilize well known accounting or mathematical methods, but are unique in that they employ clever programming schemes which result in minimal running time on the computer, or the ability to make optimum use of certain data. Would these programs be patentable?

A. If you can show that the programming scheme or technique itself is both new and not obvious to a skilled programmer, I believe that patent coverage should be obtainable. This issue has never been decided by the courts.

Q. Who decides whether an invention is novel and unobvious?

A. In the first instance, it is the Patent Office. Thus when you submit an application for a patent, the Patent Office is obligated to search through existing patents and literature and determine whether the new invention merits a patent. This presents a problem with respect to computer programs, as the Patent Office does not now have a substantial collection of existing computer programs. The problem is even more complicated because many programs are not documented in generally available literature.

Q. So if I got a computer program patent, and later sued a competitor for infringement, he might argue that my patent was invalid, as being antedated by an old program which was documented in his own and several other libraries, but not in the Patent Office.

A. Yes. This is one of the pitfalls of the limited ability of the Patent Office to evaluate applications for computer program patents. But if you are reasonably sure of the originality of your program, it still would seem wise to seek patent protection. Remember that an issued patent is presumed valid, and this should give your competitor cause to think twice before proceeding to copy your patented program.

[2] In re Charles D. Prater and James Wei, USPQ, decided August 14, 1969.

Protecting "Ordinary" Programs

Q. But this still leaves a very large body of programs which may be very valuable commercially, but which are not presently patentable because they use known problem solution methods and ordinary programming techniques. Is any kind of patent protection available for such programs?

A. Not at present. But the Commissioner of Patents has recognized this glaring deficiency and has proposed[3] the possibility of providing a new form of protection for innovations, including computer patents, which do not meet the rigid patent standards of novelty and unobviousness. One suggested approach[4] is an amalgamate system embodying certain aspects of both copyright and patent. It could be a registration system, without examination, and with no presumption of validity given the resultant "patent". The onus would be on the "patent" holder to show validity at the time he sued another for infringement.

Q. At the beginning of this interview I mentioned the IBM unbundling announcement. As I'm sure you know, IBM stated in that announcement of June 23, 1969, that computer programs will no longer be supplied with their computers, but will be offered separately on an individual charge basis under a license agreement from IBM. As a result, if a computer user wants even a simple, general-purpose IBM program such as a sort or merge routine, or a language compiler, he must pay an individual monthly charge for each program.

A. That is correct. Moreover, if the user has two computers he must pay a separate license fee to use the program on each computer.

Contractual Protection

Q. Well, what is to prevent the user from licensing the program for one machine, then making a copy to be used on his second machine or to give to a friend to use on the friend's machine?

A. The license contract with IBM specifically forbids this. If the user did make a second copy for his own use or for a friend, it would be a breach of the contract and IBM would have a legal cause of action under which they could sue both for damages and to prevent the user from using the program on his second machine and from duplicating the program for others. This is an example of the contractual type protection for computer programs which we discussed earlier.

Q. Can the user get around the license by making modifications to the program?

A. By terms of the license agreement, the licensee may modify the program, but if any portion of the licensed program is included in an updated work, the program still falls within the terms of the agreement. Thus, it would still be a breach of the license agreement to use the modified program even if it includes only a small portion of the licensed program.

Q. But suppose the minor portion retained and used is public knowledge, for example a simple add sub-routine?

A. Arguably, no part of the program then would be used and the usage would not be subject to the license agreement.

[3]Address by Commissioner of Patents William E. Schuyler, Jr. on August 11, 1969, to the Patent, Trademark and Copyright Section of the American Bar Association meeting in Dallas, Texas.

[4]See "Protection of Proprietary Interest in Computer Programs" by T. Buckman in the **Journal of the Patent Office Society,** March, 1969, Vol. 31, No. 3, Page 135.

Q. Suppose I have a bright programmer, who knows what a particular IBM program is intended to do, but has never seen the IBM program or its flow chart. My programmer brews up a program on his own to accomplish the same result as the IBM program. Can we use this program without IBM taking legal action against us?

A. This depends on whether IBM has patent or copyright coverage on the program. If the program constitutes a patent or copyright infringement, then IBM would have a course of action to stop your use or sale of such program. If the program did not constitute a patent or copyright infringement, or if IBM had no such coverage, then you are free to do what you wish with the program, so long as you commit no act of unfair competition.

Q. So in effect, IBM must have patent or copyright protection to make their agreement worthwhile?

A. In effect, that is so. Of course, independent of such protection, an organization owning a computer can voluntarily enter a license agreement with IBM and if they do so, they are bound to the terms of the agreement. But if they elect not to, and look to another source for a like program, either writing the program themselves or buying or leasing it from someone else such as your company, IBM cannot prevent this.

Q. Thank you very much for your advice. It seems that Crazy Freddie was right, and there is a substantial future for the independent computer software company, particularly if we have the cooperation of the Patent Office. □

THE INTERNAL REVENUE SERVICE LOOKS AT COMPUTER SOFTWARE

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"The Internal Revenue Service Directive regarding software allows a degree of leeway in accounting and is worded generally enough that drastic accounting changes should not be necessary for most taxpayers."

When Edward J. Hurney said "The United States is the only country where it takes more brains to figure your tax than to earn the money to pay it", he had no idea how complex our tax regulations would become.

Today with increasingly new applications for old equipment, the intricate new equipment, and the new, different and unusual accounting methods that are being used or tested, it is mostly a matter of either guessing the proper tax reporting method or following the lead of the little old lady who read the instruction "Return This Blank" and did just that.

The problem of how to deduct the expenses of software for tax purposes has long troubled accountants. The general practice up to this time has been to treat those expenses in the most convenient manner regardless of whether that manner was compatible to accounting methods used for other deductible expenses.

Until the Internal Revenue Service (I.R.S.) issued a directive establishing guidelines "in connection with the examination of Federal Income Tax Returns involving costs incurred to develop, purchase, or lease computer software", there was even a question as to the exact definition of "software" not to mention the proper accounting methods that should be used.

The I.R.S. directive defines "computer software" as including all programs or routines used to cause a computer to perform a desired task or set of tasks, and the documentation required to describe and maintain those programs. Computer programs of all classes, for example, operating systems, executive systems, monitors, compilers, and translators, assembly routines and utility programs as well as application programs are included. Computer software does not include procedures which are external to computer operation such as instructions to transcription operators and external control procedures.

Costs of Developing Software

The cost of developing software resembles the kind of research and experimental expenditures that are covered by Section 174 of Internal Revenue Code of 1954. According to the I.R.S. directive on software, they will not disturb a taxpayer's treatment of these costs whether for his own use or to be held by him for nil or lease to others if:

1. All of the costs properly attributable to the development of software by the taxpayer are consistantly treated as current expenses and deducted in full accordance with rules similar to those applicable under Section 174 (a) of the code: or
2. All of the costs properly attributable to the development of software by the taxpayer are consistently treated as capital expenditures that are recoverable through deductions for ratable amortization, in accordance with rules similar to those provided by Section 174 (b) of the Code and the regulations thereunder, over a period of five years from the date of completion of such development, or over a shorter period where such costs are attributable to the development of software that the taxpayer clearly establishes has a useful life of less than five years.

Section 174 of the Code referred to above provides two methods for treating research or experimental expenditures paid or incurred by the taxpayer in connection with his trade or business. These expenditures may be treated as expenses not chargeable to capital account and deducted in the year in which they are paid or incurred, or they may be deferred and amortized. Research or experimental expenditures which are neither treated as expenses nor deferred and amortized under this section must be charged to capital account. These expenses can relate to either a general research program or a particular project.

What the I.R.S. is in effect saying, is that the costs of developing computer software will not be questioned if you treat them as you would any other Research and Experimental Expenditures, and so long as you treat them in the above manner by deducting them as an expense deferring them and amortizing them over a five-year period. If you elect to use neither of the above methods, software development costs must be charged to the capital account.

Costs of Purchased Software

The fourth section of the I.R.S. directive states that with respect to costs of purchased software, the I.R.S. will not disturb the taxpayer's treatment of such costs if the following practices are consistently followed:

1. Where such costs are included, without being separately stated, in the cost of the hardware (computer) and such costs are treated as a part of the cost of the hardware that is capitalized and depreciated: or

2. Where such costs are separately stated, and the software is treated by the taxpayer as an intangible asset the cost of which is to be recovered by amortization deductions ratably over a period of five years or such shorter period as can be established by the taxpayer as appropriate in any particular case if the useful life of the software in his hands will be less than five years.

Again all they have said is that if normal recognized accounting procedures are used there will be no questions asked. If the taxpayer elects to use a different method of accounting for the costs of purchased software, the I.R.S. could conceivably question his accounting methods and disallow the expenditure. Even though the accounting method used is consistent with good accounting practices, it may not be approved by the I.R.S. in cases such as this.

Leased Software

When the taxpayer leases software for use in his trade or business, the deduction will be allowed if certain provisions of the general regulations pertaining to Section 162 (Rentals) of the I.R.S. Code are adhered to.

Under Section 162, if a leasehold (in this case the software in question) is acquired for business purposes for a specified sum, the purchaser may take as a deduction on his return an aliquot part of the sum each year, based on the number of years the lease has to run.

The cost of making permanent improvements on property (which includes software by I.R.S. definition) of which he is the lessee should be treated by the taxpayer as a capital investment, and is not deductible as a business expense unless such expense can qualify as a development expense as explained previously.

If the taxpayer should make improvements to the leased property, and if the cost of those expenses does not qualify as a development expense, he cannot, of course, deduct the cost as a business expense but can amortize the expense over the length of the lease along with any costs incurred in acquiring the lease which can also be amortized.

The situation grows more complex when the leasing is between two related parties. Special rules apply to almost all transactions involving related lessee and lessor and can affect the deduction unless certain proof is submitted to the I.R.S., otherwise substantiating the legality of the transaction. Corporate and business relationships are defined and explained in Section 178 as well as in Sections 267 and 1504 of the Internal Revenue Code.

Accounting Methods

Normal accounting procedure, unless markedly inconsistent with the practices recommended by the Revenue Service in their directive and previously mentioned in this article, will be accepted by the I.R.S. for all taxable years ending prior to the publication date of the I.R.S. directive on software which was October 27, 1969.

For taxable years ending after that date the I.R.S. will not disturb the taxpayer's treatment of software costs that are handled in accordance with the practices recommended in the directive.

Any change in the treatment of such costs, even to bring them in line with recommended accounting procedures, is a change in method of accounting and subject to the provisions of Section 446 and 481 of the Code.

Section 446 is merely the section pertaining to the accounting methods that are to be used by taxpayers. It outlines the procedure to secure permission of the Commissioner in changing either the overall method of accounting or the treatment of a material item such as software. The necessary steps include the filing of an application on Form 3115 within 90 days of the beginning of the taxable year in which it is desired to make the change.

Section 481 states the basic rules for changes in accounting methods and outlines the amounts the tax burden can be adjusted to without the taxpayer being required to revert to his prior tax accounting methods. Inasmuch as a change from a present accounting method to an I.R.S. method of accounting for software would be a change more likely to increase the tax burden, this section would most likely not apply.

Acceptance by the I.R.S.

The new tax reform bill which affects the coming calendar year does not bring any changes that would affect the treatment of software beyond those areas already mentioned in the Internal Revenue Directive, and we can most likely assume that the treatment of software will not be questioned so long as the Revenue Services' guidelines are followed.

Those guidelines allow a degree of leeway in accounting and are worded generally enough that drastic accounting changes should not be necessary for most taxpayers, although there will be a few who will have to file for a change in accounting method in order to insure acceptance by the I.R.S. of their deductions.

This directive has not yet been tested in the tax courts; and until such time as it is, compliance with the procedure recommended by the directive will be a voluntary matter for most taxpayers.

Choosing an accounting method has long been a matter of attempting to find the most advantageous method for the particular field. Because of the many types of industry that will or do attempt to deduct expenditures for "computer software", no one method can be recommended for even this one type of expenditure; and ultimate application within the established guidelines is up to the taxpayer.

The Future

The future at least as far as software and taxes is concerned looks brighter. Although this particular directive limits or somewhat restricts the deduction as well as the definition of software, there are those who believe that the day is not far off when a deduction for even such intangible things as employees may be taken with complete approval of the Internal Revenue Service.

Along this line, the University of Michigan has a research team working in cooperation with several industrialists in an effort to compute how much various employees are worth to a company.

This far-out project is primarily designed to enable corporate officers to create and maintain a balance sheet for the human resources of a company. Its acceptance by industry (there is already an indication of interest in this project since over 100 companies are requesting progress reports on the project) could and most likely will lead to the I.R.S. establishing guidelines for deductions for losses incurred with the loss of key employees.

But all of this is in the future, and today you have to worry about the present, and the present means, at least for calendar year taxpayers, tax return filing time. It is hoped that the I.R.S. directive and this report will aid you in adjusting software outgo to receive more favorable acceptance by the Internal Revenue Service. □

MAZE SEARCH:
A PROGRAM THAT SOLVES N DIMENSIONAL MAZES

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"The algorithm is a simple one. The program 'constructs' a 'mouse' whose location within the maze is stored in a register. This 'mouse' can 'turn' and 'sniff'. These properties are simulated by specific routines."

The usefulness of a program which would solve mazes in n dimensions is endless. Such a program could be applied to a variety of real world or business world problems—for example, the design of circuit boards and integrated circuit chips; highway designing; contour-map generation. And with minor alterations, this program should be suitable for any type of "search and find" problem. The reader may readily think of applications that arise in his own field or discipline.

Such a program has now been developed. Given any maze in n dimensions, this program will indicate whether or not the maze is solvable, and if it is, print out a solution. If a solution to the maze proves to be impossible, the program will so indicate, and it will also indicate every place in the maze it has explored.

This article will discuss this program, its algorithm or solution-finding method, and some of its applications in the business world.

The program, originally named "Mouse", was written in time-shared FORTRAN II during the winter of 1968-69. The program was later adapted to PDP-7 assembly language (used on the Digital Equipment Corp. PDP-9 computer) and was to some extent improved and given the name "Maze Search".

Types of Mazes

Before discussing Maze Search, it is necessary to say something about mazes. Now the reader may say: "I know all about solving mazes. It's really simple: just pretend you're in the maze, put your right hand on the wall, and walk forward. You can't miss!"

Michael F. Tighe is a senior at Newton South High School, where he also serves as executive editor of the high school newspaper, is a member of the chess team, and a participant in dramatic activities. The program which he describes in this article recently won first prize in a competition for computer programming at his high school. Mike was introduced to computers during the summer of 1968 when he enrolled in a course in computer programming at Northeastern University. In 1969 he attended a course at M.I.T. in "Artificial Intelligence and Computation". He will enter college in the fall, and plans to concentrate in science and mathematics. Since last April he has been a member of the part-time staff of Berkeley Enterprises, Inc.

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Figure 1

This maze demonstrates the "one wall unity" property of some mazes. If a blind person were placed in the upper left hand corner of the maze, facing south, he could, by placing his hand on the wall, walk forward until he hit the cheese. The Maze Search program is able to solve this type of maze.

Well, this may be true for a class of mazes which may be called "one-wall unity" mazes—that is, they are constructed from one expanded wall. (For the mathematically minded, this type of maze is constructed from a two-dimensional torus, misshaped using permissible topological distortions.) Such mazes are also solvable using the Maze Search program here described. (See Figure 1.)

But other mazes exist without completely connected walls. These are constructed by drawing a one-wall maze completely surrounded by another one-wall maze (which may itself be completely surrounded by another one-wall maze, and so on). This type of maze is not solvable using the above method of "putting your right hand on the wall and walking forward." So a different method of solution is needed. The program Maze Search contains one such method, so it can solve this type of maze. (see Figure 2.)

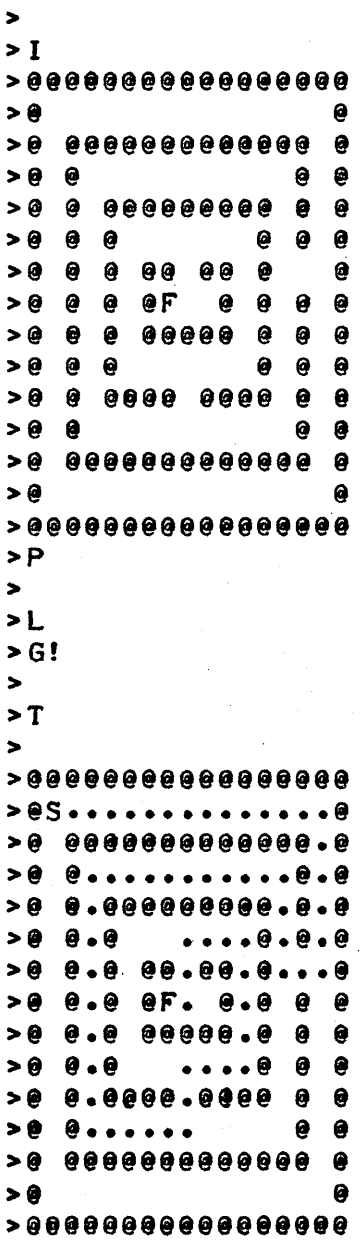

Figure 2

This is a maze in which "one-wall unity" is not present. A blind person who was limited to following his hand as it touched the wall would be doomed to circle infinitely. The present program has successfully solved this problem, although it may not find the shortest route. Thus the program is not restricted to flat mazes, but can solve 3-dimensional mazes, and "climb walls like a spider."

Using a Simple Algorithm

Maze Search was written using the algorithm of a "mouse-cheese" search. The algorithm is a simple one. The program "constructs" a "mouse" whose location within the maze is stored in a register. This "mouse" can "turn" and "sniff". These properties are simulated by specific routines. The mouse sniffs forward one step, and determines the state of the path ahead of him as either (1) cheese; (2) walk space; or (3) non-walk space (wall). These decisions force the mouse to treat his own "footprints" as walls.

If the state of the sniffed square is cheese, the program indicates successful completion, clears up the maze by getting rid of dead-end markers, and returns control to the human operator.

If the state of the square is walk space, the mouse steps in, recording its step, and resniffs.

If the state of the sniffed square is non-walk space (wall), the mouse turns and resniffs. By utilizing a counter, the mouse knows when he has turned around completely. (In **n** dimensions, the algorithmic translation is that the mouse has tested all possible exits.) He therefore backtracks, placing a marker in the dead square to indicate a dead-end trail. An indication that the maze has no solution is determined when the mouse has returned to his starting place, and has found no other place to go; and an appropriate signal is then given to the human operator.

This algorithm is not dependent upon any special property of the maze. This makes the program easily adaptable for any maze in any number of dimensions. In fact, in the assembly language version, all that is necessary to handle **n** dimensions instead of 2 is to change one table of vectors, and one counter.

