SCIENCE & TECHNOLOGY

January, 1971

Vol. 20, No. 1

computers and automation

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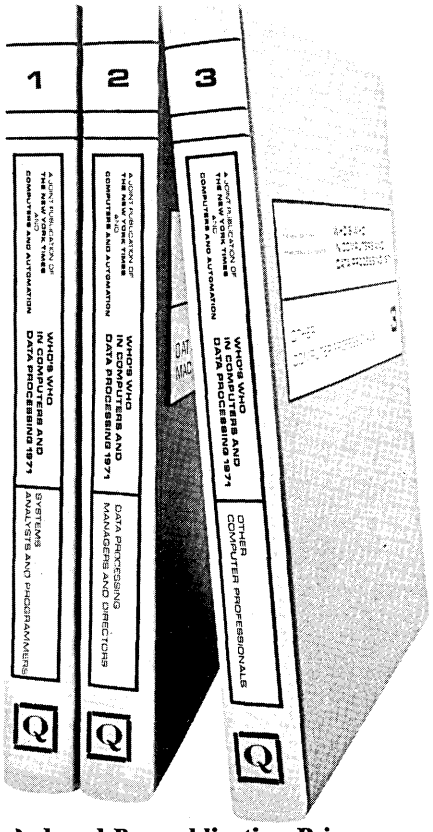

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computers and automation

Vol. 20, No. 1
January, 1971

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The magazine of the design, applications, and implications of information processing systems.

This Month's Cover

The decision to grow the carnations shown on the front cover was "made" by a computer program. Burgett Floral Co., Cloudcroft, New Mexico, used an IBM 1130 computing system to analyze cyclical sales patterns, costs, production rates, disease factors, and spoilage rates. The computer "concluded" that carnations and roses were in greatest demand, and most profitable, for the company to grow. The company also uses its computer to monitor temperature and humidity control devices and to remind company officials when to order, plant, fertilize and top flowers. Burgett annually produces five million flowers.

Departments

Key

[A] — Article
[C] — Monthly Column
[E] — Editorial
[F] — Readers' Forum
[R] — Reference Information

Books, Computers, and the Great Future

One way of thinking of a computer is to think of it as a kind of book.

Output. A book (for example, in Russian) contains information which you can read, provided you know the spoken language (Russian), the alphabet (of Russian), and can pronounce the alphabetic signs (in context) which spell the designated words. In the same way a computer contains information which can be output usefully, provided you know the set of operations by means of which the computer will produce the information you desire.

Input. You can put information into a book. For a simple example, you can make entries in your date book, or put notes into a notebook, or even write a manuscript which a publisher will print as a book. In the same way, you can put information into a computer – give it data and programming by means of which later you can get useful information out.

Storage. You can store information in a book. In fact, a book is a magnificent way of storing information. The sheets of paper it comprises can be easily impressed with marks that will stay a few days or a few centuries. The sheets of paper with their marks can be easily duplicated in quantity and spread all over the world. You can store information in a computer, not as well all in all, but effectively. Of course, most of the time the storage cannot be sensed by human beings; only by magnetic changes and electronic pulses can human beings find out the information stored in the computer. But the techniques are becoming so widespread that one nowadays hears few complaints that "you cannot see what is in the computer."

Calculation. You can calculate with a book. Books are full of tables of results – for many varieties of combinations of many kinds of data. In this way they effectively provide many calculations that exactly fit the requirements. A great many more calculations than those stored in books can be done by a man with a book of factors in his pocket and some rules for estimating stored in his brain. In this way the man may be ready to inspect, and approve or disapprove, all kinds of calculated results.

However, a computer really comes into its own when it is a matter of calculating and deciding about more elaborate cases than can ever be tabulated in books or decided by educated inspection.

Ideas. But when we think of ideas, of knowledge, we think of books.

The knowledge written down and printed in books is still the foundation of all present-day civilization. This is true for many reasons. First, quantity: The amount of useful information recorded in print is enormously greater than the amount of useful information expressed in all the other ways put together. Any story, epic, adventure, idea, principle, science, philosophy, art, technique, discovery, technology, once written down and printed, can be read, studied, and learned from books. Second, accessibility: It is quite easy and cheap to get or borrow a copy of almost any book on almost any subject whenever you want to read it – far easier and cheaper than to obtain access to a computer and communicate with it. Third, convenience: You can take what the book says into your own mind at your own time at your own speed: if you want to hurry and skip, you can; if you want to read it over and over until you know it by heart, you can; if you want to read it on a commuting train in the morning, you can. In a book you can communicate with another mind, not at his speed or convenience but at your own. Fourth, quality: In books, the greatest men who have ever lived, the best experts, the most informed authorities, can offer you answers for your questions, instruction in the subjects you are most concerned with, guidance in the problems that rack your spirit, and far more. Fifth, vicarious experience: You and I will probably never climb Mt. Everest, or survive the sinking of an ocean liner, or look through a porthole at a kind of starfish seven miles down in the Pacific Ocean. We shall certainly never flee from Pompeii while Vesuvius erupts, or accompany Charles Darwin on the survey ship Beagle around South America. Yet reading a book at our leisure, we can become oblivious to the real world around us and feel and imagine ourselves having such experiences. The treasury of the wisdom and knowledge of the world is in books. And the gateway is open to anyone who can read.

The computer field is still enormously involved with machinery, circuits, equipment, optical character reading, interfaces, modems, maintenance, etc., etc., etc. But we can predict that as the years pass, all this will fade into the background, and the foreground of attention will be the content and ideas of computer programs and data bases, the knowledge they contain, and the power to answer questions which they express.

Which is more important – the manufacture of books or the content of books? – the manufacture of computers or the content of computers? The answers are obvious.

So we can confidently predict that the computer field in the future will be something like an automatic social mind containing concepts, ideas, programs, systems, and other intellectual constructs by means of which almost all knowledge, and records of experiences of almost all kinds, can be studied, investigated, manipulated, summarized, and communicated to individual human minds. The treasury of the knowledge of the world will become automated.

Here is where the future lies.

This view outward bound is very exciting. This development may even contain the solutions to many giant problems which human beings of today, with their own little abilities, and their even more limited memories, and their slowly accessible, passive, storehouses of books called libraries, cannot be expected to solve.

Edmund C. Berkeley

Editor

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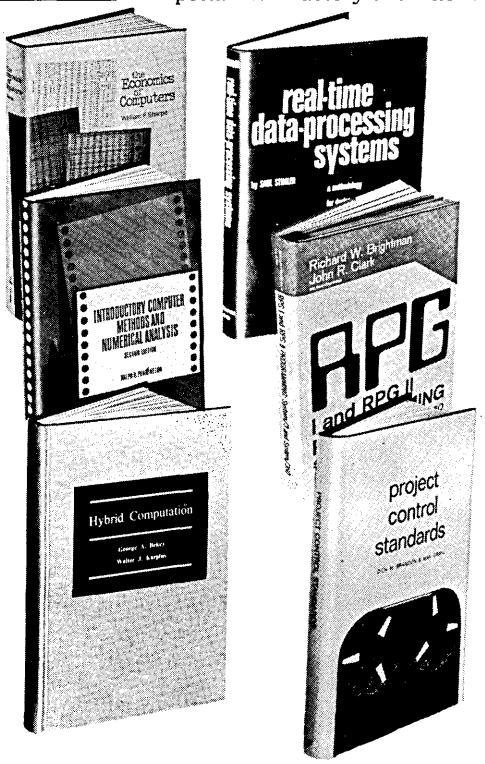

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READERS' FORUM

"RESPONSIBLE JOURNALISM" — COMMENT

Clark Squire, Panther 21
Rikers Island Prison
New York, N.Y.

Re: "Responsible Journalism" [editorial in the November, 1970, issue of "Computers and Automation", page 7 — and the article, "The Life and Times of Clark Squire: Computer Programmer, Black Panther, Prisoner" by Joseph Hanlon, in the same issue, page 36]

For any other reason, than the attack by "your colleague in the computer field" on the veracity of the "C. Squire: Programmer, Panther, Prisoner" article, I would not respond. Even had I written the article, I would feel no overwhelming need to respond. But the article was written by Joseph Hanlon with no collaboration on my part. I was simultaneously preoccupied with a fight for my life on three fronts, namely, (1) the Branch Queens jail rebellion, (2) the current court trial and (3) isolation in maximum security at Rikers Island prison. An attack on the credibility of the article is also an attack on the credibility of Joe Hanlon. So I feel compelled to respond.

I have never met Joe Hanlon personally. I read the article for the first time in the November, '70 issue of Computers and Automation. Lately I have had an abundance of exposure to the veracity of the established press. This stems from actually being involved in various day to day events (i.e., pretrial hearings, court trials, jail conditions, prison rebellions, etc.) and then reading about these same events in the established press, including the objective N. Y. Times. Needless to say, the facts are not all "that's fit to print".

After reading your colleague's criticism, I went over the article with a fine tooth comb. I came up with the following errors —

1. In March, 1969, Clark Squire was earning $17,000 per year, he was married, had a young child, and *had no criminal record.*

I had prior convictions on 2 misdemeanors, both were politically associated.

2. In all, the police reported that they found: six pistols, four rifles, a *shot gun,* a switch blade knife, and a dagger; *components and explosive powder for one time bomb;* thirty feet of detonating fuse; and pipe and powder that could be assembled into three other bombs.

The Police did report this. But since we are dealing with veracity, the correct number of shot guns is two. The claim of components and powder for one time bomb is false. This probably resulted from pretrial hearing attempts to introduce an alarm clock as time bomb components or a crayon drawing of a clock face by one of the defendants' seven year old son as a time bomb diagram; both items were rejected even by Judge Murtagh.

3. On *April 3,* a grand jury returned an indictment charging 21 Panthers . . . . .

The correct date is April 2.

4. Also, Jane Alpert and David Hughey, white radicals accused of several bombings, were released on *$25,000* bail each.

The correct bail figure is $20,000 each.

5. For the Panthers, ... were separated into *four* different jails so they could not talk to each other and could not meet as a group with their lawyers.

The correct number of jails is seven.

This is *every* error, including even the smallest and least significant error, that I could find in the entire article. All remaining parts are completely true in every detail.

For Joe Hanlon to complete in one month a lengthy uncollaborated article on such a controversial subject spanning 19 months of the Panther 21 arrest, trial and 13 years into my background with only a few insignificant errors, is a remarkable feat. From my experience, it is a phenomenon rarely duplicated by reporters in the establishment press.

Anyone criticizing an article on its credibility ought to back up their criticism with facts, but nevertheless has a right to their own opinion. This is what makes the world go around and I definitely support revolution. If your colleague, who doubts the credibility of the article, can document even one significant error in the entire article

other than the relatively minor ones I have already pointed out, then I would consider his criticism of some validity. Otherwise I tend to doubt the sincerity of his criticism and think that he does not believe the article – because he does not want to believe it, that he does not want to investigate the facts and what really disturbs him is the spectre of Black reality exploding into his serene, aloof, air conditioned, panoramic view, raised floor, show case computer profession.

I also suggest to your colleague that the only computer that will lead us closer to justice is man.