Maze Construction Within the Computer

A two-dimensional maze, for graphic purposes, can be drawn on graph paper. The separate squares are either filled in to represent wall, or left empty to represent open space. The maze is then stored line by line sequentially in core, each register representing one square of the graph paper. Each register is appropriately coded at the start as either wall or open space. During running, if the program chooses an open-pathway-register to be included as part of the trail, the contents of the appropriate register are altered to indicate a "foot print". In the graphic representation, this means marking the appropriate square with a marker, say, a period. (See Figure 3.)

Also included in memory are two arrays containing locations within the maze. At the end of running the program, the first array consists of a sequential listing of the trail to the "cheese". The second array consists of a list of locations in the maze that the program has decided are "dead ends", or places that lead nowhere. The latter are saved for a routine that will reset these spots to their original value.

The functioning heart of the program (i.e., the part excluding the arrays, but including the instructions that handle them) consists of about 500 instructions in PDP-9 assembly language. Because of its simplicity, it is very "cheap" with respect to CPU time. Improvements to the program to conserve memory would increase the running time, and also would complicate understanding of the program. (The edition of Maze Search which was especially prepared for demonstration purposes is the specific edition being discussed here.)

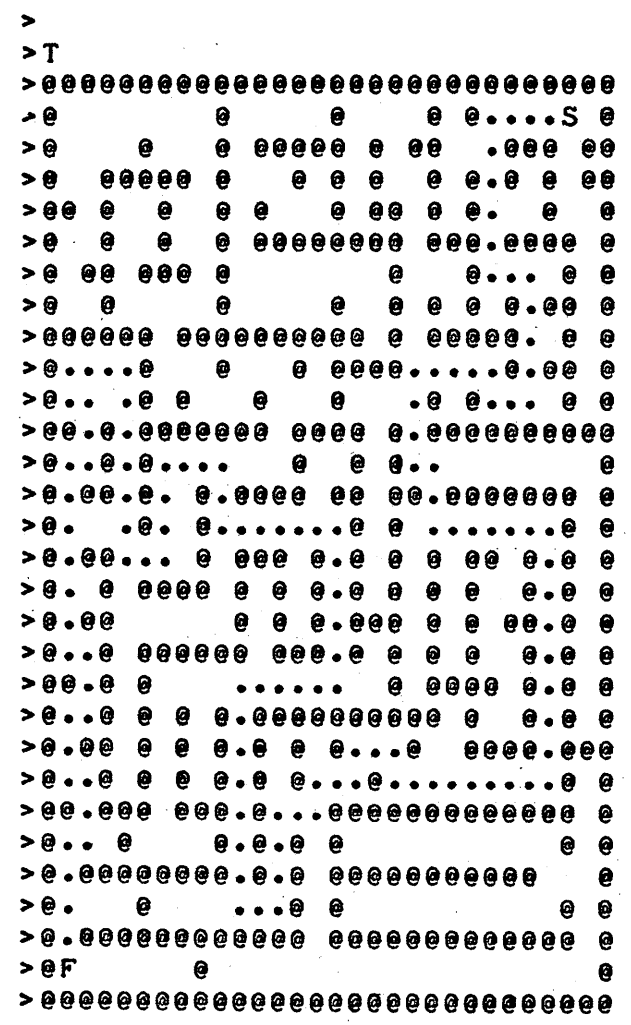

Figure 3

This original maze was constructed by Jon Becker. The program's solution to the maze is shown. Note that the program does not remember the solution to a maze. Each solution requires a restarting of the program.

Program Applications

The Maze Search program is ideally suited to a variety of problems. Let us take the following example of the program's application to circuit-board design and checking. (For this purpose, assume that a slightly modified version of the program is being used.)

Suppose a manufacturer desired to design a rather complex circuit board with no crossovers. He could use the program to design connections between all specified points. The program would take the first pair of points and connect them with a path, choose the next pair of points and connect them, and so on. The program uses only **one** value as a space and any other value as a wall. The circuit board at the start might consist of all open spaces. Then a path of A's for the first pair of points, a path of B's for the second pair, and so on, would be constructed. Similarly, the problems of road layout and contour map generation could be solved.

The figures show sample mazes, including a rather large one adapted from a "Scientific American" book on mathematics. This large maze is an excellent example of a maze constructed without "one wall unity". This particular maze, occupied about half of core for the PDP-9 that it was run on. □

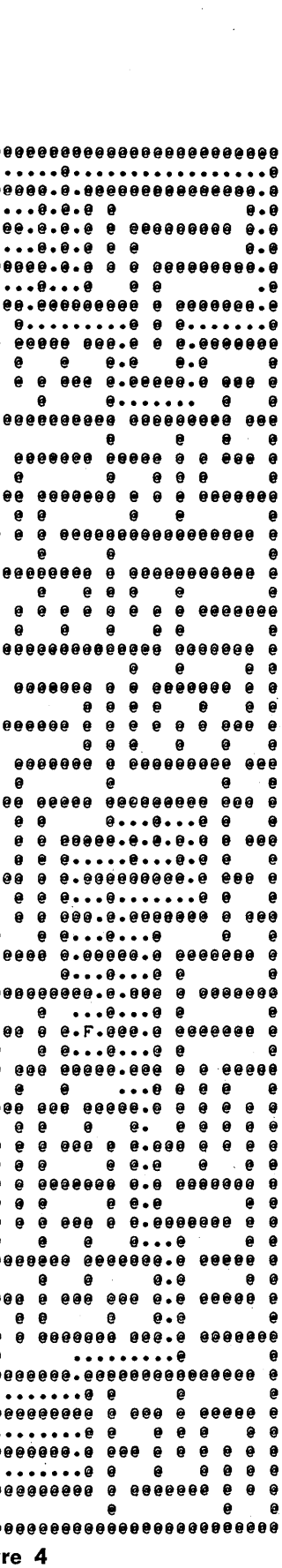

Figure 4

This maze was adapted from a "Scientific American" book on mathematics. (Thanks go to Morris Keesan for typing it.) The maze is not particularly difficult; it merely requires persistence. The CPU time for solving this maze using the Maze Search program was about 1/10th of a second.

COMPANY CONTROL SYSTEMS

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"For big business of today to retain the high levels of management efficiency possible in the smaller concerns, systems of communication, decision-taking and controls must be developed which can operate at something like the speed and efficiency of a single individual."

A glance almost any day at your Business news will reveal a common phenomenon of our times—the takeover or merger. The reasons will vary from one situation to another but the underlying theme is one of rationalisation —the desire to achieve economies of scale.

In terms of increased efficiency and profitability, the results are often disappointing, and the economies one hoped for are inevitably eroded by the enormous difficulties of coping with long communication channels and mastering the overall complexity of the business.

It is quite feasible for one man to manage single-handedly a small manufacturing business, e.g., a fabrication shop, without the aid of any special management techniques. The manager can carry most of the facts and figures of the business in his head—knowing which orders are in progress, which have been placed but on which work has not yet started, and probably many potential future contracts. Should an order be cancelled he can take action immediately to arrange any necessary changes to his production schedule, to ensure efficient utilisation of his labour and machines and cancel the appropriate orders for materials and components.

But the same man managing a shop which is just one unit in a large manufacturing complex will inevitably encounter delays before any change in the order book filters through to him—and even then any decision he takes to alter his own production schedules will amost certainly have repercussions on other units which will usually be impossible for him to determine. Consequently, any major replanning has to be done centrally, and hence inevitably with a lack of precision and the introduction of yet further delays.

For big business of today to retain the high levels of management efficiency possible in the smaller concerns, systems of communication, decision-taking and controls must be developed which can operate at something like the speed and efficiency of a single individual.

A Company Control System

A company control system comprises, basically:

a) The manager—who must ultimately decide which action to take, and when.
b) The various communication systems—which provide the manager with the routine information on which to base decisions.
c) Models of different aspects of the company—which allow the manager to test the likely result of alternative courses of action (valuable in those instances where untried situations are being encountered).
d) Control engineering
e) The computer
f) The experts who provide the software to make the computer work.

The Manager

The characteristic which distinguishes a manager from others in the Company is that his specialty is information, and the arrival at specific decisions based on this information. Three distinct levels of decision taking generally exist within the company structure and hence it is possible to distinguish three distinct levels of Management.

Policy Making

The man normally associated with the first level, policy making, will be a director of the company, whose overall concern whatever his functional responsibilities, is with the long term prospects of the company. His decision will influence, if not totally determine, the course of investment of company resources into new plant, new processes, new products and new markets.

Planning

Second, there is the planning level of decision taking where it is more usual for the decision taker to be a line manager or departmental head whose role in the company is to meet the production targets within the budgets already defined.

Operating

Finally, there is the operating level of decision taking, perhaps involving the foreman, progress chaser or quality control inspector who supervises the day to day operations of the company.

The job of the manager is to make use of the information available to ensure that as far as possible the course of action he initiates is the best one. Much of the information will be quantifiable such as cost, output rates, and machine capacities—but a part of it will be purely qualitative and consist of little more than a collection of impressions. In the case of the policy maker these impressions may be the result of conversations he has had with business colleagues and others about the market for a new product, and in the case of the operating manager they may be his stored-up knowledge of the difficulties he is likely to encounter in manufacturing a particular customer's order.

The quality of the manager's decision will depend to some extent on his ability to make good value judgements, but as the business gets larger and more complex, it will depend to a greater and greater extent on the accuracy and the relevance of the qualified evidence. Thus, the chances of making the right capital investment decision will be increased if he has estimates of the respective risks and payoffs for all sensible alternatives.

Thus, the efficiency and effectiveness of company decision taking at all levels depends almost entirely on the ability to collect and condense facts about the company, its markets and its competitors.

Management Information Systems

Although it appears to be one of the in-topics for business conversation these days, there does seem to be a certain ambiguity as to what really constitutes a management information system. Essentially, it is any organised means for collecting, storing, and processing data that is necessary or helpful in the running of a business. Sales statistics, market research, cost analysis and quality control reports are all examples of the output of organised information systems. A number of popular fallacies and misconceptions about them exist, and it might be useful, at this point, to dispense with them in a few brief words:

"Large amounts of information are needed." This is not generally true—most current systems make the mistake of providing the manager with too much information, too often insufficiently processed.

"The more the data—the better the decision." A reassuring thought, but unfortunately not true. In the same way, it could be urged that an excess of instruments in the cockpit of an aircraft is just as dangerous as too few.

"Give the Manager the information he wants." Many systems are designed on the basis of asking each manager what information he requires. In these circumstances he has little alternative but to list everything he is ever likely to need to cover every situation. Any system designed on this basis will almost certainly be cumbersome and costly, and probably unworkable.

"Given the data, the Manager can then make the right decision." Another long-suffering fallacy. Firstly, the raw data will almost certainly have to be processed, sometimes by sophisticated means if the right conclusions are to be drawn. Secondly, no manager can effectively quantify all the facts and in his own judgement come to a decision. If his judgement is faulty, the results will amost certainly reflect it.

The profitability of any company therefore depends on the effectiveness of its managers and the quality of their decisions. However decisive they are they can only make the right decisions most of the time if they have the right information. Hence the need for a good information system. But a good information system is not one that simply bombards the manager with all the facts and figures; rather it is one that disentangles this information, summarises it, and presents in a quantified form the likely effect of different courses of action.

An information system should therefore provide the manager with the means to answer whichever series of questions are most relevant to his own role within the company, and should be designed to assist him in every way to fulfil that role with the utmost efficiency, thus eliminating at source the possibility of 'faulty' judgements.

The sort of questions encountered might be, for example:

- What would happen to our gross margins if the price of copper were to increase by $100 per ton?
- What would be the effect on our revenue and profitability if we were to discontinue some or all of our small selling and less profitable lines?
- What would be the net effect of doubling the number of sales representatives?
- How would our distribution costs be affected if we were to close down some or all of our depots?

Models

To find such answers, the manager will need more than a data collection system. Models of different aspects of the company's operations are essential to evaluate the various possible outcomes of different courses of action. The input will be the evaluation of the manager's own hypothesis. Models may be physical—i.e., in the case of a factory which delivers to various depots, it would be possible by considering distances and tonnage in relation to a map showing the various depots, to arrive at a number of workable possibilities. In practice, physical models are difficult to construct for all but the simplest situations and inappropriate anyway for our data handling systems. Instead we can conveniently use mathematical models usually consisting of a string of equations in a computer. We feed in the raw data, such as the distances and the tonnages, and the solution of the equations will provide the answers we are looking for.

What a model gives us then is the basic structure for analysing crude data and presenting management not with the final answer to any particular problem, but with the likely cost and effect of any particular course of action under the assumptions implicit in the use of the model.

Already we use unsophisticated models whenever we look at cost data. If we are in the oil industry for example, we may be using quite sophisticated linear programming models to help plan refinery programmes.

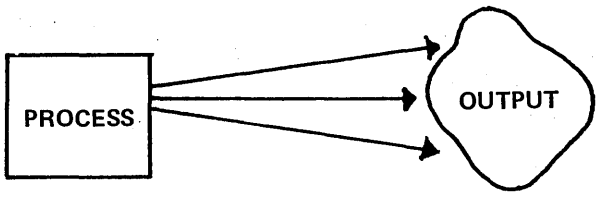
Control Engineering

Control engineering has only recently emerged as an autonomous subject of study, although, in fact, it has been

with us in different forms for a considerable time. Mechanical engineers originally sought ways of controlling the speed of steam engines—since then electrical engineers have developed controls for generators, electronic engineers have developed rocket guidance systems, chemical engineers plant process controls and so on. Although the specific applications have all been different, the theory turns out to be the same and is now generally taught under the subject of control engineering.

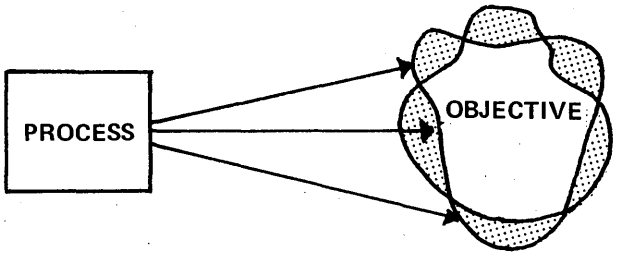
Control is something that we do to systems, but for reasons which are not too difficult to find, we have not yet applied the theory to the management of industrial systems. Let us depart from our general theme for a moment so as to get a better idea of what is implied by the term ***control.***

Since a control system exists primarily to achieve one or more specific objectives, some adequately defined or distinguishable objective must be present before control ideas can be applied. The objective can be simple, e.g. an engine driver may be asked to maintain his speed to 50 m.p.h.



along a particular section of track; the objective here is represented by a single number 50. In the case of a company, however, the objectives may contain statements about the rate of growth of the company, limitations on resources, values of ratios that should be obtained and a whole host of other targets. I propose to represent it simply as a shape.

Due to its complexity, it is necessary to devise some type of process which is capable of producing an output which meets the requirements of the objective.

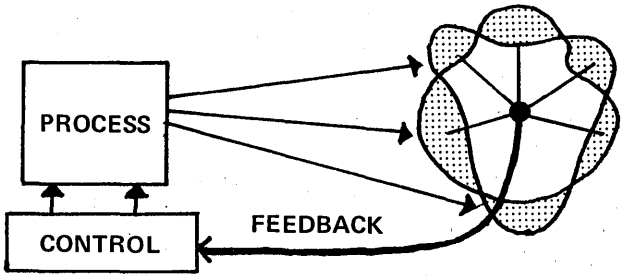


Since in practice the objective is likely to change with time the process must be capable of achieving a range of outputs which corresponds to the entire range of objectives likely to be met in practice.

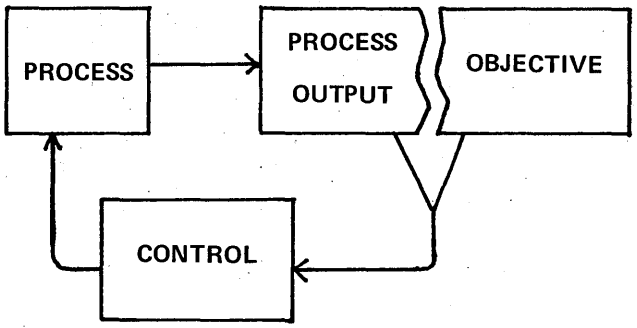
A system for the control of supplies must be capable of adapting to new patterns of demand and of ordering from new suppliers. The process can be thought of in an abstract sense as a device with knobs which can be manipulated to produce different outputs. The shape of the output being determined by the setting of the knobs.

The next stage in building up the control system is to decide what settings of the knobs will produce an output that matches the objectives. Notice that we can never expect to get an exact match—our train will not travel at exactly 50 m.p.h.; what we need to do is to lay down an acceptable error level within which the operation of this system is considered satisfactory.

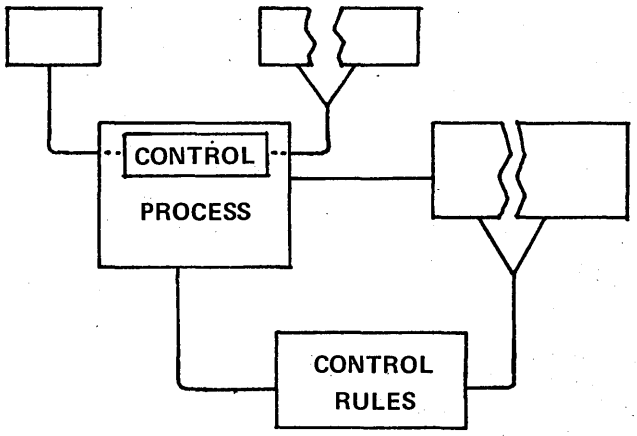
If we now superimpose the objective in our diagram onto the output, the shaded area represents the error or deviation from objective. Now the conceptual diagram we have built is almost complete. We can add a box labelled Control which adjusts the setting of the knobs but it remains to decide how this box itself should operate; this is precisely the job of control engineering. The basic procedure is to form a closed loop by feeding back the size of the measured errors into the box labelled control which will then operate the knobs in such a way as to reduce this error; this procedure is called negative feedback.



As an example, our engine driver will note the divergence of his measured speed from the objective and adjust the throttle in such a way as to reduce this deviation. The point about having a closed loop control is that it does not matter what disturbance occurs, perhaps a slight change in the output such as the engine going up an incline; but the deviation from objective is immediately spotted and the appropriate corrective action taken.



As with the three levels of decision taking within a company there exists in any company a similar hierarchy of control each with its own objective process and control operation. Consider for example the regular weekly purchasing of raw materials. The process involves the writing of a purchase order and its despatch to the supplier. The result or output of this process is the delivery at some time later of the required raw materials to the warehouse; the objective is to maintain specified target levels, and the controls are applied to decide whether fresh buying orders



should be raised. The rules may involve a simple re-ordering of x tons when stocks fall below y tons, or alternatively a more complex calculation.