NATIONAL ASSOCIATION FOR STATE INFORMATION SYSTEMS

Daniel B. Mcgraw
President, National Association of State Information Systems
Assistant Commissioner
Department of Administration
State of Minnesota

About four years ago the Council of State Governments established a Committee on State Information Systems in recognition of the growing importance of information systems and computerization in the affairs of state government. A year and a half ago the Council authorized the establishment of NASIS as a CSG cooperating agency.

During this period the impact of information systems and computerization on state government has grown enormously. NASIS has had some part in and influence on that growth. Much of this influence has come through the personal relationships that have developed within the NASIS membership, among both executive and legislative personnel.

The needs and the opportunities for NASIS to strengthen its leadership role are demonstrated daily. Through the financial assistance of OEO and a number of the States, we can now take the initiative in furthering our program. A major step was taken when Charles R. Rowan agreed to serve as Director of Staff Services for NASIS beginning August 15, 1970. We now have a competent, full-time staff person to assist in accomplishing our objectives.

Some areas in which our efforts can be fruitful are those subjects in which our committees are presently operating: Standards, Federal-State Relationships, Inter-branch Liaison, Research and Education, Local Government Liaison, and Data Security and Privacy. Each of these encompasses large and important tasks.

A further area of activity is methods whereby we may give advice and assistance to States in information systems organizational and policy problems.

Many State computer activities have strong assets in the form of good programs that may be directly or indirectly valuable to other States. Already some of us have received direct, valuable assistance from other States. NASIS has the ability to assist the actual transfer of extremely valuable assets between and among States. These are not just "free advice" but are effective computer systems that may save hundreds of thousands of dollars and, prevent years of lost time.

We need, therefore, to develop methods to assure knowledge of these available assets and to increase their utilization.

Committee chairmen named by President Magraw:

Federal-State Liaison:
Robert E. Scharg, New York
Standards:
George H. Roehm, Michigan
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Dr. Charles P. Smith, California
Inter-Branch Liaison:
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– From Vol. 1, No. 1 of "Newsletter"
National Association for State Information Systems
c/o the Secretariat, Council of State Governments
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'INSTANT INSANITY' — MORE COMMENTS

M. B. Rawlings
Bakkevej SIA
2830 Virum
Denmark

I enter the Instant Insanity debate rather late.

I tackled the problem some time ago, intermittently between September 1968 and February 1969 using 360 DOS Assembler. My main interest in the number of possible combinations was an initial concern about the amount of computer time I might require, and I incorporated interrupt and restart routines!

In fact the theoretical maximum (whether 8 or 16 million) is irrelevant, since there is no point in rotating cube number 3 until cubes 1 and 2 satisfy the conditions. Similarly cube 4 need not be rotated for every position of cube 3, and of course this is how the puzzle should be tackled manually. What is more, when a human being finds a solution, he derives no additional satisfaction from rotating the whole stack about a longitudinal axis, nor from laying down the stack and rotating each cube 180° about a vertical axis.

Thus the efficient computer program considers only 3 attitudes for the 1st cube (mine tried all 24) and tests all 24 positions of the second cube against each. Whenever a potential solution is found, cube 3 is rotated 24 times, bringing in cube 4 as appropriate. After 24 turns of cube 3 it is 'reset' and cube 2 resumes.

On this basis the actual number of combinations examined only runs into thousands, and this depends of course on the choice of colours. The two sets of cubes which I met in England were identical and produced only one basic solution in eight variations. My program counted the number of rotations of each cube, and the time between solutions; unfortunately I no longer have the printout. The job was printer-bound on a System 360 model 40. □

THE IEEE COMPUTER SOCIETY

I. John L. Kirkley
Administrative Office
IEEE Computer Society
16400 Ventura Blvd. Suite 321
Encino, Calif. 91316

On January 1, 1971, the Computer Group of the Institute of Electrical and Electronic Engineers, Inc., became the IEEE Computer Society.

The change in status recognized the Group's rapid growth, its wide range of member services, and the importance of the computer and information technology field in general. On the January 1 change-over date, the Computer Society had well over 17,000 members.

Professor E. J. McCluskey, Director of the Digital Systems Laboratory at Stanford University, is currently Group chairman, and the nominee for President of the IEEE Computer Society.

Following is a statement from him.

II. E. J. McCluskey, Director
Digital System Laboratory
Stanford Univ.
Stanford, Calif.

Historically the IEEE Computer Group evolved from two committee activities of the American Institute of Electrical Engineers and the Institute of Radio Engineers. These were the Computing Devices Committee and the Professional Group on Electronic Computers, respectively. The membership of these two organizations consisted essentially of professionals educated as electrical engineers who happened to be working on computers or to be interested in them. The committee type of organization was appropriate for these engineers and worked reasonably well. As a result of maintaining its position within the IEEE, the IEEE Computer Society will be able to continue to serve these "electrical engineers specializing in computers."

The changes which we hope to implement are aimed at increasing our ability to serve a different type of member. Specifically, the innovations should be most significant for that newer type of professional who regards himself as a computer engineer or scientist rather than an electrical engineer. An increasing number of such individuals are being educated in computer science or engineering curricula. Also, many people who received their formal educations in diverse disciplines now work as full-time computer engineers. By providing such individuals the opportunity to become full members of the Computer Society without requiring them to join the IEEE, it is hoped that we will be able to provide a better organization for them while maintaining our service to our more traditional type of member. With this broader type of membership, the committee type of organization no longer seems appropriate. For this reason the changes in structure and names are being made.

Information on membership in the Computer Society can be obtained by writing the Society's Administrative Office, address above.

CALL FOR PAPERS --
IEEE COMPUTER SOCIETY CONFERENCE, 1970

The theme of the fifth annual IEEE Computer Conference, to be held at the Sheraton-Boston Hotel, Boston, Massachusetts, September 22-24, 1971, is:

HARDWARE, SOFTWARE, AND FIRMWARE TRADE-OFFS

Papers should relate to the engineering and design problems of trade-offs between hardware, software, and firmware, and the use of system methodology for resolving design questions. The rationale for design choices, rather than particular implementation techniques, is of primary interest.

Typical major subject areas, which may serve as themes for particular sessions include:

- Modeling and Measurement Techniques
- Analysis of Memory Hierarchies
- Hardware and Software for High-Availability Systems
- Communication-Network Analysis and Design
- Operating-Systems Tuning
- Systems Requirements for Terminal Based Systems
- Program Compatibility, Conversion and Emulation
- Optical Character Recognition and its System
- Computer-Aided Design of Computers and Their Components

Conference presentations will consist of both invited and solicited papers. Submitted papers will be evaluated by referees. A written digest and major illustrations summarizing the proposed paper should be submitted for review by April 30, 1971.

Send a single typewritten copy of the digest of the paper to:

1971 IEEE Computer Conference
P. O. Box 245, Prudential Station
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THE INTERACTIVE TIME-SHARING MARKET

Joseph Levy
Frost and Sullivan
106 Fulton St.
New York, N.Y. 10038

The interactive time-sharing market was $10 million in 1965; climbed to $180 million in 1969; and will rise to $1.5 billion by 1975.

This is one of the main conclusions and predictions of an analysis and forecast of this market which we have just finished and published in a report. There are approximately 175 companies in the time sharing business; 150 of them started in business within the last three years.

Personnel constraints, cost escalation, the availability of independent software firms, and new hardware and software have enabled and encouraged many large companies to buy time-sharing services for an increasing portion of their needs in data-processing.

(Please turn to page 13)

(Continued from page 10)

The report includes market projections for time sharing, for central processing units, memories, communications, and other peripheral equipment.

Computer hardware sales are expected to reach $25.4 billion in 1975. The number of computers with remote terminals will increase to 25% of all installations by 1975. Software services will soar to $8.5 billion.

We shall be glad to furnish more information about our analysis and report. □

ACCESS TO ONE'S OWN RECORDS

Bruce Madsen
10332 East Lake Road, RD-1
North East, PA 16428

I hope Professor Gotlieb (see "Computers and Automation", September, 1970) can clarify a point in his article for me. When "... is [it] not desirable for a person. . .to have access to his complete record (as might be the case with a doctor's report)"? (Page 16, bottom, left column).

At one point I was refused any access to my medical record at a health center I had not visited in two years. Another health center refused to send my record to anyone but "my family doctor". These restrictions have created gaps in my medical record which (theoretically) could cost my life.

When is it desirable for an individual to be ignorant of himself? Who is qualified to judge what another individual should not know?

"COMPUTERS AND AUTOMATION" — SOME VIEWS

I. From Michael Richter

1378 Morningside Way
Venice, CA 90291

In several years in both software and hardware management, I had never encountered *Computers and Automation.* Two months ago, the office copy was routed to me, and now I have the November issue as well. Where had you been hiding?

Enclosed are a copy of your subscription card and my personal check for $18.50. That will cover, I believe, one year's subscription (excluding the Computer Directory and Buyer's Guide) and one copy of each of the May, July, August, and September issues. Your articles on Computers, Science, and Assassination seem to be of value not only in themselves, but also as representative of the efforts responsible engineers and scientists should be undertaking to advance humanity and human interests outside of aerospace and business. I am looking forward to reading the series.

Incidentally, and trivially, Numble 7011 appears to read "Offended self-esteem will never forgive." And pity 'tis 'tis true.

Also, the solution to Problem 7011 (Octal 107 = Decimal 071) that I come up with seems curiously coincident with the problem number. Is the solution unique? It appears to be, but there is no obvious proof for *n* digits.

Finally, is it practical to begin my subscription with the November issue so that I have also a copy of "Confidential and Secret Documents . . ." to complete the set to date? Thank you for your journal, and for your assistance in my request.

II. From the Editor

Thank you for your interest and your subscription.

We do believe that much of what we publish expresses your philosophy, "to undertake to advance humanity and human interests outside of aerospace and business."

The solution to Problem 7011 includes at least one more case. See the department Problem Corner in C & A.

It is "practical" to begin your subscription with the November issue – and we are sending you the October issue gratis since that one also contains information on "computers, science, and assassinations".

III. From Arthur E. Gardner

Technical Innovation Inc.
6331 Hollywood Blvd.
Los Angeles, CA 90028

We were pleased to receive your letter expressing interest in the Comprint 90 paper presented in New York last month.

As requested, a copy is enclosed.

As a long standing subscriber to "Computers and Automation," I would like to take this opportunity to compliment you for the very fine job you have been doing with the publication for so many years.

IV. From the Editor

As someone has said: If you like what we are doing, please tell your friends – if you do not like what we are doing, please tell us.

Not every part of a magazine can be useful to every reader. But it should be possible each month to put into a magazine at least some information of interest and importance to almost any reader.

As we enter our 21st year of publication, the goals we have for "Computers and Automation" are high. To attain them may be beyond our powers. An economic depression and storm is sweeping through American business. This depression was essentially initiated by President Nixon's decision, called "Vietnamization", to continue to pour billions of dollars into the war in Indochina and into the pockets of the corrupt Saigon régime of Thieu, Ky, and Company – instead of devoting that money to meeting overdue domestic requirements in the United States. The economic storm is particularly devastating in the computer field, and is reducing many computer magazines to one third of what they used to be.

But as advertising in "Computers and Automation" has shrunk, we have filled up our vacant space with more articles and more editorial matter. Our issues are almost the same size as they used to be. We can do this because we survive on paid subscriptions from readers who really want our magazine.