In practice the true objective in buying raw materials may be to minimise some specific weighting of the risk of production delays and the stock holding costs. This may be derived by a higher order process operated by the Accounts Dept. working on a less frequent cycle, e.g. every month. The process consists of setting the objective and revising the controls; this can be illustrated by combining two loops together.

Gaps in Policy Making

For completeness, the diagram could be extended to allow a third loop to take account of the need to update and revise the control rule selection procedures at regular though large time intervals. The three loops correspond approximately to the three arbitrary divisions we made earlier, namely policy making, planning, and operations.

It is in the first two areas, policy making and planning, that gaps are most apparent in the majority of company organisations. All too often the functions of planning (the medium term loop) are performed by appointing a buyer who is responsible for buying. This man will work with no adequate objective and consequently no measurement of his performance can be made, and therefore, he has little chance of improving that performance. Over the years he will evolve a mixture of judgement, experience and rules of thumb which will enable him to do the job adequately. How well the job could be done with optimum control rules neither he nor anybody else knows.

The long-term or policy making control loop is often even more haphazard. No regular surveillance of buying performance will be made at all. Occasionally, when capital becomes scarce, the Board may turn its attention to money tied up in stocks; the result may be a directive to the buyer to reduce his stocks. This is unsatisfactory. It is much better to set up a regular procedure under which, each year, a calculation would be made of the market movements and production fluctuation. This idea of performance would then be compared with the actual achievement of the buyer's department and a limit for divergence fixed, above which action by higher management would be required.

We then conclude that it can be most useful to formalise the operations of the control systems active within the company, both from the point of view of the internal consistency of the individual system and from the point of view of the relationship between systems: "planning the planning". As we go further up the pyramid we still want to be thinking in control system terms, but more judgement is needed; we are concerned more and more with unquantifiable information about the world outside, rather than the precise measurements that occur lower down the pyramid.

The Computer

The computer is important in company control systems because properly handled it compensates for deficiencies in running a large complex business. Its ability to store quantities of information, retrieve particular items rapidly, carry out repeatedly a series of calculations on the data with unfailing accuracy and then push out the results over great distances—all virtually instantaneously—underlines the significance of its role in modern-day management. Thus in many respects, it can substitute for the working of our manager operating his own small manufacturing business. When this does not accord with one's own experience, it is less likely to be the computer that is at fault, than the way it is being used. The simple truth is that our ability to build ultra fast and reliable computing equipment at increasingly low cost has far outstepped our ability to use it. The main reason for this can be found in our reluctance to invest money in intangibles. While willing to pay the top price for the best and most suitable machine, managements tend to look for economies in staffing the department which is to make use of this same machine, due possibly to an inborn reluctance to accept the view that people's abilities vary. This leads us naturally to the last ingredient, specialists and experts.

Specialists and Experts

To achieve the goal of an integrated company control system which will reduce the problems of running a large and complex business organisation to that of running a one-man business, we need to make use of specialists wisely. These are a relatively new phenomenon on the management scene. They are the systems analysts, the programmers, the operations research men, the control engineers, and other management scientists. Although usually young and bright, because of their relative inexperience in matters of management the tendency is to distrust them, not least when they appear to differ amongst themselves on fundamental issues.

The problem of selecting and deriving the full potential from people when we cannot hope to understand in any depth their particular specialities is not unlike choosing a medical consultant. We may initially select him on the basis of recommendation; but we are unlikely to follow his advice unless his explanation of how he arrived at a particular diagnosis and a recommended course of treatment appears logical. Even then if he fails to meet his objective and alleviate our complaints, we will almost certainly seek alternative advice.

The same considerations surely must apply when recruiting specialist staff for the company. Having ascertained the quality of their reputation, a few simple human judgements about them as individuals should be reached, e.g., are they able to talk intelligently about the manager's problems? Then, as their work on the project progresses, their solutions to the problems should be studied from a standpoint of practicality. Any devious attempts to blind the issues with a combination of scientific and technical jargon should be firmly resisted. Finally, the chosen experts must be judged on their performance: how do the results line up with the original targets?

These are the ingredients essential to the construction of a comprehensive company control system. The plan for putting it together will vary from one company to another, depending on its size, resources and position in relation to such a system. As it progresses—and it may take between 5 and 10 years to completely install and learn to operate a company control system—numerous side benefits will be found, systems will be analysed and uneconomic company operations will be unearthed. The ultimate benefits, however, will only be achieved when most of the important sets of control loops have been implemented. Then one should see pay-offs which in money terms alone will more than compensate for the investment made and the risks incurred.

Relatively few organisations have yet begun to think in terms of complete company control systems. They simply think about buying computers. Companies which have already burnt their fingers with computers are now realising that the machine is the last thing to think about. The important thinking concerns organisation structure, objectives, decision making and management information. If management cannot do the thinking itself, no computer will be able to do it for them. □

A Two-Day School Entitled

COMPUTER PIONEERS WHO MADE THE PAST AND WILL SHAPE THE FUTURE

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Wednesday and Thursday, JULY 8 AND 9, 1970

HOURS: 8:30 a. m. (promptly) to 5:00 p. m.

Chairman: Richard H. Williams, Managing Director
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- J. PRESPER ECKERT, co-inventor of ENIAC and computer pioneer in the United States, now Vice President and Technical Advisor to the President of the Univac Division, Sperry Rand Corporation
- PROFESSOR G. C. EDWARDS, British computer pioneer, now Director of the Computer Laboratory of Manchester University
- DR. GRACE MURRAY HOPPER, Comdr. USNR, originator of computer software, Director of Navy Programming Languages Division, "1969 Computer Man of the Year"
- B. J. A. HARGREAVES, formerly IBM Marketing Executive and Communications Manager, now Director of Public Affairs, IBM United Kingdom Ltd.
- F. FILIPPAZZI, Italian computer pioneer, now Manager of the Electronic Technology Design Division, General Electric Information Systems Italia
- PROFESSOR KONRAD ZUSE, German computer pioneer and founder of Zuse KG, now Siemens AG
- BRUNO LeCLERC, co-inventor of the Gamma computer, Vice President, Compagnie Bull-General Electric
- T. R. THOMPSON, pioneer of the first British commercial computer LEO, later Marketing Director of English Electric Leo Ltd. (now ICL), now Computer Adviser to Shell Mex and B. P. Ltd.
- EDMUND C. BERKELEY, formerly Chief Research Consultant, Prudential Insurance Company of America, now Editor and Publisher, Computers and Automation

DR. Z. L. RABINOVITCH, inventor of a Russian computer, now Chief of the Laboratory Institute of Cybernetics of the Ukrainian Academy of Sciences, has also been invited, and it is hoped that he will be able to attend.

Llandudno is a beautiful seaside holiday resort situated on the borders of the Snowdonia National Park, North Wales. All types of accommodations are available, both in Llandudno and the neighboring district. Those attending the school should make their own arrangements and reservations regarding meals and accommodations. Details may be obtained from the Publicity Officer, Town Hall, Llandudno, North Wales, Great Britain.

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"The House is on Fire"

THE PROFESSION OF INFORMATION ENGINEER AND HIS BRIDGES TO SOCIETY

Computers and Automation believes that the profession of information engineer includes not only competence in handling information using computers and other means, but also a broad responsibility, in a professional and engineering sense, for:

- the reliability and social significance of pertinent input data;
- the social value of the output results.

In the same way, a bridge engineer takes a professional responsibility for the reliability and significance of the data he uses, and the safety and efficiency of the bridge he builds, for human beings to risk their lives on.

Accordingly, this department of **Computers and Automation** will publish from time to time, articles and other information related to socially useful input and output of data systems in a broad sense. To this end we shall seek to publish here what is unsettling, disturbing, critical—but productive of thought and an improved and safer "house" for all humanity, an earth in which our children and later generations may have a future, instead of facing extinction.

The professional information engineer needs to relate his engineering to the most important and most serious problems in the world today: war, nuclear weapons, pollution, the population explosion, and many more.

The article which follows is based on an address by Dr. Kingman Brewster, Jr., President of Yale University, delivered at the fall commencement exercises at Michigan State University, East Lansing, Mich., in December, 1969. We believe this article provides some significant and provocative insights.

THE "INVOLUNTARY CAMPUS" AND THE "MANIPULATED SOCIETY"

Kingman Brewster, Jr., President
Yale University
206 Elm St.
New Haven, Conn. 06520

"The ultimate escape from the private government of the large corporation used to be your ability to take your trade elsewhere — now often there are no elsewheres."

I want to talk about two things which I think are among the roots of what is politely called campus "tension", or even more delicately called student "unrest."

The first thing has to do with the circumstance of most colleges—I would call it the "involuntary campus."

The second thing has to do with the circumstance of the nation—I would call it the "manipulated society."

If we do not succeed in achieving a campus which is more voluntary than most of ours now are; if we do not restore a widespread faith in the openness of society, then I think our present troubles will seem as nothing compared to what lies ahead. Optimism is one of the requirements of my calling, however, so I would also like to share with you some wishful thoughts about how we might achieve both a more voluntary campus and a more open society.

My elders and betters, my peers and contemporaries are backed to the wall, then driven up the wall, eventually driven up and over it, by students who are often fundamentally anti-intellectual; who are impatient with learning and research; who think there are social ends other than the advancement of learning which a university should serve; and who see no reason why the majority vote of students should not dictate what those ends are and how they should be pursued.

Students Feel Trapped

It was an SDS member at Berkeley who first woke me up to the fact that the reason so many seek to divert the university from its primary mission is because so many are there involuntarily, not because they want to be there. "Don't give me that stuff about how I'm here to learn," he said, "I'm here because I have to be; so if I have to be here against my will, why shouldn't I have a say in running the place?"

He might have been talking about the draft. He might have been referring to parental insistence that he go to college. He might have meant that the university seems to be an indispensable hiring-hall for those who would escape the menial levels of drudgery.

Whatever he meant, it was clear that his determination to take the place over was motivated in large part by the sense that he was trapped in it by forces beyond his own choice or control. On the whole, this reaction is not without noble precedent. It is in areas where freedom of choice, including freedom to escape, is not possible that we are most insistent that self-determination shall be gained collectively, by democratic participation or representation.

The All-Voluntary Campus

I am not at all sure I favor the all-volunteer army, but I am very sure I do favor the all-volunteer campus. It is not primarily because I'm sorry for the undisciplined student who finds himself unable to buckle down and make the most of his good fortune. It is, rather, because a university, too many of whose members feel captive, is corrupted, distracted, and fouled for all its members. Higher learning cannot work if it is involuntary. And the judgments which universities and their faculties must make about degrees and about appointments cannot be made by a process which allows the judged to outvote their judges.

The most dramatic distortion of the motivation for going to college is, of course, the result of the draft. I can no longer blame a young man for accepting the draft sanctuary of academia as an alternative to the risk of killing and dying in a war nobody is enthusiastic about. You might as well blame a man of wealth for buying municipal bonds. But I can blame a conscription system which permits the obligation of service to depend on whether a boy is on campus or off at the age of nineteen. No campus can be all-voluntary as long as the draft herds thousands into the academic corral in the hope that by the time they graduate the dreadful war will be over.

The Pressure To Conform

But even if the shadow of the draft in an unpopular war were lifted, there would be powerfully coercive pressures driving young men and women to universities in a hang-dog, involuntary mood. Parents and schools are likely to think that somehow, something is wrong with the son or the daughter who doesn't want to go right on to college after high school, or who doesn't want to go through college in four consecutive years. Now some of this is economic—the desire to get them off the family's back, to put it bluntly. But most of it is pure conformity to the pace of the conventional escalators of success. Parental concern is whetted, of course, by the fear that once off the escalator the son or daughter might never get back on. The dreadful word "drop-out"—quite appropriately pejorative at the elementary and high-school level—has been allowed to frustrate sensible plans for splicing academic and non-academic experience. It makes it harder to think of taking a year off for work or social action involvement between school and college, or in the middle of college.

It is the excessive lock-step, continuity of learning, from age five to twenty-five, which stultifies the motivation of some of the most gifted students. Easier escape and easier re-entry would do much to make the campus a voluntary community once again.

"Credentialitis"

Then there is the growing notion that to be really accomplished it is necessary to have an advanced degree, preferably a doctorate. (Here I speak with diffidence, for all my doctorates are literally as well as figuratively "unearned.") "Credentialitis" is one of the principal diseases which afflicts university life.

Here I do place the blame on the employers, professional, semi-professional, business, financial, and governmental. Its most absurd extreme is the decision of the great Harvard Law School to follow the lesser sheepskins and allow me to convert my LL.B. to a Doctorate by mail application and the payment of an appropriate fee! No doubt there are corporations, state governments as well as the federal government, which will automatically reward this "higher degree" with a higher job-rating, and several thousand dollars of higher salary. The package, not the product, seems to be what counts.

Nothing would be healthier for the voluntary campus atmosphere than for prestigious employers to make a deal with universities whereby a talented college senior could count on returning to the campus when he needed it, any time within ten years after graduation. Then he could go to work right after college. He could be confident that if more specialized training would help his advancement, his employer would be able to send him back to study. Even better, he would know that if he decided he did not like the field he was working in, he could go back to the university and equip himself for another specialty or profession.

A person should not be made to feel that he must get all his formal education in the first twenty odd years of his life. Nor should he be made to feel that once he picks a line of work he has forever forfeited a chance to change his mind and tool up for some other career.

There must be more chance to recycle back through the university, if we are to retain the sense of continuous freedom of career choice. If everyone must choose his rut, and feel that by graduation he is beyond the point of no return, then we will have lost much of that sense of freedom which is essential to the voluntary society. The university may be our best hope of retaining this sense of having a chance for a second start.

It would be far better for the campus atmosphere and the academic ethic if the university were a resource for men and women of all ages, if, but only if, they really want what it has to offer.

Far better to have the second starter, if he is a self-starter, than to have students carried through by a tide of career conformity, propelled by someone else's expectation rather than by their own motivation. Of course this ideal can never be completely achieved, but I submit that the approach to the ideal of the all-volunteer campus is worthy of much more attention, energy, and ingenuity than it has received.

The "Manipulated Society"

My second concern, what I would call the "manipulated society" is, of course, a larger order. It may point to a more deeply-rooted malaise.

The open society presupposed widely dispersed centers of initiative—economic initiative, political initiative, opinion initiative. No one was supposed to be wholly trapped in any political community, or dependent upon a single political organization. No one was supposed to be subject to just one source of news or confined to a single point of view.

Of course, there were always pockets of economic power and political power and opinion power which were hard to escape. The genius of American society, however, was the widespread confidence that by and large the person with a new and better idea could break in or break out. The idea might be a way of meeting some economic need; a way of satisfying a political aspiration; or a way of thinking about things.

Best of all was a sense that you could move on and start again. If you were persecuted by the crown, you moved to the colonies. If you were hemmed in by the aristocratic system of the east coast, you moved west. There was what Margaret Mead called in her wartime book about American values, "And Keep Your Powder Dry", a widespread sense that success depended more on effort than it did on inherited status or political favor.

The impertinence of a Mr. Dooley, a Mark Twain, a Will Rogers was perhaps the best expression of a society of

independent, self-determined men, who relied more on rivalry tempered by mutual good humor and good will than on the patronage or the patrimony of a paternalistic government.

Indeed, abusive government was the enemy. There was a healthy sense that the greater the power, the greater the chance of its abuse. Efficiency, speed, order were all sacrificed to assure the citizens' protection against abusive authority or corrupt power. Fairness was more important than dispatch.

That fight, the fight for fairness, for the presumption of innocence, for the risk of freedom of unpopular thought and expression, is still very much our fight.

But I have confidence in the ability of the citizenry to call a halt to public persecution. Even if our government officials do become afraid of freedom, I think that in the country as a whole and among the younger citizenry in particular there is a zest for the contest of free men and free ideas.

Our problem is more subtle. It is not the problem of a latter day George the Third; it is not the fear of official regimentation, so much as it is a sense that the society is more manipulated than it is free; more closed than it is open.

Concentration of Economic Power

In economic terms it speaks of the concentration of economic power. Affluence may be one dividend of mass production and huge combinations of capital; but the loss of choice is another result. And the loss of choice is not just an economic concern. It means that more suppliers, more dealers become dependent satellites of fewer and fewer large conglomerates. The ultimate escape from the private government of the large corporation used to be your ability to take your trade elsewhere—now often there are no elsewheres. Frequently rivalry has shifted from useful lowering of cost and price to larger and larger sales expenses, inflating the role of the huckster. Madison Avenue, not Wall Street, has become the control headquarters.

Concentration of "Idea" Power

In terms of the opinion industry and the so-called market place of ideas, concentration of power has to some extent been ordained by a technology which requires the rationing of limited air waves. It has been compounded, though, by the privilege of private restrictive networking in the broadcast media, and compounded by fantastic labor costs and resistance to labor saving devices in the printed media.

The survival of the strongest if not the fittest newspapers has produced local and regional journalistic monopolies. The technology of news gathering and the cost of efficient nationwide and international magazine distribution has left little room for significant new entrants in national weekly journalism.

From Newport palace to Appalachian hovel, into every parlor come the three networks; each competing for the same advertisers, with roughly the same estimate of what the market most wants. All are equally fearful of offending either the private or the public powers that be. Each strives for the dramatic and the sensational splash, even if it means artificially creating a pot party at Northwestern in order to film it as a sample of student life; or hiring students to race motorcycles across the Berkeley Campus in order to create the desired atmosphere of student mayhem.

Politics

So we come to politics, the last best hope of the citizen for control of the public destiny. This market too is increasingly dominated by the concentration of self-perpetuating power. Running for office (or being run for office) has become a millionaire's game as the cost of campaigning has soared to unbelievable heights. John Lindsay spent more than two million reported dollars to run for Mayor of New York City! No one can even think of running for Senator in a major state, let alone for President of the United States, unless he can command millions for television time.

Now this is not a saga of wicked men. Those who fashion mergers are not wicked. Those who preside over, or serve, the networks are not wicked. Those who run for office or who finance candidates are not wicked. Each of them is simply making the most of the opportunity which modern technology and management systems offer for the success of his stockholders, his views, his partisan organization.

The wickedness is that we do nothing about the undue concentration of power. Like Mr. Agnew we blame the men and do nothing about the system which makes their increasingly exclusive power possible. Yet if we do nothing, ours will soon become a closed, manipulated society; no longer an open, free one.

The concentration of economic power, opinion power, and political power creates a sort of closed loop. Politicians must raise money from corporations in order to pay the networks the enormous cost of television time. Corporate advertisers call the network tune. And the networks must curry favor with the successful politicians to assure their franchise.