To continue to publish we need subscribers: If you like what we are publishing – please persuade at least one or two of your friends to subscribe. (Their money back, if they are not satisfied.) And if you do not like what we are publishing, please give us the benefit of your suggestions and comments.

THE EDP MANAGER—

AND THE COMPUTER PROFIT DRAIN

"The average computer installation in the United States uses its equipment productively less than half the time it is available."

Walter J. Schroeder, Principal
A.T. Kearney & Co., Inc.
100 S. Wacker Dr.
Chicago, Ill. 60606

Part 1
The Present and Future Status of the EDP Manager in the Corporate Organization

The status or condition of the EDP manager can be viewed from various perspectives:

1. We could look at his status vis a vis other top corporate management positions in the organization.
2. We could review the status of the EDP Manager from the view of the public. Much has been said on that subject in the press recently.
3. We can inspect his status from the perspective of the computer professional's expectations for the position.

It is the third perspective that I have chosen for my theme. Compared with the expectations of the field, how has the EDP Manager fared in the corporate organization and what is the prognosis?

A Look at the Past

In order to do this it is necessary first to take a brief look at the past. Predictions concerning the future of the computer are not difficult to find. Everyone it seems has at one time or another felt compelled to make a prognostication about where electronics would lead us in managing business enterprises. It is an intriguing fact that about the only major forecast to be achieved was the number of computers installed. There we have exceeded expectations.

But in other, more fundamental aspects, the predictions have largely failed to materialize. Consider some of the following which were widely held beliefs during the 1960's:

1. That there would be a reduction in the numbers of middle-management personnel required by corporations as the computer began to take over routine decision-making functions. There is certainly no evidence to support any conclusion this has been achieved. If anything, there are more middle-management positions today than there were five years ago.
2. That profitability and return on investment will improve when EDP functions fulfill their primary purpose of providing faster and better information. High-speed information should result in better management decisions and improved performance. Although there are some instances where improved information has lead to improved performance, I can name many more where it did not come to pass.

What many top management people and most EDP personnel have overlooked is the fact that decisions are made by people. If people are going to become more effective, they not only need good information but:

(a) they need to be motivated to change, and
(b) they need to be taught how to change.

Few EDP functions adequately address this problem, let alone even recognize it as the really fundamental objective of their activity. In case after case, from hundreds of interviews and consulting assignments in this field, I have found the EDP manager turning more and more into a technician and less and less into a business manager.

Many people have believed that the EDP manager, by virtue of his analytical training and understanding of the business through the information systems, will become the general manager of the enterprise. A few EDP managers have crossed the barrier into the ranks of functional or operations management positions. Most of these are in staff jobs and only a very few are in line positions. Those who achieved top management did it mostly by starting their

Walter J. Schroeder is a Principal with A.T. Kearney & Co., Inc., an international management consulting firm. During his five years with the company, he has had a wide variety of assignments in all aspects of production and inventory control, electronic data processing, systems planning and control, management information systems, corporate organization studies, physical distribution, operations research, and management sciences.

Prior to joining Kearney, Mr. Schroeder served as Vice President of Management Services for Massey-Fergusson Inc., and held several accounting, operating, and merchandising positions with other companies. He holds a B.S. degree from Marquette University, and is a member of the Board of Directors of Guide International.

own businesses in the EDP service industry. A large number of these have proven to be less than sufficiently capable – as testified by the large number of business failures in this industry.

Lack of Training for Business Management

My own observation is that, in general, there is little about the systems and data processing field which trains a man to join future top management of the company. He learns little about the true nature of competition, choosing product or pricing strategies, and the use of risk capital. Many in the EDP field have become so engulfed with the hardware and software they do not even relate well with their fellow men – an important ingredient in leadership needed at top corporate levels.

Some EDP managers, particularly those under 35 years of age, have had work experience only in the EDP function where they started their careers as computer programmers. Unfortunately they often know very little about the business.

I conclude that the major expectations of the past have largely not come to pass. What then is the current status of the EDP manager?

The Current Situation

To assess the current situation, I would like first to draw upon several personal observations.

1. The EDP Organization

Recent surveys indicate a trend toward moving the EDP organization out of the corporate accounting or financial area and placing it higher in the overall corporate structure. Many EDP departments located in the financial areas of the business have concentrated on financial information systems and have done very little to help in other problem areas. About 50% of the EDP Managers now report to non-financial executives. The larger the corporation, the more likely the EDP manager will report to the President or other high ranking officer.

2. Systems Planning

The effectiveness of the service to solve problems and develop application systems provided by EDP functions is heavily dependent upon the way in which the EDP manager views his own role in the business.

Some consider their proper role one which is closely related to the technical computer environment. They concentrate on the development of highly capable computer complexes and rely upon the users to ensure the realization of economic benefits. The EDP manager with this view is likely to describe his function as one of supplying better information faster.

The other perspective is to view the job as one of solving user problems – problems which can be stated in terms of:

– Too much inventory,
– Excessively high cost of operation, or
– Inadequate customer service.

Personally, I endorse this latter view as the proper role of the EDP manager. However, to fulfill that role effectively requires the EDP function to be fully absorbed into the operations of the business. EDP cannot stand alone or be isolated from the line and other staff activities. We have found the degree of EDP absorption into the business is revealed by the extent of its planning for the future and how well those plans are integrated with the plans of the operating functions of the business.

Long-Range Plans

Only a minority of EDP departments have a really effective long-range plan. At A.T. Kearney, we define a long-range systems plan as containing:

1. An overview of the systems as they are intended to function by the end of the planning period.
2. A list and description of the projects which will be undertaken.
3. Estimates of personnel requirements by skill categories.
4. Plans for hardware and software changes within known state of the art.
5. Estimates of benefits and costs.

Even this degree of detail of planning will not be effective where there is no corporate planning activity. If top management lacks the vision, desire, or understanding to establish objectives of performance and to integrate planning across functions, the EDP plan will be better than nothing, but not truly viable.

We often are called upon to help clients prepare EDP plans. Presidents of client companies have commented later they did not realize the far-reaching consequences of such a project. While systems planning of this type is on the increase, there are a pitifully small number of companies which do it.

Part 2
The Computer Profit Drain

The other main topic I would like to discuss is the effectiveness with which EDP managers manage computer operations.

Whether EDP managers in general do a good job with the tools they have was revealed by a research study which we conducted recently at A.T. Kearney and Co., Inc. The study was entitled, "The Computer Profit Drain". Because of the significance of the findings, the rest of this article will summarize that study.

Computing Costs in the U.S.

On the basis of the 1969 World Computer Census published by *Computers and Automation,* a conservative estimate of annual equipment rental in the United States is $3 billion.

Generally accepted rules of thumb indicate a company may expect to spend one-third of its systems and computer expenditures for rental, another one-third in operating costs in the computing center (personnel, supplies, power and space) and the balance on system development and programming. It appears therefore that at least $9 billion are spent annually in the United States for computers and related costs.

The Burden of Excess Computing Capacity

It has long been suspected that our national economy bears a heavy burden of excess computing capacity. There also are indications that a substantial number of users are not effectively managing computer operations, and, as a result, may be paying a heavy penalty. The Kearney study

provides substantial evidence that two-thirds of annual expenditures for computer rental and operating costs (about $6 billion in the U.S.) are poorly managed. It further reveals that the average computer installation in the United States uses its equipment productively less than half the time it is available. Idle time and rerunning of poor quality work alone is costing the average company in this study over $100,000 each year.

About the Study

The A.T. Kearney study covered 155 computers used by 89 organizations. A stratified, random sample of companies in several major industries (see Exhibit 1) was chosen from the mailing list of a well-known financial service. Each company was asked to provide explicit information about their computer operations. First, a small sample of companies was contacted and results summarized. Later, a larger sample was analyzed and the results compared with the earlier sample to test the validity of the study. The two groups were highly correlated, indicating the results are statistically valid.

Significant Findings

Interestingly, though the study sample was broken down by industry, the data revealed no significant differences among industry groups. Briefly, the six most revealing findings are:

1. Only 48% of available time is used productively.
2. Computers are operated only 64% of available time.
3. 25% of manned hours are wasted.
4. Large centers have the poorest performance in all categories of lost time.
5. 42% of the companies reporting do not maintain accurate records on computer performance.
6. Firms using multi-programming achieve higher production.

However, of much more significance are differences in performance between small, medium and large computer installations.

Productive Use of Available Computer Time

Of the total available machine hours (three shifts, thirty days per month = 720 hours) the average computer in the study performs productive work only 48% of the time.

Productive work is defined as the time equipment is used to process Production Runs and Testing, without regard for how effectively the computing power of the machine is being used at any one time or the value of the information produced. Based on our experience, there is a high probability that the computers are not working to capacity when doing productive work. Therefore, productivity is even less than indicated by the study results.

Operation During Available Time

Computing centers are manned and operated only 64% of available time, a major factor contributing to low computer utilization. Significant differences exist in hours manned as between large and small installations. The larger installations tend to operate much longer hours. Several companies reported that their computer centers hardly ever close.

The percentages of manned hours to total hours convert into shifts per week as follows:

Size of Installation	Number of Shifts Per Week
Small	10
Medium	14
Large	16
Average	13
Available	21

Waste of Manned Hours

A comparison of productive time with total hours that a computing center is manned and operated is most revealing. This comparison indicates that 25% of all costs are wasted due to Idleness, Reruns, Machine Maintenance, and Down Time.

Largest Centers Lose the Most Time

Significantly, larger installations suffer about 40% greater losses for these reasons than smaller ones. This suggests that huge computing centers are less efficient, experience greater scheduling problems, are more difficult to manage and are more likely to have highly structured, inflexible organizations resulting in lack of coordination and a negative impact on efficiency.

The substantially higher rerun percentage suggests that large installations need better controls and need to provide improved training for personnel.

From other studies of individual computing centers we have seen that the technology of massive hardware and complex configurations of devices create an environment which may not be fully understood and controlled by its staff. Trial and error play major roles in managing these installations.

It is readily apparent that EDP management should evaluate the productivity ratios of its computer installation before authorizing multiple shifts and new equipment. During the time the computers are manned but idle, the company is paying for both rental and payroll. Sixteen percent idle time translates into a cost to U.S. businesses of about $960 million annually. The four percent average reruns costs American industry $240 million per year.

On the average the companies in the study are incurring the following annual losses due to idleness and reruns:

Size of Computer Installation	Annual Costs due to: (1) Idle Time	(2) Reruns
Small	$30,000	$2,000
Medium	84,000	18,000
Large	280,000	94,000

These costs represent inadequate management in the truest sense. In our experience, they result from such factors as:

1. Inadequate instructions for computer operators.
2. Absence of internal controls.
3. Improper or non-existent computer scheduling.

All of these require management attention.

Maintaining Accurate Records

The 155 computers in the survey represent a total

capital investment of approximately $110-million at purchase price. The low utilization indicates that management is not giving its attention to the performance of this expensive equipment. This is substantiated by the fact that 42% of the respondents report the data submitted are *estimated* because accurate records of computer utilization are not maintained.

Clearly management has written the computing center off as being outside of its management technique, and have left the center for the technician to manage.

Multi-Programming Brings Higher Production

Approximately 28% of the computers in the study are operated in a multi-programming or multi-processing mode (processing more than one application program at any one time). Those with multi-programming achieve a ratio of productive time (production and testing) to total available hours of 62% compared with only 42% for non-multi-programming operations. This indicates that, as companies require processing in multiple shifts, they also seek more ways to increase throughput per hour of processing.