The open society seems to be closing—not by conspiracy, but by the mutual dependence of a very small group of advertisers, media, and politicians.

It is increasingly difficult to keep alive a burning faith in the competition of ideas in the free market place, the competition of candidates in the free ballot box, or the competition of producers guided by Adam Smith's unseen hand of Providence.

Prying Open a Closing Society

I am convinced that there are ways to pry open the closing society if only we would put our minds and energies to it.

Legal requirements and tax incentives for economic deconcentration are not beyond our capacity. If business wants to remain free to manage itself, it should realize that the burden of persuasion should be put on bigness, especially bigness by merger. Perhaps the presumption against bigness was best put by Louis Brandeis when he was an attorney prosecuting the railroads, when he remarked to the judge: "Your honor, if the good Lord meant us to have such large organizations, he would have given us the brains to run them."

Politics need not be the monopoly of the rich or their hirelings, if only we would insist that those who enjoy the public franchise of television and radio waves shall give candidates ample prime time at nominal cost during campaigns. Perhaps we could require a candidate's deposit for this privilege refundable if he achieved a decent minimum of votes, much as the British do for the privilege of a place on the ballot.

The opinion industry itself could be loosened up by the introduction of variety of ownership interest. We could reverse the trend toward self-perpetuation by defeating the

(Please turn to page 54)

THE SYMBOLS OF THE KHAN

Anonymous

"At a time when Europe was a chaos of disorganized city-states, the Great Khan controlled an empire of a million square miles with his unique Apparatus of Decision — a universal written language, though spoken differently everywhere."

"Now I will begin telling you . . . of all the wondrous things and all the mighty marvels concerning the great Kublai Khan . . . You shall be convinced that he is the greatest Lord that now lives or that has ever lived.

"And I will tell you why." —Marco Polo

► With these words, Marco Polo began his "Travels," a book which today, unfortunately, is somewhat regarded as a sort of romantic, not-quite-real tall tale, suitable for Hollywood epics and juvenile novels.

But Marco Polo and his travels were real . . . he journeyed across more of the world than had been seen by any man who had ever lived. He changed the history of the western world as profoundly as did Columbus . . . two centuries later. Indeed, the only reason for Columbus' expedition was to find a new route to the very lands which Marco Polo had described in his book. It is truly a book of "wondrous things," and woven through its pages like a strand of gleaming Chinese silk runs the thread of genius of the Lord of Lords, Kublai Khan . . . and the remarkable Apparatus of Decision with which he bound in unity Earth's greatest empire.

Marco Polo was a youth of 17 on that luminous summer day in the year 1271 when he set out from the shimmering wonder of Venice. His journey took more than three years of severe hardships to complete. But—perhaps because of his youthful vigor—he survived the illness, the violence of the extremes of climate, and the constant pushing eastward across the entire Asian continent. Partly by ship, but mostly on camel and horseback, and on foot he made his way more than 5000 miles through the waterless deserts, the endless plains, and the awesome Himalayas.

(Reprinted with permission from **Input for Modern Management,** Third Quarter 1969, published by Sperry Rand Corp., Univac Div., 1290 Ave. of the Americas, New York, N. Y. 10019.)

Finally, forty days from his goal, an escort from the Great Khan met him and guided him in regal fashion to Shangtu, the sumptuous summer residence of the Emperor.

Despite having come from one of Europe's most glittering cities, Marco was staggered by the magnificence of the Khan's court . . . and his description of the Royal Pavilion inspired Coleridge to write his famous poem (. . . calling Shangtu, "Xanadu"):

"In Xanadu did Kublai Khan
A stately pleasure-dome decree:
Where Alph, the sacred river, ran
Through caverns measureless to man
Down to a sunless sea.
So twice five miles of fertile ground
With walls and towers were girdled round:
And here were gardens bright with sinuous rills
Where blossom'd many an incense-bearing tree;
And here were forests ancient as the hills,
And folding sunny spots of greenery."

The friendliness of Marco's reception at this "pleasure-dome" was not as strange as it might appear: the power of Kublai Khan was so immense he could afford to be gracious to strangers, and Kublai was fully as curious to learn about Marco's world as Marco was to learn about his.

The first Spanish edition of Marco Polo's book contained this woodcut of the author.

Portraits of the Great Khan show him to be stocky and undistinguished in appearance. But Marco described him in glowing terms:

"The Great Khan has a fine figure, neither tall nor short, but of middle height. He has the proper amount of flesh, and is exceedingly well-shaped in all his limbs. His countenance is white and red, like a rose . . . He is the wisest man, and most gifted in every way . . . that ever sprang from the race."

Whether "like a rose" or middle-aged Mongol, Kublai Khan was absolute sovereign of a greater population than had ever acknowledged one man's supremacy. He demanded, and received, extraordinary pomp and respect. Anyone coming within half a mile of the Royal Presence was obliged to lower his voice and assume a humble attitude. The Emperor was robed in garments spun of pure gold, and he drank of the milk of ten-thousand snow-white mares. He had forty-seven sons and 12,000 personal guards. And whenever he raised a cup of wine to his lips, seven Kings and a dozen Princes fell to their knees.

Yet Marco Polo became his trusted friend and, after spending the summer months at Shangtu, he accompanied the court when it returned to the capital at Khanbalik ("City of the Great Khan"), present-day Peking.

The Capital was probably the largest city in the world, twenty-four miles in circumference, and laid out in a perfect square. Walls forty-five feet high encircled it and within them dwelt a vast population. The city was a microcosmos of China itself: enormous, rich and populous, and walled. And one thing more: it was polyglot. Men from north China and men from the south, and east and west, *spoke entirely different tongues.*

But this complex tapestry was held together by a web of constant order and understanding . . . the Apparatus of Decision of the Khan, *a universal written language.* Every written word-symbol had precisely the same *meaning* in every language throughout China. Unintelligible to each other when *speaking,* men from different regions shared complete understanding when *reading.*

At a time when Europe was a chaos of disorganized city-states, the Great Khan controlled an empire of a million square miles—the largest the world had ever known—with *writing!*

Marco was stunned:

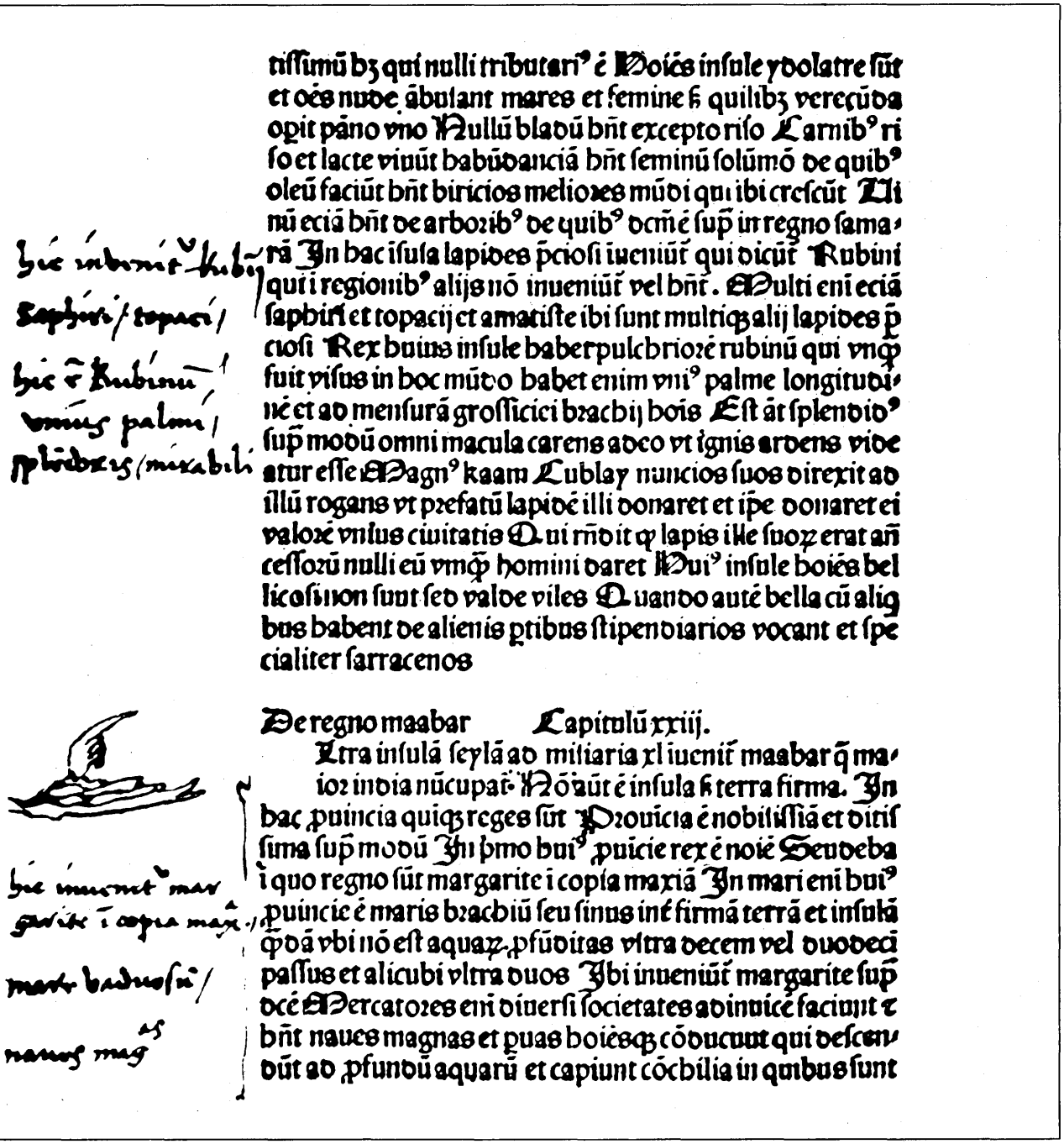
"It is so wonderful a System as it is scarcely possible to describe."

Written symbols of thought raced over the endless landscape, carried by Royal Messengers who travelled 250 miles in a single day, riding fresh horses from the 200,000 the Khan provided, to bring the ever-changing, ever-expanding knowledge of Empire to the Lord of Lords.

In time, Marco himself became an emissary for the Khan, and the Emperor hung a golden tablet upon his breast . . . a "golden passport" . . . emblazoned with the written words *every* man understood:

"Honor me as thou would'st honor the Great Khan himself. Give me fresh horses and let me pass . . . for I am on the business of the Khan."

With far greater ease than a modern man can tour Europe (thanks to his "golden passport") Marco travelled throughout the vastness of China, taking careful notes of the wonders he saw . . . and reporting back to Kublai Khan. And always, Marco was astounded by the incredible wealth of China. It was a wealth not to be found solely in the coffers of the



tissimũ bz qui nulli tributari⁹ ẽ Boiés insule ydolatre sũt et oés nude ãbulant mares et femine ⁊ quilibz verecũda opit pãno vno Nullũ bladũ bñt excepto riso Carnib⁹ ri so et lacte viuũt babũdanciã bñt seminũ solũmõ de quib⁹ oleũ faciũt bñt biricios melioꝛes mũdi qui ibi crescũt Ui nũ eciã bñt de arboꝛib⁹ de quib⁹ dcm ẽ supᵖ in regno sama rã In hac isula lapides ꝑcios iueniũt qui dicũt Rubini qui i regionib⁹ alijs nõ inueniũt vel bñt. Multi eni eciã sapbiri et topacij et amatiste ibi sunt multiqz alij lapides ꝑ cios Rex huius insule baberpulcbrioꝛe rubinũ qui vnᵖ fuit visus in boc mũdo babet enim vn⁹ palme longitudi nẽ et ad mensurã grossicici brachij bois Est ãt splendid⁹ supᵖ modũ omni macula carens adco vt ignis ardens vide atur esse Magn⁹ kaam Cublay nuncios suos direxit ad illũ rogans vt prefatũ lapidẽ illi donaret et ipe donaret ei valoꝛẽ vnius ciuitatis Qui rñdit q lapis ille suoꝛ erat añ cessoꝛũ nulli eũ vmᵖ homini daret Hui⁹ insule boiés bel licosi non sunt sed valde viles Quando autẽ bella cũ alig bus babent de alienis ꝑtibus stipendiarios vocant et spe cialiter sarracenos

De regno maabar Capitulũ xxiij.

Ltra insulã seylã ad miliaria xl iueniť maabar q̃ ma ioꝛ india nũcupať Nõ dũt ẽ insula ⁊ terra firma. In hac ꝓuincia quiqz reges sũt Prouicia ẽ nobilissiã et ditis sima supᵖ modũ In ꝓmo hui⁹ ꝓuicie rex ẽ noiẽ Sendeba i quo regno sũt margarite i copia maxiã In mari eni hui⁹ ꝓuincie ẽ maris bracbiũ seu sinus iné firmã terrã et insulã q̃dã vbi nõ est aquaꝝ ꝓfũditas vltra decem vel duodeci passus et alicubi vltra duos Ybi inueniũť margarite supᵖ dcẽ Mercatoꝛes eñ diuersi societates adinuicẽ faciunt ⁊ bñt naues magnas et quas boiesqz cõducunt qui descen dũt ad ꝓfundũ aquarũ et capiunt cõchilia in quibus sunt

This is a page from Christopher Columbus' copy of Marco Polo's "Travels". Notations in the margin are by Columbus.

Khan, however; it lay in the fabulous commerce of his empire. Vast cities—linked by broad paved roads and networks of canals—traded in all the rich and varied wares the world's most advanced culture could need . . . and produce. Supporting the web of commerce was an invention that Marco termed "miraculous" . . . the world's first *paper money.* The small squares of beaten mulberry-bark were printed with the universally understood written symbols of the Khan's Apparatus of Decision . . . and backed by his almost limitless golden treasure.

Despite Marco's enchantment with paper currency, one feature escaped his notice: the fact that it was *printed.* It would be almost 200 years before Europe would discover printing. (Fittingly, one of the first books printed in Europe would be Marco's own "Travels.")

After nearly 20 years in the court of Kublai Khan, Marco Polo returned to Venice to astound the western world with his tales of China . . . and the Lord of Lords. Marco Polo inspired men of all Ages to look beyond their own petty lives . . . to search for wonders in the world and its peoples. He bequeathed to us all the spirit of exploration. His manuscript —circulating throughout Europe—became the bright lamp which erased the shadows of the Dark Ages, and ushered in the Renaissance.

And yet, on that chill January day in 1324, as he lay dying, Marco Polo—who had seen and described more of the world and its wonders than any man who had ever lived—whispered these last words to his priest:

"Alas . . . I did not tell half of what I saw, for I feared I would not be believed."

WORLDWIDE

REPORT FROM GREAT BRITAIN

The "Little Neddy" Reports

With hindsight, in a year or two, we may single out as the main EDP event in Britain during 1969 the closely-studied report of the Electronics Group of the National Economic Development Council, familiarly known as the "Little Neddy for Electronics".

This body, in a study which took about a year to carry out, explored every nook and cranny of the industry—including mainstream computer operations in Britain. Its conclusions could be interpreted as ominous for International Computers, though they almost certainly were not intended to be so. They indicated quite clearly that in spite of the government backing for this group, the task of catching up with the immense American lead was probably too much for ICL.

The Little Neddy, which reports to the NEDC under Harold Wilson, is composed of representatives of industry, government bodies, the trade unions and the management associations of the electronics industry. Its conclusions are less likely to reflect bias than those of any other organization. When it says that the present state of the domestic EDP market taken by imported goods (38 per cent) will rise rapidly to a peak of 50 per cent in 1971, falling off slightly to about 45 per cent in 1972, there is certainly cause for alarm. It identifies the main influence in this trend as the large influx of computer peripherals needed for major projects, such as the banks' automation plans.

The report says that the Burroughs and NCR plant now being expanded and/or built in Scotland will contribute to a reversal of the trend, but it does not identify what portion of equipment of this type assembled in Britain at this moment is actually imported in a knocked-down form from the U.S. This is nonetheless an important consideration.

It suggests that American manufacturers of important peripheral equipment—presumably OCR, key-to-tape and other converters, and terminals of various kinds—should be invited to come and set up manufacturing operations in Britain. This can only be effective in the medium term; short-term remedies do not exist and the damage was done four years ago when three smallish British computer companies were allowed to go on squabbling for half the UK market. Cut-throat competition kept all three too poor to develop a good peripheral range. Most of their needs were met by agreements with a number of U.S. companies—Potter, Analex, Bryant, CDC—a dangerous arrangement because of the rapidly changing structure of the industry in America as a result of mergers and take-over bids.

When the reshuffle which produced ICL had been completed, the latter's management found itself saddled with an intricate web of pacts concluded by its constituents, and these webs have only just been unravelled.

To make matters worse, there is no real indigenous peripherals industry—Plessey tried but scored relatively little success with a powerful tape drive and an incremental recorder, was more lucky with a cassette type system for small computers, but never came anywhere near being a "supplier of peripherals".

Plessey's latest venture in this area may nevertheless be a world winner. Made by the Automation Group of Plessey at Poole, Dorset, it is an optional character reader with an all solid state reading head. The readers are an array of photosensors formed on the same large-scale integrated circuit chip as the control and logic circuits. The chip contains around 2,400 components. If the company's own circuit and microelectronics specialists can make them with a reasonable yield, the product will begin to look very interesting to the DP operator, if only because it can be expected to require little or no servicing. This is far more than can be said for the complex optical systems now in use.

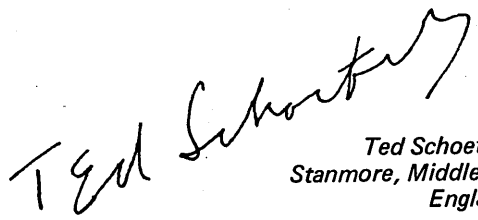
But one device does not solve ICL's peripheral problems, particularly when the latter has been working on its own OCR units for about seven years. It has developed a fairly wide range of its own, but remains dependent for important disc technology on America, and on CDC in particular.

Impatience With COCOM

A thought for the New Year is that UK manufacturers are becoming increasingly impatient with COCOM, the strategic embargo system operated by NATO but entirely—so some manufacturers say—under the thumb of the U.S. State Department.

COCOM, designed primarily to prevent "strategic goods" from reaching the Eastern Bloc countries, is being used to slow down West European penetration of the budding East European markets for high technology content equipment, it is asserted. The process is simple. A proposal from, say, a British maker goes up to the COCOM Council. The American delegation does not oppose it; simply takes no action. Meanwhile, and particularly where licensing is concerned, the equivalent company in the U.S. is given a breathing space in which to "bend" COCOM regulations, it is also asserted.