To validate this conclusion, we compared meter hours with total operating time. Meter hours are widely held to be the only convenient measure of how near capacity a computer is operating. Multi-programming computers have a 94% relationship between meter hours and operating hours. Non-multi-programming computers have only a 75% ratio.

It is easier (but more costly) for managers to increase throughput by going to multiple shifts, than it is to install multi-programming.

Although many installations have the technical competence and hardware/software capability to increase throughput of their computers with multi-programming, they do not avail themselves of this added capacity due to:

1. Desire by technicians for more powerful and costly equipment.
2. A large residue of computer programs written in second generation or non-compatible programming languages.
3. Management's inability to understand the true capacity of equipment on hand.

Performance Objectives

Only 22 companies, out of the 89 in the study, reported productive time compared with available hours exceeding 60%. The results of the 22 companies with the highest ratio of productive time (production and testing) to available hours, were segregated from the total sample to establish performance criteria that might suggest goals or objectives for less efficient operations. As a group, they operate their computers longer hours and achieve 68% productive time compared with only 40% for the other respondents.

As a percentage of manned hours these high performance companies turned in the following results:

Performance Indicator	Percent of Manned Hours
Productive Time	81%
Idle Time	10%
Reruns	6%
Machine Maintenance and Down Time	3%

All industry groups and all size classifications were represented among these high performers. Only in rerun performance did this group have a poorer result than the rest of the respondents. It appears that even the best computing installation can find opportunities to cut waste.

The Challenge for Management

It has become more and more apparent, to both EDP specialists and general management, that selection and management of computer systems projects has suffered from lack of management attention and direction during the decade of the sixties. It has often seemed that frustrations generated by delays and escalating costs of systems projects causes executives to breathe deep sighs of relief once the systems are installed. They quickly and gladly turn attention elsewhere, and the result is waste and inefficiency in the computer room.

This study demonstrates clearly the opportunity available to the executive who has the interest, determination and know-how to measure and improve the performance of his computer operations. Simple tools can be utilized to monitor the computing center. Once such tools are in use, goals can be established and performance gradually improved. This is the approach taken by several of our clients.

> *Case.* The computer was manned initially 100% of the time. Outside rental of computer time had risen sharply and was being used to justify a proposal to increase computing power. Initial analysis of throughput revealed very low utilization of the installed computer. By instituting monthly management review of several performance indicators management began to establish specific goals.
>
> EDP personnel, working diligently to achieve these goals, discovered numerous ingenious ways to increase throughput and eliminate outside rental time. They successfully delayed acquisition of a new, larger computer for two years, created much better rapport and communication with management, and developed a more professional EDP group.

Regardless of industry, managing a computing center has virtually all the characteristics of managing a manufacturing plant. Many of the same disciplines and techniques apply.

It is time to apply some of the concepts of Management Information Systems to the management of computers. Although millions upon millions of words have been written about information systems that schedule and control manufacturing processes, and millions upon millions of dollars have been invested in such systems, there is seeming reluctance to apply similar techniques to the data center.

A machine tool costing $50,000 may be scheduled, loaded and measured in terms of minutes and mills. A complex of accounting, routing, standards and methods are used in the process. But even a modest size computer, costing ten times that amount, is often operated with inadequate or non-existent management tools.

Facilities Management?

Management has the option of applying generally known planning and control techniques to the computer center, or employing one of the more recently developed services –

facilities management – where an outside vendor takes over operation of the customer's computer center, sometimes including systems and programming activities, and physically removes operations to the vendor's data center. Such an approach is not without trial and tribulation.

> One of the largest financial institutions in the world has for years operated its business without an internal computer or systems and programming staff. It has been using a local service bureau installation for all systems design, programming and computer operations. Unfortunately, the proprietor of the service bureau recently decided to retire. He, therefore, opened negotiations to sell the service bureau, including the applications programs, to a third company that intended to market them to competitors of the financial institution. There has been considerable concern about how to regain independence from this operator so the company can become master of its own destiny.

When the computer is used effectively and becomes an integral part of the business, it usually is due to an intense involvement by top management. The systems and information with which the business is operated are as vital to its success as the products or services it sells. Thus management does not have the choice of:

1. Managing these systems and computer activities, or
2. Turning them over to someone else.

They must be well managed irrespective of where they are performed, and those responsible for the success of the enterprise are responsible for the successful conduct of all its vital functions.

An Effective Approach

The findings of this study suggest that the EDP manager of the seventies must become a much more effective manager of his resources. At the same time he must continue to struggle with user relationship problems. A great deal of credibility is lost by the EDP manager who does not look to the effectiveness of his own managing techniques, while trying to advise others on how to solve their problems.

Those who have seen the opportunity have been rewarded by substantial improvement. They have usually accomplished that by following a five-step process:

1. Find out where you are. The first step is to determine what the current situation is. How good or bad is it? Which aspects are satisfactory? Which are not? This can usually be established by a brief survey and elementary measurement of current performance. Five broad areas to be reviewed are:

- Objectives, Goals, Long-Range Plans, Organization
- Relationships with Major Users
- Quality of Design Concepts Employed
- Efficiency of Machine and Manpower Utilization
- Administration of the Function

2. Define Objectives. Executives need to determine the role and mission of the EDP effort within the organization. Without defining these and specific objectives for accomplishment, effectiveness will be seriously hampered. It is important that these be:

- Put into writing for analysis, study and modification as necessary.
- Understood and accepted by senior management, user members of the organization and systems and data processing personnel.

Overemphasis on the service-to-users aspect of data processing objectives may contribute to inadequate understanding of the cost trade-offs which service involves. It is important that all affected persons view these conflicts in proper perspective. Development of objectives can materially assist.

3. Establish Measures of Performance. On the basis of objectives, systems and data processing activities should be analyzed to establish those specific performance factors that will be measures of effectiveness. Care must be taken to identify items that can be measured with some precision and accuracy. Major categories of measured activities are:

- Costs
- Quality
- Schedule Adherence
- Utilization of Personnel
- Utilization of Machinery

4. Develop Goals and Plans. For each measured activity, standards of acceptable performance should be agreed upon between senior management and EDP management. Where the standard represents significant improvement over current performance, interim goals and plans for their accomplishment should be developed. The goals represent gradually improving performance each month until the standard is reached. EDP management should then set forth in detail the actions to be taken to achieve each increment of change.

5. Measure and Motivate. Senior management should demonstrate its sincere desire in seeing that standards are achieved. This requires the personal time of the interested executive to:

- Hold regular meetings and review progress.
- Ensure that the reporting system is accurate and objective.
- Review proposed plans.
- Aid in diagnosing successes and failures.
- Provide motivation (reward and punishment) for EDP personnel to achieve the standards.
- Reexamine and modify standards, measurements and reporting systems as conditions change.

Our study, "The Computer Profit Drain", indicates that the total burden of excess computing capacity in the United States is nearly $3.5 billion. Elimination of idle time and reruns would increase throughput about 20% and reduce costs by about $1.2 billion per year. Elimination of unmanned hours would provide a 75% increase in computer throughput. This is the equivalent of about $2.25 billion in computer rental per year.

These projections do not even consider the improvements which can result through use of available technology in the equipment now installed.

Thus while the A. T. Kearney study presents only a portion of the EDP manager's responsibility and performance level, it seems quite clear that the wave of criticism – of both computers and those who work with them – is in at least some ways justified. Perhaps, then, the status of the EDP manager can best be characterized by one word: opportunity. □

TAX RETURN FILING BY COMPUTER

"With the joint-filing program, as with any of the magnetic tape filing programs, it is permissible to file only magnetic tape, or to file a combination of magnetic tape and paper forms."

Mark E. Battersby
39 E. Lancaster Ave.
Ardmore, Pa. 19003

To most taxpayers, the increasing use of computers by the Internal Revenue Service simply means more possibilities of being caught, for, as Will Rogers said: "The income tax has made more liars out of the American people than golf has." For those engaged in the computer field, however, this expansion of I.R.S. computer facilities means more opportunities for increasing use of their own equipment in not only preparing tax information, but in filing it.

The Internal Revenue has for several years permitted the filing of certain information returns on magnetic tape, but only recently has it worked out a new program in conjunction with the Social Security Administration that permits an employer to file the Annual Wage and Tax Statements (Copy A of Form W-2) together with Earnings Reports for the fourth quarter (Form 941, Schedule A). These can now be combined on one magnetic tape and filed with the Social Security Administration, and when combined, they will satisfy the filing requirements of both the Social Security and the I.R.S.

What this program can mean to your business operations depends, of course, on your present capabilities and whether you are already taking advantage of the existing programs to file magnetic tape. Utilizing this program when or if combined with the other reports already acceptable by the Internal Revenue can minimize programming effort, simplify payroll procedures, reduce the number of machine runs, eliminate at least one major report to the government, and provide other benefits to both employers and the government.

The Forms

Virtually all of the basic "information returns" required by the Internal Revenue can be filed using either the "paper" forms or magnetic tape.

In addition to the Earnings Reports for the fourth quarter (Form 941, Schedule A) which may be combined on the same tape as the Annual Wage and Tax Statements (W-2), the data for the other three quarters can be prepared in a compatible tape format and mailed to the Social Security Administration to satisfy both Social Security and the I.R.S. filing requirements.

Regardless of whether an employer utilizes the joint filing program or not, he may obtain permission to substitute magnetic tape filing for the following forms:

Form W-2. The Employee's Wage and Tax Statement
Form W-2 RR. Railroad Employee's Wage and Tax Statement
Form 1087. Nominee's Information Return
Form 1099. U. S. Information Return

With the joint-filing program, as with any of the magnetic tape filing programs, it is permissible to file only magnetic tape, or to file a combination of magnetic tape and paper forms. While this does save much frustration, it does not in any way relieve the filer from his requirement to provide a copy of the W-2 or the Form 1099 for the employee or the individual who would normally receive one.

This is not as awkward as it may seem because the format stipulated by the I.R.S. closely follows the basic forms currently in use, and thus it is a simple matter to make a print-out of the information using pre-printed forms and fulfilling the requirements to furnish copies when required.

Who May File

The requirements of who may use these programs and file magnetic tape permits virtually anyone to file.

While both the Social Security and the I.R.S. are limited as far as equipment goes, they will accept any tapes even if the tape used is not compatible (see Table 1). When non-compatible tapes are filed the I.R.S. will attempt to find conversion facilities.

Generally, the applications for magnetic tape filing will be disapproved only when the Government is unable to obtain facilities to convert an employer's tape to a compatible form.

Applications from employers or from agents acting for employers or groups of employers will be accepted regardless of their ability to submit all required reports on magnetic tape. As long as there is no duplication or omission of records, some reports can be on tape and some on paper forms.

Mark E. Battersby is a consultant specializing in taxes and finance. He has worked with clients ranging from large multi-national corporations to foreign corporations to small businesses.

Mr. Battersby has had numerous articles published (nearly 30 in the past year), including "The Internal Revenue Service Looks At Computer Software" in *Computers and Automation* for February, 1970. Mr. Battersby is a member of the Authors Guild and several professional business associations.