What the truth is of these assertions I cannot say. There is no doubt, however, that all the big U.S. EDP groups have set up campaign headquarters around the East European border. IBM is reputed to have moved in as many as 300 shock troops, and not just because they like Viennese pastry.



Ted Schoeters
Stanmore, Middlesex
England

C·a JOBS AND CAREERS IN DATA PROCESSING

Computers Offer New Opportunities for the Blind

There are currently over 300 blind computer programmers in the United States, and more than a hundred others in training in the several programming schools offering instruction for the blind. Because intelligence, and not visual acuity, is the chief requirement for developing the ability to program, visually handicapped persons, who in other industries may be confined to menial jobs, are slowly coming to be recognized as an important resource to help relieve the programmer shortage in the computer industry.

Four examples of the value of this resource can be found at the Los Angeles County Data Processing Center in the persons of Roger Levine, Richard Villa, Gene Westra, and Don Rauen. All four men are blind; all four are graduates of an extensive training program conducted yearly by System Development Corp., Santa Monica, Calif. And all four are good programmers. Their training, sponsored by the Department of Vocational Rehabilitation, included all generations of hardware and all levels of programming languages.

The basic tool of these blind programmers is the Perkins Brailler. This is a small, simple machine which they use to Braille each coded program statement on blank punch cards which they then use for "debugging" and modifying their programs. The four men also use tape recorders as an additional aid for reference materials and problem specifications. There are no apparent limitations on the complexity or type of program they may be required to write.

The following list of procedures describes the area of programming which are unique to a blind programmer:

1. **Program Package Assignment.** All of the information pertinent to the program, including record layouts and print formats, can be recorded on a tape recorder. He summarizes the package information on 8½"x11" Braille cards for easy reference during program development. The programmer supplies his own tape recorder and using assistance, such as his wife or a non-programmer assistant, this task is done.
2. **Block Diagramming.** A general block diagram is prepared to demonstrate his understanding of the assignment. (An assistant does the drawing.) He begins writing COBOL statements, using a Perkins Brailler and punch cards. He then creates a numbered source deck in Braille, which he can use to create typewritten coding sheets for key punch and for exploration of syntax and logic problems. When the statements have been keypunched, a detail block diagram can be produced to give the programmer a chance for review of his logic with the lead programmer.
3. **Compilation for Syntax.** An assistant is required at this point to read to the programmer the error messages on the program listing and insert the corrected statement cards in the source deck after he has typed the corrections and had them keypunched.
4. **Program Testing.** Creating test data usually involves generating tape and/or disk files, and this is done by writing one or several short COBOL programs. The programmer does this easily, with a minimum of assistance. Typing 80-80 card listings for keypunch covers the need for card input. Test results need to be described by an assistant, who will also document the program.

The work which Messrs. Levine, Villa, Westra, and Rauen are doing at the Los Angeles County Data Processing Center indicates that there are just three basic ingredients that should be present if a data center is to take advantage of this programming source: (1) two-man offices; (2) assistants or helpers to read; and (3) plenty of programs to write! □

*Based on a report in the Los Angeles County Data Processing News, Vol. 69, No. 5, Sept.-Oct. 1969, published at 714 West Olympic Blvd., Los Angeles, Calif. 90015.

C·a IDEAS: SPOTLIGHT

Programs that "Understand" the Nature of Ill-Defined Problems

Various "problem-oriented" computer languages have been developed and are available to translate automatically from the problem-oriented language to the basic "order-code" of the computer. At present all such problem-oriented languages are very rigid systems. This means that the problem domain must be one which lends itself to rigorous, complete, formal definition, e.g., algebraic manipulations, accounting procedures, or machine-tool operations.

Many interesting problems are not sufficiently well defined or clearly understood to be expressed in any of the conventional computer programming languages. Still, people are able to describe these problems to each other and to assist one another in making the problems more precise and in solving them. In order to utilize the high speed and large memory capacities of computers while working on such ill-defined problems, people need some useful way to communicate incomplete information to the computer; some way which will make the computer "aware" of facts and enable it to "understand" the nature of the problems which are described to it. The system SIR (Semantic Information Retrieval) is a prototype of a computer system which captures some measure of the "meaning" of the information presented to it and can act upon its stored body of knowledge in an "intelligent" manner. . . . □

—*from Chap. 2. "SIR: Semantic Information Retrieval" by Bertram Raphael in* Semantic Information Processing *by Marvin Minsky, Editor, and seven authors. The MIT Press, Cambridge, Mass. 02139, 1969, hard cover, 438 pp.*

C.a

PUNCH LINES . . .

In a period of rapidly rising costs, we can expect businessmen and industrialists to employ computers wherever possible to increase the efficiency of their operations to the maximum extent. **To keep up with the fast-moving world we live in, progressive management is interested in obtaining all of the facts concerning their business in "real-time" or "now" rather than on a historical basis.** Real-time computers are the heart of the Management Information System concept, which is now assuming a predominant role in the operation of major companies throughout the world.

—Robert E. McDonald, President
Univac Div. of Sperry Rand Corp.
P.O. Box 8100
Philadelphia, Pa. 19104

In spite of the reduction in the growth rate of the general economy which is expected by most economists, the computer services industry will continue to expand rapidly in 1970. The revenue for data processing firms for 1970 is expected to increase 20-30%, and will probably exceed $2.4 billion; the revenue for software firms is also expected to increase at a rate of at least 20-30%; and the timesharing segment of the industry is expected to maintain its 1969 growth rate of 60-80%.

—J. L. Dreyer, Executive Vice President
Association of Data Processing Service Organizations, Inc.
551 5th Ave.
New York, N.Y. 10017

Expenditures in 1970 for research and development in the United States are expected to total $25.7 billion. This would represent an increase of less than 1% over the total estimated for 1969, and industry, rather than the Federal Government, will be largely responsible for the modest increase that is expected. **Because of increases in research and development costs, this could mean, in fact, a reduction of as much as 7% in the real level of research and development in 1970.**

—Battelle Memorial Institute
Columbus Laboratories
505 King Ave.
Columbus, Ohio 43201

To talk to a computer, think like a computer. The machines have nothing against you personally. For example, they are programmed to send letters on overdue accounts. They're just machines, following orders over and over again. Be patient with them. When you write to complain, include your account number, payment amounts, dates, copies of address labels, and receipts. Machines are not emotional. They won't be moved by either your hottest or sweetest language. **Computers are your friends, really. They speed up the handling of the huge volume of credit transactions, reduce your needs for cash, permit payment-by-mail, and shorten the lines in stores and at payment counters.**

—"Hints on Getting Along with a Computer"
Continental Bank
231 S. LaSalle St.
Chicago, Ill. 60690

C.a

NUMBLES

NUMBER PUZZLES FOR NIMBLE MINDS —AND COMPUTERS

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.

NUMBLE 702

```
    S T U P I D
  X       I T Y
  ---------------
    N R H A H D H
  Y N A S L P L
  N R H A H T H
  ---------------
= N U N L Y P L R H
```

T = D

E = I = Y

25787 04292 02112 76

Solution to Numble 701

In Numble 701 in the January issue, the digits 0 through 9 are represented by letters as follows:

R = 0	M = 5
N = 1	E = 6
D = 2	T = 7
A = 3	G = 8
I = 4	C, S = 9

The full message is: "Time is anger's medicine."

Our thanks to the following individuals for submitting their solutions to Numble 6912: T. Paul Finn, Indianapolis, Ind.; A. Sanford Brown, Dallas, Tex.; Gerald K. Olshanski, Sheboygan, Wis.; and James Tucker, Rock Island, Ill. Numble 6911: Lambert J. Simon, Irving, Texas. □

By 1973, we estimate the total computer market will be $45 billion. Some sources estimate a $60 billion market in 1975. **When we reach that point, the overall computer market will be larger than the U.S. automobile market.**

—Burton A. Yale, Executive Vice President
General Automation, Inc.
706 W. Katella
Orange, Calif. 92667

CALENDAR OF COMING EVENTS

Feb. 5-6, 1970: The 1970 AIIE (American Institute of Industrial Engineers) Systems Engineering Conference, Sheraton-Dayton Hotel, Dayton, Ohio / contact: Technical Services Director AIIE, 345 East 47th Street, New York, N.Y. 10017

Feb. 12-14, 1970: First Annual Meeting of the Association of Business Forms Manufacturers, Monteleone Hotel, New Orleans, La. / contact: John W. Randall, President, Association of Business Forms Manufacturers, 4344 East-West Highway, Washington, D.C. 20014

Feb. 17-19, 1970: Computer Software & Peripherals Show & Conference, Midwest Region, The Palmer House, Chicago, Ill. / contact: Show World, Inc., 37 West 39th St., New York, N.Y. 10018

Feb. 18-20, 1970: IEEE International Solid-State Circuits Conference, Sheraton Hotel, Philadelphia, Pa. / contact: Mr. L. D. Wechsler, Program Committee Secretary, General Electric Co., Electronics Park, Bldg. No. 3, Syracuse, N.Y. 13201

Feb. 23-25, 1970: Annual EDP Conference of American Management Association, Americana Hotel, New York City, N.Y. / contact: John McClane, AMA, 130 West 50th St., New York, N.Y. 10020

Feb. 23-25, 1970: Data Processing Supplies Association, Winter General Meeting, The Royal Orleans Hotel, New Orleans, La. / contact: Data Processing Supplies Association, 1116 Summer St., P.O. Box 1333, Stamford, Conn. 06904

March 17-20, 1970: IEEE Management and Economics in the Electronics Industry Symposium, Appleton Tower, University of Edinburgh, Edinburgh, Scotland / contact: Conference Secretariat, Institution of Electrical Engineers, Savoy Place, London, W.C.2, England

March 23-25, 1970: Eighth Annual Symposium on Biomathematics and Computer Science in the Life Sciences, Houston, Tex. / contact: Office of the Dean, The University of Texas Graduate School of Biomedical Sciences at Houston, Division of Continuing Education, P.O. Box 20367, Houston, Tex. 77025

March 23-25, 1970: INFO-EXPO-70, the Second National Meeting of the Information Industry Association, The Shoreham Hotel, Washington, D.C. / contact: Paul G. Zurkowski, Information Industry Association, 1025 15th St., N.W., Washington, D.C. 20005

March 23-25, 1970: TIMS College on Simulation and Gaming Symposium on "Corporate Simulation Models", Univ. of Washington, Seattle, Wash. / contact: Prof. Albert N. Schrieber, Graduate School of Business Admin., Univ. of Washington, Seattle, Wash. 98105

April 2-3, 1970: First National Symposium on Industrial Robots, IIT Research Institute, Chicago, Ill. / contact: Mr. Dennis W. Hanify, IIT Research Institute, 10 West 35 St., Chicago, Ill. 60616

April 3, 1970: Computer Graphic Workshop, Marriott Motel, Rosslyn, Va. / contact: Special Interest Group for Graphics, Box 933 Blair Sta., Silver Spring, Md. 20910

Apr. 7-9, 1970: Computer Software & Peripherals Show & Conference, Western Region, Anaheim Convention Center, Los Angeles, Calif. / contact: Show World, Inc., 37 West 39th St., New York, N.Y. 10018

Apr. 8-10, 1970: Seventh Annual Meeting and Technical Conference of the Numerical Control Society, Statler-Hilton Hotel, Boston, Mass. / contact: Numerical Control Society, 44 Nassau St., Princeton, N.J. 08540

Apr. 13-16, 1970: Computer Graphics International Symposium, Uxbridge, England / contact: R. Elliot Green, Cg. 70, Exhibition Organiser, Brunel University, Uxbridge, Middlesex, England

Apr. 14-17, 1970: Conference on Automatic Test Systems (IEEE), Birmingham, Warwickshire, England / contact: Conference Registrar, The Institution of Electronic and Radio Engineers, 8-9, Bedford Square, London, WC1, England

Apr. 17-19, 1970: National Gaming Council Ninth Symposium, Hotel Sonesta, Washington, D.C. / contact: Dr. Peter House, Envirometrics, Inc., 1100 17th St. NW, Washington D.C. 20036

Apr. 26-28, 1970: Data Processing Supplies Association, Affiliate Membership Meeting, Rome, Italy / contact: Data Processing Supplies Association, 1116 Summer St., P.O. Box 1333, Stamford, Conn. 06904

Apr. 29-30, 1970: Fifteenth Annual Data Processing Conference, Univ. of Alabama, Engineering Bldg., 1919 Eighth Ave., South Birmingham, Ala. / contact: C. E. Adams, Coordinator of Conference Activities, Box 2987, University, Ala. 35486

May 5-7, 1970: Spring Joint Computer Conference, Convention Hall, Atlantic City, N.J. / contact: American Federation for Information Processing Societies (AFIPS), 210 Summit Ave., Montvale, N.J. 07645

May 7-8, 1970: Seventh Annual National Information Retrieval Colloquium, Sheraton Hotel, Philadelphia, Pa. / contact: Philip Bagley, Information Engineering, 3401 Market St., Philadelphia, Pa. 19104

May 17-20, 1970: 23rd International Systems Meeting, Las Vegas Convention Center, Las Vegas, Nev. / contact: Richard B. McCaffrey, Assoc. for Systems Management, 24587 Bagley Rd., Cleveland, Ohio 44138

May 18-22, 1970: "Image 70," 23rd Annual Photographic Science and Engineering Conference, New York, N.Y./ contact: Society of Photographic Scientists and Engineers, 1330 Massachusetts Ave., N.W., Washington, D.C. 20005

May 24-28, 1970: 29th General Meeting of GUIDE, Leamington Hotel, Minneapolis, Minn. / contact: Allan J. Burris, Northern Trust Co., 50 So. LaSalle St., Chicago, Ill. 60690

May 25-27, 1970: Forum of Control Data Users (FOCUS) Annual Conference, St. Paul Hilton, St. Paul, Minn. / contact: William I. Rabkin, FOCUS Exec. Sec., c/o Itek Corp., 10 Maguire Rd., Lexington, Mass. 02173

May 27-29, 1970: Eighth Annual Workshop Conference of the Interagency Data Exchange Program (IDEP), Cosmopolitan Hotel, Denver, Colo. / contact: James D. Mason, TRW, 1 Space Pk., Redondo Beach, Calif. 90278

June 1-3, 1970: "Session 70", the Inaugural Joint National Conference of the Information Processing Society of Canada (formerly the Computer Society) and the Canadian Operations Research Society, Vancouver, British Columbia / contact: W. J. Sheriff, Suite 1404. 1177 W. Hastings St., Vancouver 1, B.C.

June 15-16, 1970: Conference on Solid State in Industry, (IEEE), Statler-Hilton Hotel, Cleveland, Ohio / contact: A. J. Humphrey, Technical Program Chairman, The Reliance Electric & Engrg. Co., 24701 Euclid Ave., Cleveland, Ohio 44117

June 16-18, 1970: Computer Group Conference and Exposition (IEEE), Washington Hilton Hotel, Washington, D.C. / contact: Bob O. Evans or Donald E. Doll, IBM Federal Systems Div., 18100 Frederick Pike, Gaithersburg, Md. 20760

June 22-24, 1970: Data Processing Supplies Association, Spring General Meeting, The Olympic Hotel, Seattle, Wash. / contact: Data Processing Supplies Association, 1116 Summer St., P.O. Box 1333, Stamford, Conn. 06904

June 22-23, 1970: Eighth Annual Conference, ACM Special Interest Group for Computer Personnel Research, Center for Continuing Education, Univ. of Maryland, College Park, Md. / contact: Robert A. Dickmann, The Johns Hopkins Univ., Applied Physics Lab., 8621 Georgia Ave., Silver Spring, Md. 20910

ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

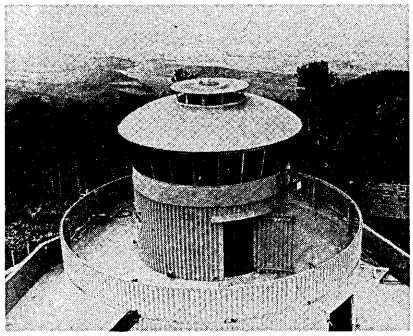
Table of Contents

APPLICATIONS

ANATOMY OF THUNDERSTORMS BEING INVESTIGATED WITH AID OF COMPUTER

At the Langmuir Laboratory in New Mexico, scientists from throughout the free world are participating in a study to find out what causes thunderstorms and the associated lightning and rain. Armed with rockets, airplanes, a laboratory in the sky and an IBM System/360 Model 44, each is able to test his theories. As an idea is offered, others may try to prove or disprove it; findings are shared and new knowledge is gradually being built. The Langmuir Laboratory project coordinated by nearby New Mexico Institute of Mining and Technology, is funded by several federal agencies and involves guest scientists from Canada, England, Japan, Israel, India, Denmark, and Switzerland.

The site of the Langmuir Laboratory, built atop a 10,600-foot peak in the Magdalena Mountains west of Socorro, N.M., is unique in that thunderstorms occur almost daily during the summer and autumn, directly above and around the lab.



The remote lab site is one of only a few places in the inhabited world — another is Russia — where thunderstorms develop with a precise pattern of regularity. A large observation tower at the lab (shown above) offers a panoramic view of the area and enables a viewer to look right into the base of a storm cell. The tower is hit by lightning several times each year.

A variety of devices and techniques are used by the scientists to gather information. One specialist from the National Center of Atmospheric Research fires instrumented rockets into the towering cumulonimbus (thunderhead) clouds to measure electrical fields inside the storms. The "warheads" of his rockets contain delicate, miniaturized electronic measuring devices and transmitters which broadcast the readings back for processing by the IBM system.

The IBM system assembles and organizes all of the information obtained via the numerous devices and techniques. Charles Holmes, a geophysicist involved with the IBM section of the project, said, "The system automatically synchronizes our separate readings of many events that occur during the life of a storm cloud and translates the information into numbers that we can interpret." For example, he explained, in the brief course of a lightning bolt, the IBM system shows what all sensing devices recorded at the same instant of time. Readings include temperature, pressure, water content, heat energy, electrical energy, thunder intensity and several other scientific measurements.

Many of the thunderclouds that form at Langmuir Laboratory rise to altitudes above 45,000 feet and contain vertical drafts of up to 40 miles an hour. Langmuir scientists say that an IBM machine analysis of tumultuous claps of thunder shows that noise generated by a clap represents only 1/4 of 1% of the total energy released in the electrical discharge. In an hour, an average thundercloud expends thermal energy equivalent to 30 million kilowatt hours of electricity — enough energy to power a city the size of Dallas for almost three days.

COMPUTER USED TO TEACH BANK EMPLOYEES HOW TO USE A COMPUTER

Computers are being used to teach clerical employees of First National City Bank (New York) how to use a computer. The program is believed to be the first in which a computer has been used to assist in training large groups of clerical personnel in day-to-day banking operations.