Table 1
MAGNETIC TAPE SPECIFICATIONS

Tapes meeting the following specifications are compatible:
Type of Tape – ½ inch Mylar base, oxide coated
Recording Density – 200, 556, 800 or 1600 CPI
Parity – Even or odd
Interrecord Gap – ¾ inch
Recording code – 7 channel binary coded decimal, 9 channel ASCII, or 9 channel EBCDIC

Once an employer or his agent has received authorization to file magnetic tape, such approval will continue in effect in succeeding years providing that all Revenue Requirements are met and that tapes continue to be submitted. A new application is required if users change to equipment producing tapes requiring conversion, or if they discontinue tape reporting for one or more years and then decide to resume this method of reporting.

Applications

Employers or agents desiring to file information returns in the form of magnetic tape are required to first file a letter of application. This letter should be addressed to the Director of Internal Revenue Service Center in the region in which the employer or the agent normally files returns. They should be marked: "ATTENTION, Chief of Program Analysis Staff."

Employers or agents who desire to participate in the Social Security Administration – Internal Revenue, Joint Filing Program should file applications addressed to:

Social Security Administration
Bureau of Data Processing & Accounts
Baltimore, Maryland 21235

Applications will usually be processed and the applicant notified that his application has been either approved or disapproved. Applications for the Joint Filing Program will be reviewed by the Social Security Administration and coordinated with the Internal Revenue Service, with all applicants usually notified within 30 days from receipt of the applications.

Filing

Packaging, shipping and mailing instructions for the magnetic tapes are provided to the employer or agent after approval of his application.

Magnetic tapes submitted under the Joint Filing Program will be submitted to the Social Security Administration. They will duplicate the Form W-2 data from the fourth quarter submission and send it to the I.R.S. The filing of a Joint Tape in the fourth quarter with the Social Security Administration will satisfy the filing requirement for the Form W-2 with the I.R.S.

The data prescribed for filing "Paper" forms will apply to all magnetic tape filing. Requests for extension of time for Joint Filing should be sent to an Internal Revenue Service Center, marked "ATTENTION, Chief Program Analysis Staff." If the extension is granted, a copy of the letter granting the extension should be attached to the tapes when filing.

Table 2
Sources of Information on Filing Procedures

Copies of Revenue Procedure 70-7 dealing with the I.R.S.-Social Security Joint Filing Program can be obtained from:

Social Security Administration
Bureau of Data Processing & Accounts
Baltimore, Maryland 21235

Information on the filing of magnetic tape records is available from an Internal Revenue Service Center (Attention: Chief Program Analysis Staff) at one of the following addresses:

a) Southeast Region, P. O. Box 47421, Doraville, Ga. 30340
b) Midwest Region, P. O. Box 5321, Kansas City, Mo. 64131
c) Central Region, P. O. Box 267, Covington, Ky. 41012
d) Southwest Region, P. O. Box 934, Austin, Texas 78767
e) North Atlantic Region, P. O. Box 311, Andover, Mass. 01810
f) Mid-Atlantic Region, 11601 Roosevelt Blvd., Phila., Pa. 19155
g) Western Region, P. O. Box 388, Ogden, Utah 84401

Provisions have also been made for correcting returns by using the appropriate paper form to correct employee records originally submitted in the form of magnetic tape.

Magnetic Tape Specifications

The Social Security Administration and the I.R.S. regional centers can provide copies of the Revenue Procedure (Rev. Proc. 70-7) as well as additional information (see Table 2).

The detailed procedures for filing magnetic tapes, regardless of whether for the Joint Filing Program or in lieu of other information returns, cover every aspect from a detailed definition of what will constitute an acceptable file down to a technical explanation of the information that is required in each tape position.

The Results

Computer firms that have used magnetic tape filing in the past have experienced very little trouble either in having their initial application approved or in receiving their tapes back from the I.R.S.

The Internal Revenue claims a thirty day approval or disapproval of applications for using other forms, and a normal turnaround time of 45 days in returning the original tapes submitted. In the past the I.R.S. has managed to live up to that, and there is no reason to expect that it cannot do the same under the new Joint Filing Program.

Several years ago there were reports of bugs that had to be worked out of the Internal Revenue computers, but now they appear to be completely operational. Since the Social Security Administration has used their computers for many years, there is no reason to anticipate trouble on this new program.

The potential for magnetic tape filing seems to be increasing as more and more employers demand improved service from the I.R.S. The "Statement of Organization and Functions" of the I.R.S. lists an Assistant Commissioner at the national level whose job is to supervise the Data Processing Branch (including internal and external training, and instituting and monitoring all Service Center Data Processing pilot programs). Thus this new program can be seen as another step towards total computer/magnetic tape tax reporting – and not by any means the last step. □

OPPOSITION TO NEW IDEAS

"Human beings resort to a great variety of different methods to avoid doing adequate work upon new ideas. . . . . Even after Orville and Wilbur Wright had proved by their flights that flying in a machine heavier than air was both possible and practical, people generally simply would not believe that it had happened."

Neil Macdonald
Assistant Editor
Computers and Automation

This article was originally published in *Computers and Automation* in February, 1959, almost twelve years ago.

Neil Macdonald has been an Assistant Editor of *Computers and Automation* for almost eighteen years; he has been on the masthead since Vol. 2, No. 2, March 1953; he has performed many useful services in those years. But because of certain limitations, he has never become more than an Assistant Editor: Neil Macdonald is a pseudonym for Edmund C. Berkeley.

1. New Ideas

About three months ago I lent a friend of mine a book by E. J. Ruppelt called "The Report on Unidentified Flying Objects."[1] A short while ago my friend returned the book to me, and I said, "What did you think of it?" He said he had not read it. I was surprised, and said, "Did you look at it?" He said, No, he hadn't. I was still more surprised and said to him, "Why not?" He mentioned two prominent astronomers who had said that flying saucers were nonsense, and said, "That's good enough for me. I don't want to spend time on them."

I looked at him and smiled, and said, "Well, that is a nice, comfortable way of settling something, isn't it? Accept the views of someone else without thinking about them yourself?"

He looked at me, quite uncomfortable. I suddenly realized I might be losing a friend; I said, "Forgive me for teasing you," and changed the subject.

But it struck me with great force how often a new idea is judged by "Who says so?" instead of on more logical evidence. I began to wonder seriously about OPPOSITION TO NEW IDEAS, both in the computer field and more generally. For automatic computers and their fantastic powers are one of the great new ideas of the twentieth century, and many aspects of computers have encountered opposition.

A new idea is disturbing, provoking, uncomfortable, sometimes frightening. It often requires the making of a decision, and that often requires mental work, utilization of psychic energy. As James M. Barrie, Scotch author and scholar, said once, "Work is not real work unless you would rather do something else." So human beings resort to a great variety of different methods to avoid doing adequate work upon new ideas.

2. "You Can't Make an Automatic Computer"

Charles Babbage was undoubtedly the first computer scientist who suffered opposition over a new computer idea. He probably first conceived the idea of making an automatic digital computer in 1812, when he was a professor of mathematics at Cambridge University in England. He set out to build a "Difference Engine," a machine which would construct mathematical and navigational functions by adding various orders of differences.

In his case, he met first with some success, including aid from the British Government for some twenty years; but little progress was achieved, and in 1833 government aid was withdrawn and the project dropped. Babbage, however, incurably optimistic and obstinate, at once laid plans for a much more ambitious machine which he called an "Analytical Engine." This was to consist of three parts: (1) the "store," where numbers were to be stored or remembered; (2) the "mill," where arithmetical operations were to be performed on numbers taken from the store; and (3) the "sequence mechanism," which would select the proper numbers from the store and instruct the mill to perform the proper operations.

As we can see from the viewpoint of more than a century later, his idea was perfect — both complete and accurate. We can also see that the failure of his plan at the time

[1] "The Report on Unidentified Flying Objects" by Edward J. Ruppelt, Doubleday and Co., New York, 1956, 243 pp. An interesting and scientifically objective book, reporting (among other data) that up to the end of 1953, there had been 429 sightings (out of 1593 thoroughly investigated sightings) of flying objects that could not reasonably be identified as balloons, aircraft, astronomical bodies, searchlights on clouds, birds, mirages, reflections, frauds, hoaxes, etc. A great many of these 429 sightings were combined radar-visual sightings; some included photographs; a few included movies. Ruppelt, a former Air Force Officer, was head for 2½ years of the Air Force project charged with investigating and analyzing UFO's, under the direction of the U.S. Air Force Technical Intelligence Center located at Wright Patterson Air Force Base, Ohio. Since the beginning of 1954, however, the U.S. Air Force has adopted a policy of suppressing all news about UFO's.

was due mainly to the lack of sufficiently advanced machine tools, and the lack of mechanical and electrical devices that finally became available around 1900-10. But the verdict about Babbage back in the 1830's and for many years afterwards was that his whole idea was absurd, nonsensical, laughable, as well as a waste of money. In fact, I remember hearing some echoes of that laughter when I was studying in school and college in the 1920's.

3. "You Can't Really Use an Automatic Computer Because it is too Unreliable"

Another of the arguments many people asserted against the new idea of a computer in the years 1946 to 1950 was that automatic computers could not be expected to operate both reliably and speedily, because the number of electronic parts in a computer was extraordinarily high. "Why, who ever heard of a machine with a million parts that was not breaking down every few minutes?"

This argument too has suffered greatly in the course of a few years. What would have seemed fantastic reliability has now been built into a great many automatic computers.

4. "Machines Don't Think"

Another thesis in the computer field, which is perennially opposed by many kinds of people, is that "a machine can think" or "it is appropriate to call automatic computers giant brains."

A recent astute comment on this thesis is provided by the present name of a project at the Research Laboratory for Electronics at Massachusetts Institute of Technology. This project is called the "Artificial Intelligence Project." It consists of a serious and sensible investigation of programs to handle various types of intellectual activity not yet performed by machines. Examples are programs by means of which an automatic computer: may learn from experience; or prove high school geometry theorems; or improve its method of playing a game, such as chess, on the basis of learning; or "take advice" in carrying out a simulated geographic trip from one location to another.

But what would have been the reactions of newspaper reporters and the public if the project had been called not "Artificial Intelligence" but "Machine Intelligence"? Yet certainly the problems mentioned require intelligence for their solution, and certainly machines (automatic computers) are being programmed to deal with these problems and solve them. The name "artificial" does not change the reality.

5. "It is Impossible to Plan Production for a Whole Society Using Computers"

Another thesis that relates to the computer field is expressed in one of the standard arguments against the variety of socialism that is defined as a planned economic society in which the means of production are in theory owned by all the people and operated in their interest, and distribution is in theory "from each according to his capacity, to each according to his work." The argument is that such a society cannot possibly operate properly, because the amount of detail and the number of decisions to be made are so great that the calculations cannot possibly be performed.

This same argument about quantity of calculation has also been used about weather forecasting. The argument is that the amount of data required, and the mathematical equations that need to be applied, are so voluminous and involved, that the forecast cannot possibly be computed in time to do anybody any good. For example, the opponents of the idea may say with quiet humor, "Yes, today's 8:00 a.m. forecast will come out of the computer at 7:00 a.m. tomorrow." And everyone laughs (or is supposed to).

But a number of computer scientists are seriously working on the problem of weather forecasting using automatic computers. And there exist at least half a dozen nations in the world today including at least 800 million people where a planned economic society called by some people socialism is operating with the benefit of at least some degree of computation.

6. Wisdom Before the Event

Now it is easy enough to be wise after circumstances have shown that a certain idea is false or bad — a broken reed, like the impossibility of reliable computers, or an evil principle, like McCarthyism. But how can one be wise before the event, the outcome, has been revealed?

For dealing with new ideas which are unpopular, disliked, or opposed, a scientific method does exist and can be followed. It is outlined below.

7. "Impossible"

"That is impossible!" "That is contrary to human nature." "No computer will ever do that."

Here the most useful response is "Why?", "How do you know?" People need a skeptical, inquiring attitude. A great many things that were impossible at one time have become possible at some later time. "Ever" in fact is an exceedingly long time, more than a thousand years, more than a million years. And the world is a more complicated place than many of our theories make it out to be. For example, the mechanics and relativity of Albert Einstein include the mechanics of Isaac Newton as a useful first approximation at small velocities.

There are two kinds of real impossibility. One kind is logical; the other kind is observational. Under the agreement that "2, 4, plus, equals" are to have their usual meanings, then it is really impossible that 2 plus 2 does not equal 4. Why? Because of definitions and logic. The other kind of real impossibility relates to observations of the physical world. Under properly described, ordinary conditions, it is really impossible that common table salt will not dissolve in common tap water. Why? Because of many experiments about solutions that have no exceptions, and a well established physical theory that explains solutions.

Between these kinds of real impossibility, and many kinds of impossibility asserted in ordinary discussion, there are many differences.

In the computer field, a great many statements of the form "no computer will ever have such and such a property" should be wondered about and questioned. And if the statement is questioned and wondered about long enough, and if the property is useful, it is perhaps even likely that one day a computer will have that property in substance, if not in literal detail. In the same way, man does not fly by flapping wings like a bird — but he does fly.

8. "Impractical"

"Well, it might be possible, but it certainly is impractical." "If you try it, it won't work" (or, "won't work

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— "The 'Involuntary Campus' and the 'Manipulated Society'"

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"Confidential and Secret Documents of the Warren Commission Deposited in the U.S. Archives" — November
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"The Assassination of Reverend Martin Luther King, Jr., The Role of James Earl Ray, and the Question of Conspiracy" — December
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The 1970 Issues of "Computers And Automation"

An Unusual Year

Computers and Automation is an unusual magazine, and 1970 has been an unusual year for Computers and Automation. It is the oldest magazine in the computer field, first published in September 1951. Thus 1970 is the 20th year of publication.

Factual, Useful, Understandable

Since the beginning, we have looked on our magazine as devoted to factual, useful, and understandable information about computers and their applications and implications, including automation. We have always sought particularly to cover the most important implications of computers and automation. In 1970, two particular implications seemed clearly important, and C&A branched out in two new directions.

A New Direction: Computers and Society

The first new direction in which we have branched out during 1970 is a series of articles with the general title

Computers and Society: "The House is on Fire"

In this series we have begun to print articles (even if they don't mention computers) which are likely to help the computer professional see more clearly his responsibilities as a professional to help build a bridge between his professional knowledge of computer "magic" and the great, complex, unsolved problems of society.

For our "house" (which is our earth) is "on fire" — our planetary spaceship is in serious difficulties — because of ruinous disregard by human beings of tremendous problems. [For a list of articles and other items of information on this subject which we have published during 1970, see page 24.]

A New Direction: Computers, Science, and Assassinations

The second new direction in which C&A has branched out during 1970 is "Computers, Science and Assassinations".

The ordinary assumption of a computer professional is that he can obtain, quite directly and fairly easily, truthful data. He observes, listens, reads, and asks questions — and thus he finds truthful data which he needs to have in order to install and operate a computer system. He can assume that if he is careful, he will not get "garbage" input into his system — and so he has a good professional chance of outputting what is not "garbage". This is a correct assumption in the ordinary business or scientific application of computers.

But in regard to crime, and particularly the crime of political assassination, truthful data are hard to obtain. Powerful forces of the establishment or the elite which have arranged or subsequently approved a crime or an assassination are most uneager to have anybody find out the truth. Computers can have here a role of great importance: they can be applied to analyzing great quantities of evidence, revealing clues, discovering correlations, finding out inconsistencies, applying facts of physics to lying statements. Computers can reveal truth that powerful establishments have sought to hide and bury.

We believe Computers and Automation can play a role in this direction. [For a list of articles and other items of information on this subject which we have published during 1970, see page 24.]

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CALENDAR OF COMING EVENTS

Jan. 31-Feb. 5, 1971: IEEE Winter Power Meeting, Statler Hilton Hotel, New York, N.Y. / contact: IEEE Headquarters, Technical Conference Service, 345 E. 47th St., New York, N.Y. 10017

Feb. 17-19, 1971: Sixth Annual Conference on Use of Digital Computers in Process Control, Louisiana State Univ., Baton Rouge, La. / contact: Dr. Cecil L. Smith, Dept. of Chemical Engineering, Louisiana State Univ., Baton Rouge, La. 70803

Feb. 22-24, 1971: DPI's 1971 Data Processing Conference and Trade Show, Skyline Hotel, Ottawa, Ontario, Canada / contact: Revett Eldred, Conference 71 Publicity, Data Processing Inst., Box 2458, Postal Station D, Ottawa 4, Ontario, Canada

Feb. 22-24, 1971: San Diego Biomedical Symposium — 1971, Ramada Inn, Harbor Island, San Diego, Calif. / contact: Richard D. Yoder, M.D., Univ. of California, San Diego, University Hospital of San Diego County, 225 West Dickinson St., San Diego, Calif. 92103

Mar. 1-3, 1971: Data Processing Supplies Association, Spring Membership Meeting, The Doral Hotel & Country Club, Miami, Fla. / contact: Data Processing Supplies Association, 1116 Summer St., Stamford, Conn. 06905

Mar. 1-3, 1971: First International Symposium on Fault-Tolerant Computing, Huntington-Sheraton Hotel, Pasadena, Calif. / contact: Dr. Francis P. Mathur, Sec'y, IEEE Technical Comm. on Fault-Tolerant Computing, Jet Propulsion Laboratory, Calif. Institute of Tech., 4800 Oak Grove Dr., Pasadena, Calif. 91103

Mar. 9-13, 1971: INEL 71, the 5th International Exhibition of Industrial Electronics, Basel, Switzerland / contact: Sekretariat INEL 71, CH-4000, Basel 21, Switzerland

Mar. 22-24, 1971: Ninth Annual Symposium on Biomathematics and Computer Science in the Life Sciences, Univ. of Texas Graduate School of Biomedical Sciences / contact: Office of the Dean, Univ. of Texas Graduate School of Biomedical Sciences at Houston, Div. of Continuing Education, P.O. Box 20367, Houston, Tex. 77025

Mar. 22-24, 1971: Numerical Control Society's Eighth Annual Meeting and Technical Conference, Disneyland Hotel, Anaheim, Calif. / contact: William H. White, Numerical Control Society, 44 Nassau St., Princeton, N. J. 08540

Mar. 22-25, 1971: IEEE International Convention & Exhibition, Coliseum & N.Y. Hilton, New York, N.Y. / contact: IEEE Headquarters, 345 E. 47th St., New York, N.Y. 10017

Mar. 23-26, 1971: Third National Meeting of the Information Industry Assoc., Host Farm Resort, Lancaster, Pa. / contact: Paul G. Zurkowski, IIA Washington, 1025 Fifteenth St., N.W., Washington, D.C. 20005

Mar. 29-Apr. 2, 1971: Datafair '71 Conference, Nottingham Univ., Nottingham, England / contact: Datafair '71 Conference Office, The British Computer Society, 21 Lamb's Conduit St., London, W.C.1, England

Apr. 1-2, 1971: ACM Symposium on Information Storage and Retrieval, Univ. of Maryland, College Park, Md. / contact: Dr. Jack Minker, Computer Science Center, Univ. of Maryland, College Park, Md. 20742

Apr. 5-8, 1971: The First National Educational Technology Conference, American Hotel, New York, N.Y. / contact: Conference Manager, Educational Technology, Englewood Cliffs, N.J. 07632

Apr. 13-16, 1971: Ninth Annual Convention of the Association for Educational Data Systems, Royal York Hotel, Toronto, Ontario, Canada / contact: AEDS Convention, P.O. Box 426, Don Mills, Ontario, Canada

May 3-5, 1971: Data Processing Supplies Association, Affiliate Membership Meeting, Copenhagen, Denmark / contact: Data Processing Supplies Association, 1116 Summer St., Stamford, Conn. 06905

May 11-13, 1971: IEEE (Institute of Electrical and Electronic Engineers) 1971 Region Six Conference, Wood Lake Inn, Sacramento, Calif. / contact: Dr. D. H. Gillot, Co-Chmn, IEEE Region 6 Conference, Sacramento State College, Dept. Of Electrical Engineering, 6000 Jay St., Sacramento, Calif. 95819; or, Dr. R. F. Soohoo, Program Chmn., IEEE Region 6 Conference, Univ. of California at Davis, Dept. of Electrical Engineering, Davis, Calif. 95616

May 12-14, 1971: 22nd Annual Conference of the American Institute of Industrial Engineers (AIIE), Boston, Mass. / contact: Anthony J. Jannetti, Exhibit Manager, c/o Charles B. Slack, Inc., Pitman, N.J. 08071

May 18-20, 1971: Spring Joint Computer Conference, Convention Ctr., Atlantic City, N.J. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

May 24-26, 1971: Power Industry Computer Applications Technical Conference, Statler Hilton Hotel, Boston, Mass. / contact: P. L. Dandeno, Hydro Electric Power Commission of Ontario, 620 University Ave., Toronto, Ontario, Canada

May 24-28, 1971: 2nd International IFAC Conference and Exhibition "P.R.P.-Automation", Centenary Halls, Brussels, Belgium / contact: IFAC/P.R.P.-Automation, Jan van Rijswijcklaan 58, B-2000 Antwerp, Belgium

June 2-5, 1971: 3rd IFAC/IFIP Conference on Digital Computer Applications to Process Control, Technical University, Otaniemi, Finland / contact: 3rd IFAC/IFIP Conference, Box 10192, Helsinki 10, Finland

June 3-5, 1971: Conference on Area-Wide Health Data Network, School of Medicine, State Univ. of New York at Buffalo, Buffalo, N.Y. / contact: Continuing Medical Education, 2211 Main St., Buffalo, N.Y. 14214

June 7-9, 1971: International Computer Forum and Exposition (ComFor), McCormick Place-on-the-Lake, Chicago, Ill. / contact: National Electronics Conference, Inc., Oakbrook Executive Place II, 1211 W. 22nd St., Oak Brook, Ill. 60521

July 26-29, 1971: First International Computer Exposition for Latin America, sponsored by the Computer Society of Mexico, Camino Real Hotel, Mexico City, Mexico / contact: Bernard Lane, Computer Exposition, Inc., 254 West 31st St., New York, N.Y. 10001

Aug. 3-6, 1971: IFAC Symposium on The Operator, Engineer and Management Interface with the Process Control Computer, Purdue University, Lafayette, Ind. / contact: Dr. Theodore J. Williams, Purdue Laboratory for Applied Industrial Control, Purdue University, Lafayette, Ind. 47907

Aug. 11-13, 1971: Joint Automatic Control Conference, Washington Univ., St. Louis, Mo. / contact: R. W. Brockett, Pierce Hall, Harvard Univ., Cambridge, Mass. 02138

Aug. 16-19, 1971: International Symposium on the Theory of Machines and Computations, Technion — Israel Institute of Technology, Haifa, Israel / contact: Sheldon B. Akers, Secretary, IEEE Technical Comm. on Switching and Automata Theory, General Electric Co., Bldg. 3, Room 226, Electronics Park, Syracuse, N.Y. 13201

Aug. 16-20, 1971: Jerusalem Conference on Information Technology, Jerusalem, Israel / contact: Jerusalem Conference on Information Technology, P.O.B. 7170, Jerusalem, Israel

Aug. 16-20, 1971: Jerusalem Conference on Information Technology, Jerusalem, Israel / contact: The Jerusalem Conference on Information Technology, P.O.B. 7170, Jerusalem, Israel

Aug. 24-27, 1971: Western Electronic Show & Convention (WESCON), San Francisco Hilton & Cow Palace, San Francisco, Calif. / contact: WESCON Office, 3600 Wilshire Blvd., Los Angeles, Calif. 90005

Sept. 1-3, 1971: Second International Joint Conference on Artificial Intelligence, Imperial College, London, England / contact: The British Computer Society, Conference Department, 29 Portland Place, London, W.1., U.K.