Seventy new and veteran members of the bank's foreign tellers department recently completed a course in which twelve IBM 2260 visual display terminals linked to Citibank's IBM System/360 Model 50 were used. The computer at Citibank's Wall Street offices helped teach the foreign tellers how to retrieve information on foreign accounts. (Citibank has the largest network of overseas branches and offices of any United States bank.)

Bank personnel learn to communicate with the computer in two training sessions totaling two hours. Most of the men and women are high school graduates with no previous exposure to computers. The computer has been programmed to respond to trainees much like a regular teacher. An advantage is that each student can learn at his own pace. Throughout training and at the end of the final instruction period the computer administers and grades criterion tests which tell a class supervisor how the student is progressing and when he is qualified.

The stock transfer department has now adapted the foreign teller computer-assisted instruction for its use. With the success of the computer as a teaching tool, the bank is considering use of the computer for training personnel in other departments. The bank also is considering the use of a number of its computer terminals for teaching employees non-banking courses including remedial English, remedial arithmetic, effective writing and some elements of management training.

GEOMETRIC PROGRAMMING HELPS DECIDE BEST PRODUCT DESIGNS

A new technique, called geometric programming, is being developed by mathematicians at the Westinghouse Research Laboratories, Pittsburgh, Pa. The new technique shows which one out of possibly billions of design options for a product will perform the way the customer decides is best. Thus far, geometric programming has been used mainly in designing transformers, but mathematicians expect it to be applicable in many other situations.

The technique makes extensive use of inequalities rather than equations; inequalities indicate that some terms are greater or less than others, rather than equal. The technique takes its name from use of a standard formula known to mathematicians as the geometric inequality.

One study showed how geometric programming might be used to design an office building. The conflicting choices that have to be made are typical of this kind of problem: land costs are held down by making the building tall and narrow, for instance, but elevator costs are held down by making it short and wide.

A project could easily involve nine such decisions, each presenting 20 alternatives. The total number of possible designs then would be 20 raised to the ninth power, or 512 billion — impossible for man to consider one by one, and requiring some seven centuries for a computer to calculate in this way. Shortcuts provided by geometric programming, however, allow design choices in a fraction of an hour.

Westinghouse mathematicians say that geometric programming also will be useful in systems analysis where mathematics is used to help managers and engineers decide on the best compromises and trade-offs in large scale planning.

FLORIDA FOREST SERVICE IS USING COMPUTER TO HELP REDUCE FIRES, ANALYZE CAUSES

The Florida Forest Service, Fire Control Branch, is using an IBM System/360 Model 30 computer to help reduce the number of fires in the state's 20 million acres of protected woodland. Detailed field reports — including variables such as the location of a fire, time of discovery, size, duration, cause, weather conditions and the types of timber or vegetation burned — are processed by the computer. The analysis in depth of fire causes in a given area permits pinpointing of any unusual fire conditions anywhere in the state — and a more efficient deployment of manpower and equipment.

Computer-prepared data indicates that the average fire last year was controlled or extinguished in less than an hour and burned less than 20 acres. The majority of burned timberland was destroyed by a few dozen large fires. Over one-third of the total fires were classified as deliberately set; other causes contributing to the damage were lightning, careless smokers and campers, machinery and debris burning. While 1968 burn figures were high (7,342 fires which consumed 137,674 acres of protected timberland), the burned woodland amounted to only seven-tenths of one per cent of the total under protection.

Computer analysis also has identified the most effective fire towers and the need to change manpower schedules. This is now under way and effects about 800 fire-fighting personnel in 56 fire control areas reporting to six district offices. Eighteen new districts will replace these and help provide balanced workloads for rangers. The IBM system is helping measure field activity and staff needs of the new districts.

COMPUTER-CREATED IMAGES AID ENGINEERS IN DESIGN OF JET ENGINE COMPONENTS

Engineers at the Allison Division of General Motors Corp., Indianapolis, Ind., are using computer-created images to assist in designing gas turbine components for jet engines. The company-developed system, called Remote Access Procedure for Interactive Design (RAPID), allows the engineers to enlist assistance from a network of many complex computer programs. These programs, involving over 45-million instructions are stored in the company's remotely-located IBM System/360 Model 50.

Engineers use the IBM computer linked to an IBM 2250 visual display device. Design decisions are communicated to the computer through lighted areas of the terminal with a photoelectric light pen. These lighted areas have predefined meanings, allowing the engineers and computer to attain a "dialogue." Stored programs then display design information on the screen of the terminal. The information desired may, for example, be the drawn image of a compressor or turbine blade geometry.

The system allows aerodynamic engineers to design a gas turbine with the desired airflow, hea transfer engineers to cool critically heated parts of the engine, and structural engineers to determine proper materials consistent with stress and vibration levels. These results are accomplished without manual transfer of design information among the departments.

EDUCATION NEWS

ECPI, NEW YORK, ACCREDITED BY NATIONAL ASSOCIATION OF TRADE AND TECHNICAL SCHOOLS

Electronic Computer Programming Institute, New York, has been accredited by the National Association of Trade and Technical Schools (NATTS). NATTS is a federally recognized organization that sets standards, investigates and accredits private vocational schools. NATTS accreditation permits ECPI students to apply for federally insured loans to further their education under the National Vocational Student Loan Act. ECPI offers several courses in data processing, including classroom and actual computer experience in console operations, tab operations and computer programming.
(For more information, circle #41 on the Reader Service Card.)

TRAINING INCORPORATED OFFERS ON-SITE TRAINING SERVICES

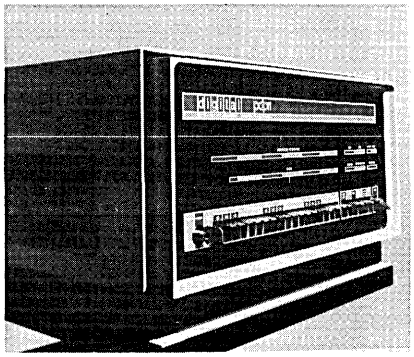
The Digital Division of Training Incorporated, Fort Lauderdale, Fla., is offering on-site digital hardware and computer assembly-language training courses to users and manufacturers of digital equipment. The firm's experienced instructors, using propriatory methods and materials, prepare detailed and completely documented courses based on the user/manufacturer's own documentation and supplemented by basic operational theory courses drawn from the firm's course library. The courses employ audio and visual training aids that provide the purchaser with a permanent, fully-developed and documented course which can be used for individual or class instruction as often as required at no additional cost.
(For more information, circle #42 on the Reader Service Card.)

NEW PRODUCTS

Digital

PDP-11 COMPUTER / Digital Equipment Corp.

The principal feature of Digital's new family of 16-bit computers, the PDP-11, is that it essentially changes the concept of computer obsolescence by means of a single, high-speed, bi-directional transfer bus (data path), designated the Unibus®. Because of the bus design, the central processor, core memory, and all peripheral devices are considered subassemblies. This means that the PDP-11 is physically and electrically modular, reducing maintenance costs to a minimum. System additions and improvements become a simple matter and the PDP-11 may be configured any way the customer wants.



Initially the PDP-11 will be offered in two models: a special purpose controller, the PDP-11/10, equipped with central processor, 1024 words of read-only memory, and 128 words of standard memory; and the PDP-11/20, a general purpose computer with central processor, 4096 words of standard core memory expandable to 32,768 words, a programmer's control panel, and Teletype.
(For more information, circle #43 on the Reader Service Card.)

GE-PAC 4010 SYSTEM / General Electric

General Electric's Process Computer Department recently introduced a completely modular process computer, designated the GE-PAC® 4010. This medium-priced system complements the larger GE-PAC 4020. The GE-PAC 4010 computer employs a 24-bit word; has a 1.6 microsecond memory cycle time; up to 64 interrupt levels; memory protection, relative addressing for full use of core memory; and fast block data transfer independent of a running program. The comprehensive instruction set (identical to that of the GE-PAC 4020) can handle the wide variety of complex operations required in process control.

The GE-PAC 4010 includes two new subsystems: a fast analog input scanner and a dual bulk memory subsystem. The scanner, capable of scanning up to 600 points per second in a multi-channel mode, can be quickly reconfigured and expanded in the field by plug-in connections. Signal conditioning modules also are plug-in. The dual-bulk memory controller accommodates up to four disc or drum storage devices, in any combination. These can be added on a plug-in basis, again without any cabinet rewiring.

The OMNIBUS family of standard software packages, developed earlier for the GE-PAC 4020, is available for the new GE-PAC 4010. A wide range of plug-in data peripherals also is available.
(For more information, circle #44 on the Reader Service Card.)

MILITARIZED COMMAND AND CONTROL COMPUTER / RCA

The new militarized command and control computer, designated Model 215, is no larger than an office desk, yet has a speed of 400,000 operations a second — equivalent to commercial systems five to seven times its size. The Model 215 is designed to meet government requirements for an advanced airborne command post from which this nation's missiles and aircraft could be directed should ground control centers be destroyed. The fact that Model 215 meets the most stringent military specifications also fits it to a wide variety of land-based and sea-going applications.

The new RCA computer is a multiprocessor with two central processing units that operate simultaneously. Each unit of the Model 215 has independent power, shielding and cooling facilities. It will withstand the partial vacuum and extreme cold that exists at 50,000 feet altitude. A special 'fail soft' feature enables it to continue operation even in the event of a major system malfunction. Simultaneously, the Model 215 would perform self-diagnosis to pinpoint the malfunction, identify it, and tell the operator what to replace.

The Model 215 is compatible with commercial systems which allows it to run user programs prepared for the RCA Spectra 70 and IBM 360 computers that have been in use by the military for several years.
(For more information, circle #45 on the Reader Service Card.)

Memories

6.4-MILLION BIT DISC STORAGE SYSTEM / Magnafile, Inc.

The Model 8504 disc storage system is Magnafile's latest entry into the medium to small computer application area. Specifications for the new 8504 include data storage of 6.4-million bits, 128 data tracks, 50,000 bits per track, 1.46 MHz bit transfer rate, and an average access time of 16.6 milliseconds.
(For more information, circle #46 on the Reader Service Card.)

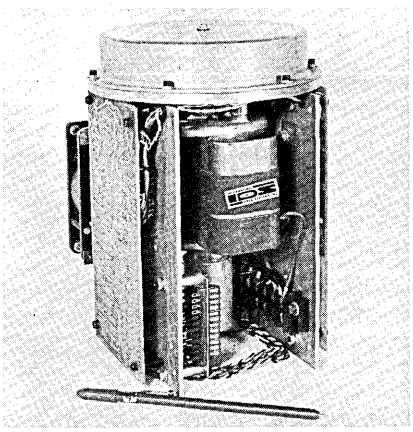
IBM-COMPATIBLE COMPUTER DISC SYSTEM 660/661 / Memorex Corp.

The Memorex system consists of the Model 661 storage control unit, which interfaces directly to the IBM System/360 computer and controls the operation of the Model 660 disc storage drive. Up to nine 660 disc drives may be controlled by a single 661 control device. Each disc drive can accommodate a Memorex Mark VI disc pack, or the equivalent IBM 2316 disc pack.

The Memorex system provides up to 233 million bytes of on-line information storage, in modular increments of 29.17 million bytes per individual 660 disc storage drive. These storage devices are used in medium-to-large-scale data processing systems, for applications requiring rapid access to large volumes of data. The system is completely hardware and software compatible with the IBM System/360 computer.
(For more information, circle #47 on the Reader Service Card.)

DISC MEMORY SYSTEM / IDS, Inc.

The 8100 series disc memory system is a compact (9"W x 9"D x 10½"H) and lightweight (12 lbs.) package with a bit storage capability approaching 145K bits of storage.



The new memory systems have 8 data tracks with 18,125 bits per track. Average access time is 8.5 milliseconds. The 8100 series may be used as the main storage on electronic calculators and small computers, as a replacement for delay line memories, as a buffer memory or as a data storage device on special purpose digital systems.
(For more information, circle #48 on the Reader Service Card.)

INTERCHANGEABLE DISK STORAGE FOR SYSTEM/360 / Potter Instrument Co., Inc.

The Potter DD 4314 Disk Drive in conjunction with the Potter DC 5314 Controller provides a system that is completely interchangeable with the IBM 2314 Random Access Memory Unit. All programs and libraries already in use can be utilized without change.

The DD 4314 has a storage capacity of 29.176 million bytes and uses an 11 disk pack, IBM 2316 or equivalent. The DC 5314 Controller has a transfer rate of 312,000 bytes per second or 624,000 bytes per second with packed decimal. File Scan, Record Overflow and a program-controlled two channel switch (allowing the controller to connect to another I/O channel) are standard.
(For more information, circle #49 on the Reader Service Card.)

70-NANOSECOND READ-ONLY MEMORY / Optical Memory Systems, Inc.

The OM-1000, a low-cost, 70-nanosecond read-only memory has a design feature enabling on-site alteration of the instruction set. Through the use of optics, a change in machine structure, control logic, or even a single instruction word may be accomplished by either altering or replacing an optical mask.

This can be done on-site in a few minutes time without altering the computer's read electronics.

The OM-1000 read-only memory has a 70-nanosecond access time with a total cycle time of 100-nanoseconds, at word lengths from 16 to 256 bits. The memory may be ordered with 4K-, 16K-, 65K-, or 265K- bit capacities. (For more information, circle #50 on the Reader Service Card.)

Software

INFORMATICS ANNOUNCES COMPATIBLE FAMILY OF SOFTWARE PRODUCTS FOR IBM USERS

The availability of what is believed to be "the first completely compatible family of software products for IBM computer users", has been announced by Informatics Inc., Los Angeles, Calif., an independent software firm. The family of software products involves an expansion of the firm's MARK IV File Management System, originally developed for larger capacity IBM 360 Series computers. The new MARK IV expansion enables all IBM 360 users, from Model 25 to 91, to use the system.

The MARK IV products are priced at $35,000 for general purpose file management systems; $20,000 for computers with 32K memories; and $10,000 for smaller information retrieval, computation, and reporting systems. The "upward compatible" programs allow the small computer user to apply the family of products to business applications as he grows to larger computers without expensive reprogramming of existing software.
(For more information, circle #51 on the Reader Service Card.)

DS/1 / System Development Corp., Santa Monica, Calif. / First in a new series of interactive data management systems. DS/1 operates under the Disc Operating System (DOS) on the IBM 360 computer family, beginning with the Model 30, at least a 32K core memory, and either 2311 or 2314 disc storage. The system operates with existing machine-readable data and extends current uses of data and equipment. It accepts commands typed in standard English phrases and responds similarly. The user needs no knowledge of computer programming. DS/1 has a basic monthly lease price of $350.
(For more information, circle #52 on the Reader Service Card.)

DYNAMIC MULTI-TASKING SYSTEM (DMTS) / Western Systems, Inc., Salt Lake City, Utah / Increases cpu and peripherals throughput for users of IBM 360 computers under DOS. System consists of a partition control program and user program linkages which allow up to nine independent user programs (COBOL, FORTRAN, or BAL) to be executed concurrently as subtasks within any of the three DOS partitions. DOS is never modified in any way. The operator commands execution of subtask programs in any combinations and sequences, subject to any storage or peripheral limitations imposed by the user.
(For more information, circle #53 on the Reader Service Card.)

PAC (Project Analysis and Control) / International Systems Inc., King of Prussia, Pa. / Designed and available for use on a computer with direct access storage devices, the system stores information on projects being designed and/or programmed by each individual segment of the project. PAC provides information to analyze the time and cost of each project and segment of the project, provides estimated completion dates, cost figures, and flags areas of potential future problems. Core requirements are 65K with disk storage, although it can be implemented on a 32K computer using available "pull down" routines. Price for the basic package is $7500 including documentation and required installation support.
(For more information, circle #54 on the Reader Service Card.)

PAT / Cullinane Corp., Boston, Mass. / A proof and transit system intended for non-dedicated use in medium-sized banks. In addition to deposit and batch proof, the system captures cash letter data for all end points on the initial pass; rerun passes are only needed for physical transit separation and require only 15K of core. An unusual feature of the system is its interrupt system, whereby operation can be stopped voluntarily at any time without losing information or destroying files, permitting a simple restart particularly valuable for single-computer banks. PAT is available for $15,000 including installation, modification when necessary, maintenance, training, and documentation.
(For more information, circle #55 on the Reader Service Card.)

SHARED LABORATORY INFORMATION SYSTEM / IBM Corporation, White Plains, N.Y. / Organizes doctors' orders for tests, validates the results and directs an IBM System/360 to print test reports and post charges to patients' accounts. The new program can be used by a single hospital or by several hospitals sharing a central computer. The system operates with IBM System/360 Models 25, 30, 40 and 50 under the Disk Operating System. The new program is compatible with IBM's Shared Hospital Accounting System (SHAS) and operates with standard SHAS executive routines.
(For more information, circle #56 on the Reader Service Card.)

SRS (Simultaneous Reporting System) / Chilton Computer Co., Dallas, Texas / Designed to access and generate up to 40 specific reports on one pass of a data file recorded on disk or magnetic tape. SRS uses conversational English-input inquiry statements that does not require knowledge of programming or computer operations. SRS is available for both IBM 360/OS and DOS users.
(For more information, circle #57 on the Reader Service Card.)

USURPER I / J. Toellner & Associates, Los Angeles, Calif. / A general purpose computer program designed specifically for information maintenance, retrieval, and reporting. Flexibility is provided the user for building and maintaining files; reformatting existing files; searching, selecting and retrieving data from files; performing specified arithmetic computations; structuring new data files; preparing reports; and printing mailing lables. A proprietary product, USURPER I is currently designed to operate on an IBM 360/30 or larger model using up to two input and two output files. Full documentation, training and support are provided with each system.
(For more information, circle #58 on the Reader Service Card.)

Peripheral Equipment

FOUR-COLOR CRT DISPLAY / Sylvania Electric Products

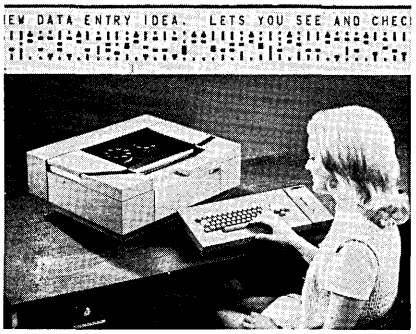
A computer-driven, four-color display is expected to have applications in air traffic control, graphic plotting, stock control, teaching machines and industrial design. Data is shown in red, orange, yellow, and green, or any combination of these colors. Program-controlled voltage levels intensify the brightness of emergency information.

The device has a 21-inch, diagonal rectangular display surface. The

display, mounted in a 59 x 32 x 30-inch console, includes shelf workspace for a seated operator, and controls for power, brightness, focus, symbol size, and color selection. Options available include geometry correction, video amplifier, symbol and vector generators, track ball, light pen, data tablet, refresh memory, and special phosphors. (For more information, circle #59 on the Reader Service Card.)