Sept. 7-9, 1971: IEE 1971 Conference on Computers for Analysis and Control in Medical and Biological Research, University of Sheffield, Sheffield, England / contact: Manager, Conference Dept., IEE, Savoy Place, London WC2R OBL, England

Sept. 14-17, 1971: Canadian Information Processing Society (CIPS) Annual National Conference, Royal York Hotel, Toronto, Canada / contact: Jack McCaugherty, James Lovick Ltd., Vancouver, British Columbia, Canada

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adequately.") This is another favorite comment from many people.

But this comment does allow a good response: you can try it and it might work. And if you do try it sensibly and on a small scale, and it does work, and works fairly well, then in this day and age, you have usually put together a rather good case for proving that the idea is practical.

In the computer field, the channel of trying something resourcefully on a small scale, and eventually making the idea work, has been a big avenue for advance. This avenue has meant winning many arguments, that such and such a type of computer or component was practical.

But we should not forget that the avenue was open in the first place basically because of government funds for computer development. In the years 1940 to 1950, only a relatively small amount of business capital was devoted to computers. The denial of adequate funds and a sympathetic administration of them may be an almost insuperable barrier to proving that something is practical.

9. "I Don't Believe It"

Another argument that opposes new ideas is: "I don't believe it." "There must be an error in reporting."

A good example of this kind of opposition is an anecdote in "The Wright Brothers" by F. C. Kelly (Ballantine Books, New York, 1950), telling how a freelance reporter, D. B. Salley, went to Kitty Hawk, N.C., where the Wrights were carrying out experiments with their flying machine. Salley inquired of a number of newspapers if they would be interested in buying his reporter's story about how one of the Wrights had flown 1000 feet in a flying machine, about 20 feet above the ground. One of the editors he inquired of, the telegraph editor of "The Cleveland (Ohio) Leader," was so indignant and insulted by the offer of the improbable story that he wired Salley collect "cut out the wild-cat stuff" and paid no further attention to Salley's response.

Even after Orville and Wilbur Wright had proved by their flights that flying in a machine heavier than air was both possible and practical, people generally simply would not believe that it had happened. The Wrights found that it took about four years to change the minds of people generally. In fact, the first large group of people to be convinced were Frenchmen and not Americans.

But "I don't believe it" is of course not a sound argument against a new idea.

10. "Contrary to Authority"

"So and so says such and such. Who am I to disagree with him?" "So and so says that . . . is nonsense, and that is good enough for me."

This is the argument from authority.

Part of the strength of this argument is the real fact that the world is very complex, and that an individual human being using his utmost efforts can have first hand knowledge of only a small part of it. As one wise man noted, we all really know nothing in most subjects. So we have to rely often on certain selected people for information and judgments — on "experts."

Nowadays, it seems as if the divine right of kings to rule has largely been replaced by the divine right of experts to establish and reveal the truth. It is in fact extraordinary in how many ways the degree to which a man may be listened to is dependent on his social and professional status, the nature and degree of his authority. If you or I say something, it usually counts for very little; but if Secretary of State John Foster Dulles or President Dwight D. Eisenhower says something, most newspapers in the country print it, and a lot of people accept it. They accept it for purposes of daily behavior, even if verbally they express some disagreement, as in desegregation or foreign policy. For example, Dulles says frequently that mainland China must not be "recognized." As a result, most people in the United States including most of Congress, in their everyday behavior, act as if mainland China does not properly exist.[2]

11. The Judgment of Experts by Non-Experts

The problem of authority raises the question of the judgment of experts by non-experts. Ordinary people, the great mass of people who are non-experts, must often judge the experts. There are several bases for judging experts which are thoroughly sound.

First, there is the test of "Why?" If you can, ask the expert "Why?" and listen to what he says; see if he makes sense. It is very hard work in a rapidly expanding field such as the computer field, and in many other fields besides, to stay an expert. Often, in fact, once a man becomes an expert, he is promoted out of the area in which he has to stay working if he is to remain an expert.

Second, there is the test of results. See what the expert produces as results. Often the results are poor, bad, or dreadful. Even if the expert has the finest degrees, preparation, and experience, if the results are bad, you may have to get another expert. In the American Civil War, the test of results was applied month after month to the commanding generals on the Federal side; and when they kept losing battles, they were replaced, until finally General Ulysses S. Grant defeated the Confederates.

Of course, when the experts can withhold knowledge of the objective results from the non-experts who are to judge these results, we are in a pretty kettle of fish. To obtain a knowledge of the objective results must then be a main effort of the non-experts in dealing with the experts.

This is true, for example, in the field of education, where there are no objective measures of education reported; and true in the field of a government's foreign policy, where there is no independent agency assessing the work of the State Department or Foreign Office, as the case may be; and true in the field of military affairs, where "security" and "classification" can cover up a great deal that is bad. It is probably fortunate that Sputnik I was launched by the Russians in October 1957. As a result, an objective test of results produced could be applied to the military and educational establishments of this country; and a "teachable moment" could and did result for both the non-experts and experts in the United States.

In the computer field, however, we are lucky: the non-experts can judge the experts by the actual work produced

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[2] Yet mainland China, a country of 600 million population, from 1957 to 1958 increased its total annual agricultural and industrial output by 70 percent (see *The New York Times* for Jan. 1, 1959), a somewhat unusual accomplishment for a country that does not properly exist, and especially for a country which supposedly is about to overthrow its present government and restore to rule a dictator who fled ten years ago.

by the automatic computers which the experts create. In fact, in most consumer goods fields, the fine anti-trust laws of the United States often really prevent the disappearance of free competition between experts; this protects consumers and the public. These laws have been applied in the computer field, for example, by the U.S. Government in the case against International Business Machines Corporation; and they have widened the area of competition, particularly by making certain computer field patents open.

12. "Disloyal"

Another source of very strong opposition to new ideas is the feeling that it is disloyal, or may be thought to be disloyal, to give any attention to certain classes of ideas. This has been backed up in this country by the long period of military security classification 1941 to the present. In connection with clearing a person for classified work, inquiries are made about the person's friends, associations, and what he reads. There was a time when "he reads about Russia" or "he reads about Communism" was derogatory information.

The application of computers to solving certain social and economic problems, such as eliminating unemployment, planning all industrial production, obtaining a rich and abundant life for all people in the United States, minimizing waste and unnecessary scarcity, providing medical and hospital care to everybody — would be considered by many people in the United States to be disloyal and suspect.

In the computer field, the advent of Sputnik I in October 1957 caused a significant change. Interest in Russian computer accomplishments, interest in machine translation from Russian to English, has become widespread, perhaps even fashionable. Today we teach Russian in many schools, and over 10,000 Americans have purchased translations of scientific Russian texts. In fact, achievements in the computer field all over the world, both machines and applications, ought to be and are of interest to computer people everywhere.

The epithet "disloyal" is of course not a sound argument against a new idea.

13. "Outside of My Field"

Finally, one of the commonest forms of opposition to new ideas is the argument: "Well, that's outside my field," "I am too busy," "I have no time," "I am not interested," "What's that to me?", etc.

This is one of the biggest sources of opposition to new ideas. Here again, this is an entirely natural and inevitable result of the complexity of the world. In the computer field, already, a single scientist is no longer expected to be a master of all the facets of a computer. Components are one field, applications are another, programming is a third.

But no matter how much specialization inevitably proceeds, we must examine new ideas and keep in touch with them. The computer people who worked on cathode ray tube memory saw nearly all their work go out as junk, when magnetic core memory arrived. At the Eastern Joint Computer Conference in December there was much talk of the "next generation" of computers, with new solid-state devices.

No one can afford to stick consistently to the attitude "not my concern," "not my field." This is the primrose path to becoming extinct. Computer people, like all other people who desire to live and flourish, must give thought to new ideas, especially the new ideas with giant possibilities, such as the intercontinental ballistic missile with the nuclear warhead, which in the world we live in is the unpublicized, central underlying motive for pouring funds into space travel.

14. The Intelligent Treatment of New Ideas

From time to time **Computers and Automation** has put forward the idea that computer people are in reality information engineers, engineers in the information sciences. This thesis is being confirmed more and more, it seems, as the effect of handling information reasonably and in great quantities and at high speeds reaches out to more and more fields, such as translating from one language to another.

Idea: If it is possible to teach a human being something, then it ought to be possible to teach essentially the same thing to a machine.

Idea: If a human being can perform a certain intellectual process, then it ought to be possible to program a machine to perform that process — and the more difficult the process, the more appropriate for the machine.

Idea: It ought to be possible to program machines to handle ideas in discussion, simulating human beings.

Idea: It ought to be possible to educate machines to know what human beings know as the result of the education of human beings.

Idea: It ought to be possible for a human being to treat a new idea tentatively, inquiringly, appraising it to determine objectively its degree of merit — and to teach a machine to do as well or better.

Computer people, as information engineers, as experts in the information sciences, should have a particularly sensible and scientific attitude towards new ideas.

THE DEATH OF WALTER REUTHER: ACCIDENTAL OR PLANNED?

EDMUND C. BERKELEY and

LEONARD WALDEN

PART 1.

EDMUND C. BERKELEY, EDITOR
COMPUTERS AND AUTOMATION

SUDDEN DEATH

About half past nine p.m., on May 9, 1970, a chartered Lear Jet carrying Walter Reuther, the President of the United Auto Workers, descended from an overcast sky towards a rural landing field in Onaway, Michigan, near Pellston, about 260 miles northwest of Detroit. The plane struck a number of trees, crashed, and burned, killing the entire party:

- Walter Reuther;
- May Reuther, his wife;
- William Wolfman, of Detroit, his nephew and bodyguard;
- Oskar Stonorov, a Philadelphia architect, who was a friend and business associate of Mr. Reuther; and
- George Evans, and G. (or J.) Karrafa, both of Columbus, Ohio, the two pilots.