DUAL IMAGE, A MODULAR DATA RECORDING AND RETRIEVAL SYSTEM / Interface Mechanisms, Inc.

Dual Image is a modular data recording and retrieval system which provides both a human readable character and a machine readable code on 11/16" wide paper tape.



Information can be entered either at typing speeds via the keyboard or at rates up to 75 characters per second from telephone data sets, modems, data loggers or other digital devices — and be transmitted to computers (or other standard business machines) over data links at speeds up to 1000 characters per second.

Up to 128 characters, including upper and lower case alpha, numerals and special symbols are available. Printing has the same size, spacing and shape as a typewritten line. Operators find the Dual Image records simple to read since the message moves across the viewing area. Data can be immediately confirmed or errors instantly corrected. Dual Images is available for purchase or lease.
(For more information, circle #60 on the Reader Service Card.)

RECORDAMAT 1250 / Perspective Systems, Inc.

The Recordamat 1250, a new electronic system for digitizing, storing, and reproducing two and three-dimensional graphics data, has been designed as a companion system for the firm's Illustromat 1200 (which converts 2-dimensional orthographic drawings into 3-D illustrations). Together they form an automated plotting system which can automatically draw a different axonometric or perspective view with each playback of a digitized tape.

The Recordamat consists of a small keyboard, a data coupler, a tape unit and a graphics processor. Data is recorded at 600 characters per second on 7 or 9-track IBM compatible tape or 8-track paper punch tape (EIA compatible). Data is played back at 4 inches per second during highspeed search. The 1250's graphics processor has a 16-bit word length, a 2 microsecond add time and a 10 microsecond multiply and divide time. A 4096 word memory is standard but can be expanded to 64,000 words. A telephone data set interface also is available.
(For more information, circle #61 on the Reader Service Card.)

ELECTRONIC READ-BY-TOUCH SYSTEM / Monarch Marking Systems, Inc.

A new hand-held optical scanning device that reads by touch, shelf labels of everything from food to hardware, has been developed to speed the managing of inventory. The system consists of a hand-held electronic scanning device, about the size of a flashlight, and a portable unit called the IBM 1907 batch recorder, mounted on a four-wheel cart and battery-operated for portability.

The clerk, or inventory specialist, using this system, merely walks through the aisles of a retail store or warehouse reading the quantities of items on hand and other data by touching the flashlight-like probe to specially printed labels affixed to merchandise shelving. (The special-purpose labels also are printed by Monarch.)

The Monarch device reads the labels for such data as the SKU (stock-keeping unit), classification and price of items. This is recorded on magnetic tape stored in the batch recording system. Variable data, such as quantity, is entered via a keyboard directly into the recording system.

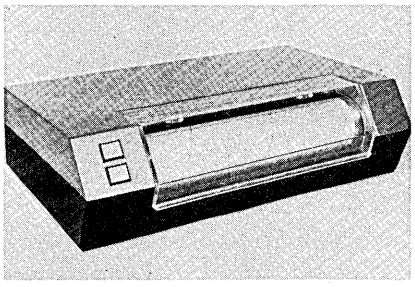
When the recording process has been completed, the portable unit is connected to a special IBM data transmission device via telephone lines. Then a remote computer polls all of the information recorded on the magnetic tape. The computer compares such things as inventory on hand with established levels and automatically issues orders to replenish merchandise.
(For more information, circle #62 on the Reader Service Card.)

COMPUTER OUTPUT MICROFILMER/ Peripheral Technology

Model 1300 offline Computer Output Microfilmer, accepts all standard tapes generated on IBM System/360 computers. Print-out rate is 13,000 132—character lines—per—minute. Model 1300 COM outputs onto 16mm microfilm. All electronics and an integral tape drive are included.
(For more information, circle #63 on the Reader Service Card.)

GRAPHIC CONVERSION TERMINAL/ Data Conversion Systems, Inc.

A totally new line of Graphic Conversion terminals, designated the Model GC-2, is capable of converting graphs, charts, and recordings into digital electrical signals for input to computer, or transmission for remote display. The computer can store, reduce, analyze and retrieve the data for issuance in printed or graphic form. Model GC-2 is capable of converting an 11" x 17" document into electrical



signals in less than 60 seconds and is fully compatible with all popular tape recorders and large and small scale computers. Remote multi-terminal display, process control, and temporary or permanent storage of maps, charts, curves and graphs are among the foreseen applications. Several options are available including, for example, BCD outputs, self-contained minicomputer, and keyboard input.
(For more information, circle #64 on the Reader Service Card.)

AUTOMATIC PHONE ANSWERING SYSTEM / Morgan Electronics

Models 53, 54 and 55 of the new Series 50 product line, an automatic telephone answering system,

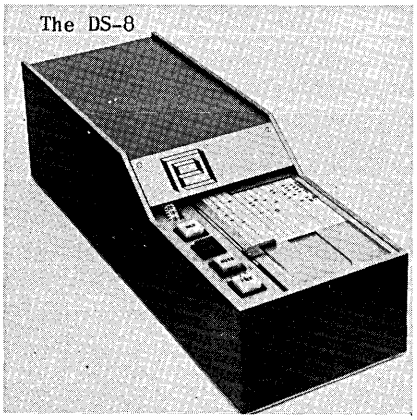
are designed to handle high-speed voice and data transmission. Each of Series 50's three models comprises a message center to answer incoming calls and a recorder/transcriber for message recording and transcription. The compact 11-pound message center answers a call with a 20-second announcement that is pre-recorded by the user. After starting the tape recorder, it monitors the call and keeps the recorder/transcriber going until the caller hangs up.

Models 54 and 55, respectively, transmit and receive voice and digital data over standard voice-grade lines at two or four times the original recording speed. Model 53 is intended primarily to answer telephone calls with a pre-recorded message and record up to eight hours of incoming information. The range of uses for Series 50's high-speed transmission capability include: sending sales information between branch sales offices and the home office; collecting data transmitted by Touch-Tone telephone and feeding it into a computer via a signal converter; and transmitting audio tapes between radio stations.
(For more information, circle #65 on the Reader Service Card.)

INCREMENTAL CARD READER / Parameters, Inc.

The DS-80 incremental card reader, developed by Parameters, Inc., uses a 12-station opto-electronic system to replace the 960 contacts used in static readers. The DS-80 programs test equipment, chemical processes, food processes, batching, machinery, and mini-computers at lower cost than required for other readers. The low cost of the reader permits its use as terminal equipment.

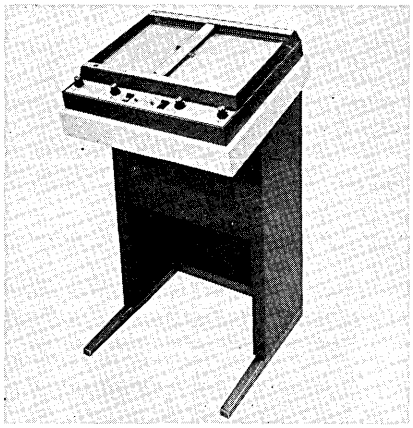
The DS-8



The DS-80 reader is complete and self-contained with interface, modular circuitry, and performance features that are compatible with most computers and data systems. It reads Hollerith coded data on command, a column at a time, up to speeds of 80 columns a second. Features include single-step function with return to start from any column; automatic feed and return; sync/output with read control; and 3 speeds determined by application. All control functions are remotely programmed.
(For more information, circle #66 on the Reader Service Card.)

TSP-212 PLOTTING SYSTEM FOR TIME-SHARING / Time Share Peripherals Corp.

The TSP-212 plotting system combines the TSP-12 Plotter with a specially-designed Honeywell X-Y Recorder. The new system connects directly to Teletypes, IBM 2741's and most other terminals. Interface through data set or coupler is accomplished with a single-cable connector.



Operator-oriented controls are all positioned on the front panel. Plot sizes up to 10" x 15" are continuously adjustable through an "absolute plot dimension" pushbutton facility. Plotting speed is 150 to 225 points per minute depending upon the particular system used.

Sub-routines in BASIC and FORTRAN (accommodated by most time-share systems) are supplied, or are available in public libraries of time-share services. TSP-212 software has simple-to-use scaling and dimension factors; alphanumeric and symbol routines are available for many systems.
(For more information, circle #67 on the Reader Service Card.)

GE MAGNETIC READER / General Electric

The compact MRA001 Magnetic Reader is designed to read magnetically coded unit records from individual items of media wherever data must be collected at the point of action, such as credit authorization, inventory control, personal identification, and many other applications.

The reader utilizes a circular magnetic reading technology for high reliability. Multiple magnetic patches may be used on the media for an increased message capacity per card or ticket; there is no maximum size limitation on the media itself.

The device, easily adaptable to new or existing systems, is dependent upon the host equipment for control and operating power. Hand-fed, the reader accepts and retains media for reading. Once energized, it will read and output logic level, serial binary data and synchronized clock waveform continuously, until shut off by its host equipment.
(For more information, circle #68 on the Reader Service Card.)

COMPUTING/TIME-SHARING CENTERS

ROME BANK AND CORPORATION S FORM OPTICAL READING SERVICES COMPANY

Banca Nazionale del Lavoro (Rome), through its subsidiary, S.A.G.A., has formed a joint-venture corporation with Corporation S (Dallas, Texas) to establish an optical input automation (Optimation) center in Rome. The new corporation, Societa' Nazionale Optimation, S.p. A., will have a large-scale optical character recognition system, an Electronic Retina® Computing Reader manufactured by Recognition Equipment Inc.

The computer—controlled system will optically read information from source documents, translate the information into computer language, and record it on magnetic tape for immediate further computer processing. Users will pay a volume-based price for each document processed at the Rome Optimation Center.

Banca Nazionale del Lavoro is the fourth largest bank outside the United States according to Fortune magazine. Corporation S, a computer service corporation, is an affiliate of Recognition Equipment Inc.

QUICK DRAW SERVICE AVAILABLE IN TIME-SHARING MODE FROM U.S. TIME-SHARING

Introduction of "Quick Draw" service in a time-sharing mode has been announced by U.S. Time-Sharing, Reston, Va. The automated program documentation, debugging and flow-charting service, now available to time-sharing users, will free computer programmers from time-consuming documentation chores.

Quick Draw provides comprehensive program logic documentation that is accurate, presented in a standard format, and easily kept up to date. No input preparation or special coding is required.

W. Porter Stone, president of U.S. Time-Sharing, pointed out that his firm is the first organization in the country to make Quick Draw available in a time-sharing mode. Nationally, more than 200 major companies are using Quick Draw in their own computer installations or through data centers.
(For more information, circle #69 on the Reader Service Card.)

COMPUTER-RELATED SERVICES

NEW COMPUTERIZED INCOME TAX SYSTEM FOR THE PROFESSIONAL TAX PREPARER

A new computer system for preparing federal and state income tax returns has been developed by MULTICOMP Inc., a time-sharing utility specializing in remote computing services. The new system, known as the MULTICOMP Tax System, does not require any particular input forms. The preparer may enter the tax data in random sequence directly from original source documents on a typewriter communications terminal connected to his office telephone. The computer organizes and stores the data as it is received and computes and prints the completed tax return on the typewriter communications terminal in the preparer's office. All work can be accomplished without the user leaving his office or any mailing to a processing center.

The computer analyzes all data after it is entered and prints a comprehensive diagnostic report calling the tax preparer's attention to apparent violations of statutory requirements, inconsistent data, and overlooked deductions. Errors disclosed by the report are corrected and the computer then determines the method of computation resulting in the lowest tax. The corresponding federal and state income tax returns, with necessary supporting schedules, are then printed on the typewriter terminal. The time it takes to enter the data and complete the return may vary from just a few minutes for the most simple return to 90 minutes for an extremely complex return.

The system is being offered for the 1969 tax season to tax professionals in the Boston (Mass.) and New York metropolitan areas. Service can be made available in any area where there is sufficient volume to justify the cost of telephone service to the company's computer facility in Waltham, Mass.
(For more information, circle #70 on the Reader Service Card.)

WESTAT RESEARCH, INC. ANNOUNCES NEW SERVICE

Westat Research, Inc., a Census Summary Tape Processing Center, has announced that, through its DATA Services Division, guidance and technical assistance will be provided in obtaining data from the Census Bureau, other Federal agencies, local government agency records and other sources. Westat is prepared to assist clients in the use of the new geographic tools such as the Address Coding Guides and Dual Independent Map Encoding (DIME) being developed in part by the Census Bureau. Westat is a firm specializing in statistical services, information systems and computer software. The company has offices in Bethesda, Maryland and Denver, Colorado.
(For more information, circle #71 on the Reader Service Card.)

CAMPSITE RESERVATIONS SERVICE AVAILABLE FOR OUTDOOR ENTHUSIASTS

Camping enthusiasts will be interested in an agreement between NARS Computer Systems, Inc., (Orlando, Fla.) and Pathfinder Travel Parks (Daytona Beach, Fla.). It provides for a nation-wide communications network capable of receiving and booking reservations for campsites within the Pathfinder organization, other groups and even independent sources. Using the NARS computer facilities, campers will be able to book and receive rapid confirmation of reservations for campsites anywhere in the United States with a single, toll-free telephone call. There is no charge to the public for the service which became effective on Decmeber 1, 1969.

NARS was founded in 1968 specifically to fill the needs of the travel and lodging industry and the traveling public by providing a faster and more reliable method of handling advance reservations, particularly for hotels, motels and car rentals.

Pathfinder Travel Parks, rapidly growing in size and prestige, is comprised of some of the finest travel parks in America. Officials of the company are aiming for a nation-wide total of 500 within the year. The company is continually and selectively searching for travel parks with first-class standards to join the system.

Camping enthusiasts desirous of trying out the new campsite reservations service should telephone:

1-800-327-9090 if they are east of the Mississippi;
1-800-525-6697 if they are west of the Mississippi;
1-800-332-6913 in Colorado;
1-800-327-9288 in the southeast;
1-800-432-7018 in Florida

In each instance the camper simply asks for the Pathfinder Travel Parks operator.
(For more information, circle #72 on the Reader Service Card.)

RESEARCH FRONTIER

OPTICAL FILTER FROM COMPUTER REVEALS "HIDDEN" PATTERNS

New experimental optical filters that can be computer coded to pass desired images and reject others are being developed by IBM researchers in Houston, Tex. The new kinoform filters look like slightly frosted 35 millimeter slides. They were developed as an outgrowth of the kinoform — a computer-produced slide which can form 3-D images similar to those produced by holograms.

Kinoform filters are easier to use than filters made from holograms. The objects viewed through a kinoform filter can be illuminated by ordinary light; hologram filters require special lighting, such as coherent laser light. In addition, the image produced by the kinoform is much brighter.

Potential applications of the filters range from use by seismologists to detect planes of underground strata in seismographic plots, to use by biologists to determine cell counts.

To code the filter to recognize a certain object, such as a cell, a mathematical description of the

cell's size and shape is fed to the computer. The computer then simulates mathematically how light waves would be scattered by the cell and how these scattered waves would expose a sheet of film placed near the cell. The scattered light waves would create a pattern on the film similar to a ripple-filled puddle. This pattern is plotted by the computer and transferred to a 35 millimeter slide, producing the filter.

ORGANIZATION NEWS

POTTER INSTRUMENT EXPANDS INTO EUROPEAN DATA PROCESSING MARKET

Based on the present and forecast growth of the data processing market in Europe, Potter Instrument Co., Inc., (Plainview, N.Y.) is establishing Potter Instrument Company GmbH, to be located in Vienna, Austria. The data processing industry in Europe is estimated to grow at a rate of approximately 21% a year between now and 1975. Growth, for the same period, in the United States is forecast at about 12% annually. Sales of EDP peripheral equipment in Europe is presently about half that of the United States. If the forecast growth rates remain valid, sales in 1975 for Europe will be essentially equal to those in this country.

Potter's European organization will include complete manufacturing, sales and service activities. Initially the Company will manufacture their line of Magnetic Tape Transports for sale throughout Europe. Manufacture of the complete line of Potter's data processing peripheral equipment is planned for the near future. Mr. Peter Erb has been appointed Managing Director of the new European organization.

JOINT AGREEMENT ANNOUNCED BY CONTROL DATA AND BIOMEDICAL COMPUTER SERVICES, INC.

A joint announcement has recently been made by Control Data Corp. (Minneapolis, Minn.) and Biomedical Computer Services, Inc. (St. Paul, Minn.) of their agreement to cooperate in the development and implementation of total systems capabilities in the health care field.

Under terms of the agreement, Biomedical Computer Services will develop a total integrated systems design including applications and problem-solving techniques for the administration and operation of hospitals, physicians' offices, clinics, extended care facilities and other allied health care services.

Control Data will develop operating systems and related software communications capability for medical utilities employing CDC 6000 series super-computer systems.

UNIVAC OPENS SERVICE CENTERS IN HONG KONG AND BANGKOK

Last month, Sperry Rand Univac opened two new service centers, the Hong Kong Center and the Bangkok Center, each equipped with a UNIVAC 9300 computer system. The Hong Kong Center opened at the facilities of On-Line (H. K. Ltd.), a subsidiary of Wheelock Marden Company, Ltd. The second center in Bangkok is located in the offices of Summit Industrial Corporation, which is the distributor for Univac products in Thailand. Both centers will be used for service bureau operations, for equipment demonstrations, as back-up equipment for the use of local Univac customers and for personnel training.

NATIONAL COMMUNICATIONS NETWORK PLANNED FOR BUSINESS, EDUCATION

Microwave Communications of America, Washington, D.C., recently announced plans for a nationwide microwave network for business communications which could also serve to link educational broadcasting stations. A Federal Communications Commission hearing was held last December to consider a proposal by Microwave Communications, Inc. (MCI) for the low-cost educational communications network.

The network, reaching more than 11,000 miles through 40 states, would be used to transmit computer data, facsimile, radio and television signals, voice and teletype messages. The proposed network would be provided by 16 interconnecting regional microwave systems, each operating as an independent supplier of customized microwave channels on a common carrier basis. Initial cost of the basic network would be $150 million, with a projected growth to a $685 million system during the first two years of operation.

One of the regional systems already has received approval from the FCC. Microwave Communications, Inc. is proceeding with construction of its route between Chicago and St. Louis and should be in service by early summer. Five other MCI-type regional systems have applied for FCC licenses, and applications from the remaining 10 companies in the network will be made within the next six months, according to William G. McGowan, chairman of Microwave Communications of America. Assuming FCC approvals, Mr. McGowan estimated the full network could be in operation in three to four years.

Microwave Communications of America is a national service organization providing technical assistance in building and operating the proposed network. It also will serve as the national marketing organization for the various regional companies.

NEW COMPANIES

CADCOM, INC. (Computer-Aided Design COMpany), Annapolis, Md. / Service and design company specializing in the development of engineering applications software with emphasis on interactive programs.

TECNICA EDUCATION CORPORATION, San Carlos, Calif. / Specializes in the instructional use of computers, and other technologies, to enrich the learning process in elementary through secondary schools.

ACQUISITIONS

AUTOCOMP, INC., Bethesda, Md., a firm specializing in computerized information systems and automated photocomposition has acquired AUTOCODE, INC., a Washington-based firm which provides consulting services and applies computer technology to the codification of statutes and ordinances, municipal law and to government functions of all levels.

COMPUTER IMAGE CORPORATION, Denver, Colo., a leader in computer animation, has acquired LES WEISBRICH AND ASSOCIATES, INC., Beverly Hills, Calif., a leading graphics house.

EDP TECHNOLOGY, INC., New York, N.Y., engaged in developing and applying new systems and technologies (including computer technology) to problems in education, health, urban affairs and industry, has acquired COMPUTER SYSTEMS & SOFTWARE, Orlando, Fla., a firm engaged in computer system design, selection and programming for business, process control and communication systems.

VISUAL ELECTRONICS CORPORATION, New York, N.Y., a manufacturer and distributor of electronic equipment, has completed the acquisition of the RAYTHEON LEARNING SYSTEMS COMPANY.

MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND AUTOMATION

The following is a summary made by COMPUTERS AND AUTOMATION of reports and estimates of the number of general purpose electronic digital 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 information 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
C -- 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 installations 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 JANUARY 15, 1970

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Part II. Manufacturers Outside United States							
A/S Norsk Data Elektronikk	NORD 1	8/68	2.0	0	20	20	10
Oslo, Norway	NORD 2	8/69	4.0 (S)	0	2	2	3
(A) (Jan. 1970)							
A/S Regnecentralen	GIER	12/60	2.3-7.5	0	39	39	1
Copenhagen, Denmark	RC 4000	6/67	3.0-20.0	0	6	6	5
(A) (Jan. 1970)							
Elbit Computers Ltd.	Elbit-100	10/67	4.9 (S)	-	-	120	75
Haifa, Israel							
(A) (Jan. 1970)							
GEC-AEI Automation Ltd.	Series 90-2/10/20						
New Parks, Leicester, England	25/30/40/300	1/66	-	-	-	13	X
(R)	S-Two	3/68	-	-	-	1	X
(Jan. 1969)	130	12/64	-	-	-	2	X
	330	3/64	-	-	-	9	X
	959	-/65	-	-	-	1	X
	1010	12/61	-	-	-	8	X
	1040	7/63	-	-	-	1	X
	CON/PAC 4020	-	-	-	-	0	X
	CON/PAC 4040	5/66	-	-	-	9	-
	CON/PAC 4060	12/66	-	-	-	5	-
International Computers, Ltd. (ICL)	Atlas 1 & 2	1/62	65.0	0	6	6	X
London, England	Deuce	4/55	-	0	7	7	X
(A)	KDF 6 - 10	9/61	10-36	0	58	58	X
(Nov. 1969)	KDN 2	4/63	-	0	1	1	X
	Leo 1, 2, 3	-/53	10-24	0	59	59	X
	Mercury	-/57	-	0	13	13	X
	Orion 1 & 2	1/63	20.0	0	17	17	X
	Pegasus	4/55	-	0	30	30	X
	Sirius	-/61	-	0	22	22	X
	503	-/64	-	0	16	16	X
	803 A, B, C	12/60	-	0	83	83	X
	1100/1	-/60	5.0	0	22	22	X
	1200/1/2	-/55	0.9	0	68	68	X
	1300/1/2	-/62	4.0	0	196	196	X
	1500	7/62	6.0	0	110	110	X
	2400	12/61	23.0	0	4	4	X
	1900-1909	12/64	3-54	0	1233	1233	C
	Elliott 4120/4130	10/65	2.4-11.4	0	151	151	C
	System 4-30 to 4-75	10/67	5.2-54	0	105	105	C
							Total: 534
Japanese Mfrs.	Various models	-	-	-	-	4900 E	800 E
(N) (May 1969)							
Marconi Co., Ltd.	Myriad I	3/66	£36.0-£66.0 (S)	0	37	37	9
Chelmsford, Essex, England	Myriad II	10/67	£22.0-£42.5 (S)	0	17	17	12
(A) (Jan. 1970)							
Saab Aktiebolag	D21	12/62	7.6	0	37	37	-
Linkoping, Sweden	D22	5/68	13.4	0	15	15	10
(A) (Jan. 1970)	D220	4/69	9.8	0	1	1	10
Siemens	301	11/68	0.75	-	-	13	C
Munich, Germany	302	9/67	1.3	-	-	23	C
(A)	303	4/65	2.0	-	-	71	C
(Jan. 1970)	304	5/68	2.8	-	-	38	C
	305	11/67	4.5	-	-	47	C
	306	-	6.5	-	-	-	C
	2002	6/59	13.5	-	-	41	C
	3003	12/63	13.0	-	-	38	C
	4004S	-	4.0	-	-	1	C
	4004/15/16	10/65	5.0	-	-	86	C
	4004/25/26	1/66	8.3	-	-	34	C
	4004/35	2/67	11.8	-	-	139	C

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Sperry Rand Corp., Univac Division, St. Paul, Minn.	U.S. Army Test and Evaluation Command, White Sands Missile Range, N.M.	Five UNIVAC 1108 and seven UNIVAC 418-II computers for use in the missile range's TEAM-UP (Test Evaluation Analysis and Management Uniformity Plan) program	$16.7 million
Cybermatics Inc., Fort Lee, N.J.	Western Union	"On-line" computer software services; contract calls for the design and implementation of software improvements for Western Union's national multi-computer data communications system	$2.4 million
Data Products Corp., Los Angeles, Calif.	Recognition Equipment Inc., Dallas, Texas	Computer line printers (4000 Series) for use in conjunction with REI's optical character recognition equipment	$1.9 million
Sylvania Electric Products Inc., a GT&E subsidiary, Needham, Mass.	U.S. Navy, Naval Air Development Center, Johnsville, Pa.	Design and development of a digital signal processor and display system for use in conjunction with the Navy's anti-submarine warfare research program	$1.3 million
Control Data Corp., Minneapolis, Minn.	U.S. Navy	Installation of seven CDC data collection systems at Naval Air Rework Facilities (NARF) throughout the country	$1 million
Uni-Tote, a division of General Instrument Corp., Towson, Md.	Liberty House, Hawaii	A Uni-Tote system of inventory control and credit authorization — order is for the largest Uni-Tote system ever sold outside the continental United States	$1 million (approximate)
Lehigh University, Bethlehem, Pa.	National Science Foundation (NSF)	Research project; enables team of scientists at Lehigh to train "talking computer" (known as LEADER) for use in science and engineering libraries, and biomedical communications systems	$1 million
COMCET, Rockville, Md.	Aluminum Company of America, Pittsburg, Pa.	Two COMCET 60 and two COMCET 10 Systems with associated peripheral subsystems to serve as frontend for an IBM 360/65 System and will process communications traffic	$900,000+
Ampex Corp., Culver City, Calif.	Western Electric Company	Modified Model TM-7 digital tape drives for use in two Bell System programs	$600,000
Westinghouse Electric Corp., Pittsburgh, Pa.	Department of Transportation, National Highway Safety Bureau	Design of an information network aimed at improving state and national highway safety programs	$488,264
Aspen Systems Corp., Pittsburgh, Pa.	State of Michigan	Preparing a compilation of the state laws current through 1970, completely integrating the Michigan Compiled Laws of 1948 and all subsequent session laws; state's Administrative Rules also will be computerized	$435,000
COMCET, Rockville, Md.	City and County of San Francisco	A COMCET 40 System to serve as the communications frontend to their combined data processing facility	$320,086
Precision Instrument Co., Palo Alto, Calif.	U.S. Naval Supply Center, Oakland, Calif.	Tape recorders which will be installed in portable GCA landing control huts in helicopters	$300,000+
Aspen Systems Corp., Pittsburgh, Pa.	State of Indiana	Creating the official compilation of the Indiana laws back to 1852; file will be used by legislature for bill drafting and later codification of Indiana law	$132,000
Alpha Data, Inc., Tarzana, Calif.	Data General Corp., Southboro, Mass.	A long-term OEM agreement for the purchase of Magnetic Disc Memory Systems to be used with Data General's NOVA computers	—
Applied Peripheral Systems, Inc., Houston, Texas	General Time Sharing, Inc., New York, N.Y.	100 DATA GAIN(D) DG-4 data entry terminals which will be used to provide low cost numeric data entry to the General Time Sharing system via telephone lines	—
Addison-Wesley Publishing Co., Reading, Mass.	IBM Corporation, Armonk, N.Y.	A five year project to produce a 16-20 volume text-reference series on systems programming	—

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Siemens (cont'd)	4004/45	7/66	19.8	-	-	130	C
	4004/46	4/69	34.0	-	-	3	C
	4004/55	12/66	25.8	-	-	14	C
							Total: 224
USSR	BESM 4	-	-	-	-	C	C
(N)	BESM 6	-	-	-	-	C	C
(May 1969)	MINSK 2	-	-	-	-	C	C
	MINSK 22	-	-	-	-	C	C
	MIR	-	-	-	-	C	C
	NAIR 1	-	-	-	-	C	C
	ONEGA 1	-	-	-	-	C	C
	ONEGA 2	-	-	-	-	C	C
	URAL 11/14/16	-	-	-	-	C	C
	and others	-	-	-	-	C	C
						Total: 6000 E	Total: 2000 E

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B500 system	New Britain Bank and Trust Co., New Britain, Conn.	Demand deposit accounting, update loan balances, extend Christmas Club balances, print statements and process checks and encoded documents (system valued at $300,000)
Burroughs B2500 system	County Courthouse, County of Delaware, Media, Pa.	Countys' retirement fund, voter registration, domestic relations and court scheduling, a real estate package auditing system, and payrolls for seven counties (system valued at over $350,000)
	Dow Badische Co., Anderson, S.C.	Applications ranging from administration of inventory and payroll to statistical analysis and process support
Burroughs B3500 system	Data Associates, Inc., Washington, D.C.	Expanding capacity in servicing customers; allows linkage coast to coast for client applications (system valued at $1 million)
	Royal National Bank of New York	Demand and time deposit accounting, transit and many special services (system valued at over $920,000)
Control Data 1700 system	Institute of Medical and Veterinary Science (IMVS), Adelaide, South Australia	Automating IMVS's pathology operation, the main function being to supply analytical data on specimens submitted by hospitals, clinics and doctors
Control Data 3200 system	Norwegian Water Resources and Electricity Board, Oslo, Norway	Statistical, technical and administrative data processing
Control Data 3300 system	Ishikawjima Harima Heavy Industries, Ltd. (IHI)	Production planning and control and for business data processing as well as program development
Datacraft DC 6024 system	Southern Systems, Inc., Hallandale, Fla.	Batch processing computer services in the construction industry; will be up-graded for time-sharing applications in the near future
Digital Equipment PDP-12 system	Ames Company, Division of Miles Laboratories, Inc., Elkhart, Ind.	Monitoring and controlling basic research experiments; also non-routine research situations
Honeywell Model 120 system	Goodstein Brothers, Inc., New York, N.Y.	Order analysis, production control, payroll, billing accounts receivable, and general ledger accounting
	Teenform, Inc., New York, N.Y.	Order writing, invoicing, inventory, sales forecasts
Honeywell Model 125 system	Instrument Systems Corp., Huntington, N.Y.	A variety of financial and manufacturing applications
Honeywell Model 1200 system	Jaymar-Ruby, Michigan City, Inc.	Expanding current computer applications and developing an order allocation system using CRT devices
Honeywell Model 1250 system	Berkshire Apparel Corp., Malden, Mass.	Order processing, production control, analysis reports of market penetration, salesman performance and profitability
IBM System/360 Model 20	Colonial Candle Company of Cape Cod, Inc., Hyannis, Mass.	Inventory control, order entry, accounts receivable and invoicing
IBM System/360 Model 40	Zale Corp., New York, N.Y. (2 systems)	Helping handle task of stocking 800 stores across the nation with gems and precious metals purchased from vendors all over world; ZOOM (Zale Operating On-Line Merchandising) system also calculates price changes and prepares "model" inventories for different types of stores
IBM System/360 Model 65	Princeton Time Sharing Services, Inc., Princeton, N.J.	Upgrading capabilities by over 300 percent; high-speed remote job entry of programs and data from customer locations will be principal feature
IBM 1130 system	Scientific Computer Service Corp., Anchorage, Alaska	Time-sharing services (first in Alaska) and when not in use as a time-sharing system, for normal service bureau operations
NCR Century 100 system	Essex County, N.J.	Payroll, appropriations accounting, pension payments, tax assessment, voter registration among many uses
	First National Bank, Holland, Mich.	Demand deposit accounting; also outside work such as Medicare billing for hospitals
	Knapp and Vogt, Grand Rapids, Mich.	Production control, inventory control and bill-of-materials processing
NCR Century 200 system	McHenry Hospital, Illinois	Payroll-personnel accounting and out-patient billing for an adjacent clinic associated with the hospital
	University of Bridgeport, Bridgeport, Conn.	The nucleus of future experimentations in Computer-Assisted Instruction; currently used for student scheduling, grade reporting, administrative tasks
UNIVAC 1108 system	University of Lund, Southern Sweden	Research and education
	University of Trondheim, Norway	Research, various educational purposes, and university administration
UNIVAC 9200 system	Bryan Utilities, Bryan, Texas	Billing for all electricity, water, garbage and sewer services provided by the city; replaces tab equipment
UNIVAC 9300 system	American Management Systems, St. Louis, Mo.	A wide variety of customer applications, including invoices, payroll, general accounting
	University of Arizona, Tucson, Ariz.	Student registration and other business applications
UNIVAC 9400 system	Appalachian Regional Hospitals (ARH), Lexington, Ky.	Expediting existing business operations (includes payroll processing, general and statistical accounting, drug inventory, medical statistics, research programs) and adding new applications which will include patient billing and inventory control

C.a PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 702: A TOSS OF THE COIN

"I know there are guys who have made a fortune in computer stocks, but I bet there are a lot more who've lost a bundle." Larry didn't sound very happy as he looked at the stock market quotations.

"You're one of those who has lost a bundle, I suppose," Mike said.

"Well, I haven't taken too big a loss, but what gripes me is that I could be showing a profit today if that coin had turned up heads."

"How's that?"

"A year ago I figured Dynamem and Picotronics were equally good candidates for appreciation. The earnings were increasing at about the same rate, sales prospects were about the same; in fact, the two were so evenly matched I ended up tossing a coin. It fell tails and I bought Picotronics even though it was ten dollars a share more."

"If they were so evenly matched why weren't they both selling at the same price?"

"Well, the actual earnings were different although the rate of increase was about the same, so that they seemed equally good prospects for growth."

"How did your investment turn out?"

Larry looked at some figures on his scratch pad. "Picotronics is selling for exactly 20% less than when I bought it," he said.

"And Dynamem?" Mike asked.

"That's selling for 10% more than it was a year ago. Actually, it's 5/8 of a point more than Picotronics now."

How much are the two stocks selling for now?

Solution to Problem 701: Oh, Say Can You "C"?

The program computes the value of $\cfrac{1}{2+\cfrac{1}{6+\cfrac{1}{10+\ \ldots}}}$

which is equal to $\frac{e-1}{e+1}$. To five decimal places this is .46212.

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.

Kingman Brewster, Jr.

(Continued from page 32)

Pastore Bill which would make it harder than ever for a newcomer to compete for a franchise. And we should arouse ourselves against the current efforts to exempt the joinder of newspapers from the antitrust laws. If we would reopen the closed society, we should absolutely prevent the merger or joint ownership of different media. Why should a town be locked into a jointly owned newspaper and television station? We should also consider requiring advertisers or commercial networks to contribute a small percentage of their outlays or revenues to the financing of non-profit community and educational television.

There are ways of breaking open the closed loop of corporate, opinion-making, and political power. The closing society could be reopened. The ancient faith in the free competition of ideas and interests and viewpoints could be revived. But it will happen if, and only if, we make it our cause.

If there appears to be no escape from this loop of social control, however; if there seems no easy way to break into the power circle, it is inevitable that "confrontation" and "pressure" should increasingly become the instruments of those who are frustrated.

If the system is not convincingly open to newcomers and is not open to change, our plea to the radicals to "work through the system" will not get very far.

The flame of the ancient faith burns bright here in your state. . . . But the flame will not burn long if you and your generation do not make the spirit of the Bill of Rights and the spirit of the antitrust laws your cause, and give the openness of society a higher priority than affluence or technological efficiency.

It is up to you to reopen the closing society so that we may retain a system which is convincingly open to everyone to work through. □

ADVERTISING INDEX

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

Practically prodigious is the Interdata family of computers now available with our unique Mass Core Memory.

It's Practical: For the first time low cost Mass Memory is available with a powerful 3rd generation computer for those jobs requiring large core resident programs. This offers you greater reliability and operating simplicity than any comparable peripheral storage unit.

It's Prodigious: Teamed with an Interdata General Purpose or Communications Processor you have 65K *directly addressable* bytes of memory, over 75 standard instructions, 16 general registers, a host of options and lots of Firmware. In addition, the full Interdata software library is compatible with Mass Memory Systems.

Send for all the facts or call the sales office nearest you. Who knows? Perhaps you'll find our Mass Memory Prodigiously Practical.

Practically Prodigious

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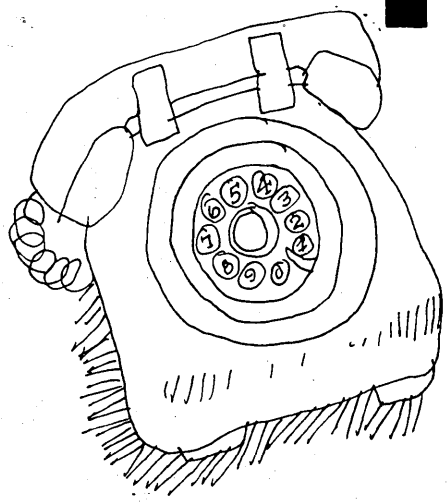

Your fingers do the talking

You can actually time-share an IBM APL/360 Terminal System over the telephone. Just dial the system direct and type in on your own computer console. The computer will type out the correct response instantly.

Complete control is yours

The system allows continuous hands-on-time programming right at your desk. With simple on-line alteration of a program statement. And immediate on-line test of a program alteration.

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