The news media reported the crash as an unfortunate accident, and as a dramatic and newsworthy event. The New York Times, on Monday, May 11, published: (1) a full column story starting on page 1, on the death of Reuther, the accident, and tributes to him; (2) a full page account by Damon Stetson covering Reuther's life, previous attacks on him, and his accomplishments; and (3) a half column story on Oskar Stonorov, architect, city planner, and sculptor, of Phoenixville, Pa. Stonorov was the designer of the United Auto Workers Family Education Center, a project dear to Walter Reuther (a $14 million facility), due to open in July, and located at Black Lake, near Onaway. This was where the plane party was going on the fatal evening. None of the news reports raised the question of possible sabotage of the plane or similar possibilities.

WALTER REUTHER'S OBJECTIVES

Walter Reuther was an outstanding champion of the labor movement and progressive causes in the United States. Damon Stetson, in his article, said, among other things:

> Mr. Reuther looked forward to the day when the worker would spend less time on his job and more time working on a concerto, a painting, or in scientific research. "Technological advances will make that possible", he said. "In the future an auto worker may work only 10 hours at the factory. Culture will become his main preoccupation. Working for a living will be a sort of a hobby." When will this golden age of factory workers-composers begin, he was asked. "I don't know," Mr. Reuther replied, grinning. "But it'll come sooner than the National Association of Manufacturers expects."
>
> During negotiations with General Motors on one occasion, a company official raised a question about Walter Reuther's objectives. ... "If fighting for a more equal and equitable distribution of wealth in this country

COMPUTERS, SCIENCE, AND ASSASSINATIONS

Computers and Automation believes that the possibility of conspiracies in the assassinations of important American leaders in our times is of the utmost interest and significance to every American – and especially to computer people, because computers can be used: to handle large amounts of information easily; to correlate the information rapidly and accurately; to prove or disprove certain theories or possibilities of conspiracy; etc. Therefore, computer people can make a unique and important contribution to society in this area. Already a computerized analysis of information regarding the assassination of President John F. Kennedy is underway in Washington.

Accordingly, *Computers and Automation* is publishing from time to time articles and reports on: investigations into assassinations; the major evidence; and the application of computers to the evidence. Our purpose is to present important, useful, and authoritative information objectively in order to find out the truth. Since this subject is not receiving adequate and comprehensive coverage anywhere else that we know of, *Computers and Automation* has taken the responsibility to publish.

No scientist, no honest man, ever refuses to consider new evidence or to correct errors. If corrections are needed or new evidence appears, *Computers and Automation* will publish both.

is socialistic," Mr. Reuther said, "I stand guilty of being a socialist."

An outstanding objective of Mr. Reuther's union career was the attainment of a guaranteed annual wage for workers. Such a guarantee, he declared, would attack the problems of mass unemployment at the root by shifting to the employer the cost of unemployment.

Mr. Reuther inspired an almost fanatical loyalty among his subordinates, and was admired and liked by many in high places, including President Kennedy, Adlai E. Stevenson, Eleanor Roosevelt, and Vice President Hubert H. Humphrey.

PRIOR ATTACKS

Several attempts had been made on Reuther's life since he became prominent in the 1930's. In 1938 he was severely beaten in a labor dispute at the Ford plant in Dearborn, Michigan. In 1939 an armed attempt to kidnap him failed, when Reuther fought off his attackers. In 1948, after he returned home from a bargaining session, Reuther was shot in the chest and arm through his kitchen window, and was permanently disabled in part. Reuther had good reason for keeping a bodyguard with him at all times. So, in view of the attacks made on Reuther's life in the past, it is desirable to consider the question whether the plane crash that killed Walter Reuther was accidental or intended.

To try to answer this question, Computers and Automation employed the services of a highly-qualified and well-recommended investigator who lives in the Washington area. We are not at liberty to name him, but we shall call him Leonard Walden. We gave him a set of questions (see next column), and asked him to look into them.

This investigation was undertaken by Computers and Automation for the simple reason that we know of no other investigation and report on Walter Reuther's death for the purpose of answering this question -- accident or intent. However, the Federal Aviation Authority is investigating the plane crash and will eventually submit its findings to the National Transportation Safety Board for review, evaluation, and a final report. Their investigation, we understand, is still in progress. Also we understand the FAA reports on accidents are no longer made public, in order to protect manufacturers and airlines.

Following are the questions given to Leonard Walden.

QUESTIONS FOR INVESTIGATION

Walter Reuther, and five more persons, died in the crash of a private plane in Michigan some weeks ago. The basic question to be looked into is: Was Walter Reuther deliberately murdered?

Following are a few questions which, if answered, may throw some light on the basic question.

1. Knowers. Who were the persons who knew beforehand of Walter Reuther's plane trip? When did they know?
2. Motives. Who were the persons who could gain advantage from Reuther's death?
3. Enemies. Had any of his actions during the last few years particularly aroused the fear or hatred of any groups or persons? Have prior attempts to murder him occurred?
4. Planning Time. When was the fatal plane trip planned? the day before? two weeks earlier? when?
5. Plane Determination. When was the Reuther plane chosen or determined? For example, did he customarily ask for and rent this plane? (A common gangland murder device, apparently, is a bomb attached to the ignition of the car that a man regularly drives.)
6. Mechanics. Who were the mechanics who approved the plane before takeoff? Were any of these men newly hired? Did any of them leave employment shortly afterwards?
7. Altimeter. Could the altimeter of his plane have been tampered with, so that it would give too low a reading when the plane was approaching the landing field? Could other instruments have been tampered with?
8. Weather Information. Was faulty weather or faulty flying information given to Reuther's pilots?
9. Final Recordings. The pilots were presumably in touch with the landing field in northern Michigan before they approached to land. Were there any final recorded messages? What did these say?
10. Wreck Inspection. What has the wreck inspection shown so far?

Probably no one answer to any one question will answer the basic question. But it may well be that

the pattern of answers to these questions will enable a decision to be made whether or not to investigate further.

PART 2.
LEONARD WALDEN
INVESTIGATOR

Pursuant to our telephone conversation last week, confirmed by your letter, I have conducted preliminary inquiry into those facets of the Walter Reuther death which you set forth in your memorandum. I believe the points therein are very well taken. While I have no full answers to the questions as yet, I will discuss them by number to the degree that my research has thus far proceeded.

1. Knowers. Large numbers of persons in the UAW and probably other labor organizations, auto rental firm, air charter service, architectural office, and tradesmen at Black Lake Center undoubtedly knew of, and/or expected the decedents to take, the flight that ended in the deaths.

2. Motives. The persons who most obviously could gain advantage from Mr. Reuther's death would probably have been the lesser officers in the UAW. The immediate interim acting president was Secretary and Treasurer Emil Mazey, who acted only until an election according to the by-laws was held. These by-laws provided that the directorate of 25 would elect from their own membership the new president. They elected Leonard Woodcock, who had been one of Reuther's four vice presidents.

Violence was nothing new to Mr. Reuther and his UAW associates, and there were undoubtedly many inter- and intra-union officials who had no reason to grieve, foremost of whom would have been George Meany, president of AFL/CIO, who had feuded bitterly with Reuther and had lost the control of UAW in 1968 in a vigorous contest and disagreement.

These remarks, of course, do not assert or charge in any way that these persons had anything to do with Mr. Reuther's death. They simply are partial answers to the question "Cui bono? - To whose advantage?"

As for attempts to murder him: there had been several that are known of and almost surely some that are not known of. In 1938 he was severely beaten in a labor dispute at the Ford plant in Dearborn, and claimed that his attackers were paid "goons" from the Ford Servicemen's group. A year later he reported an armed kidnap attempt from which he fought his way free. For this he blamed the Communist Party, with which he had split after having been very pro-Communist for many years. (He had, in fact, worked in the Gorki auto plant in Russia for several months and had published favorable and glowing letters about the "great Russian experiment" and these things returned to haunt him years later.) In 1948, after returning home from a particularly tough bargaining session with other Union representatives, he was ambushed in the kitchen of his home and shot in the chest and arm thru his kitchen window, his right arm being very nearly severed. He lingered between life and death for some time before recovering, and was left permanently disabled to the day of his death on May 9, 1970. He was constantly in the protection of a bodyguard; in fact one of the victims of the May 9th plane crash was his bodyguard. From these circumstances one can only conclude that he always felt the threat of assault and murder right up to the second of his actual death. Collaterally, his brother Victor, who is presently an International Director of UAW, was assaulted in 1949 in a very similar manner and had an eye shot out.

3. Enemies. Walter Reuther, like other Union leaders, had many enemies both in and out of organized labor, but particularly in. He was constantly on the menacing side of the bargaining table and, in fact, was preparing to negotiate the "big four" wage talks in July of this year. Although he was seemingly admired by the industry for his acumen, he was also feared and sometimes hated. He did what the UAW members paid him to do; and he probably was one of the greatest labor representatives of all time; so obviously he aroused the hatred of industry as every other negotiator does.

I have gotten no reading on his views of the Central Intelligence Agency; but he did oppose the Cambodian invasion openly, and so advised President Nixon by telegram shortly before his death.

He had, in the past, denounced Government leaders on the right, left, and in the middle. He had also denounced Russia on their middle-east policy, Communism in the attempt to infiltrate his Union, and recently had borne down hard on militant blacks within his membership.

4. Planning. I have not pinned down the complete circumstances of the planning of the fatal plane trip. But I have ascertained that Mr. Reuther had been going to Black Lake on weekends for several weeks before his death; and he had used the same charter service on several of these occasions, probably all.

5. Plane Determination. The plane was chartered by him on this and probably other occasions from Executive Jet Corporation of Columbus, Ohio. It was a Lear L-23 Jet, registry number N-231, piloted by G. Evans and co-piloted by G. Karrafa, both of

Cleveland, Ohio. I believe that he had used this aircraft and the same pilots before; but I am not yet positive of this. I am positive that he had many times before used a Lear Jet owned by the same Executive Jet Corporation.

6. Mechanics. Again I have not ascertained positively who the mechanics were who serviced the plane but I do know that they were not affiliated with UAW although some aircraft mechanics are. It is my understanding that they were non-union mechanics. The plane could have been serviced in Columbus, Cleveland, or Detroit.

7. Altimeter. The altimeter of the Lear Jet could have malfunctioned either accidentally or by design. I have known of cases, although they are rare, where the pittot (orifice in the leading edge of the wing) has failed to open properly, thereby giving an inaccurate reading. There are, of course, other instruments equally as important as the altimeter but I am not at this point familiar enough with the nomenclature of the Lear Jet to comment with accuracy on them.

8. Weather Information. Weather conditions in the evening of May 9, 1970 were generally bad throughout the Michigan area, although there was some flying activity. There were flight delays and route changes in the commercial airline scheduling. I know of one flight which, even at 30,000 feet, encountered so much turbulence that the stewardesses had to remain buckled in their seats and could not perform their duties.

The small rural landing field near Onaway, Michigan where the fatal crash occurred was not equipped with G.C.A. (ground control approach) but there was radio communication with the Reuther jet and it was reported to have been normal. The field thought that the plane was making a normal visual approach but when it came out of the overcast it was too low. It clipped the tops of some forty high trees adjacent to the strip; then attempted to regain altitude but had apparently suffered too much damage from the trees. It stalled, then dived, striking the ground at a 45-degree angle. There was no fire or explosion until after it struck. I have the names and addresses of three eye-witnesses as well as that of the State Trooper who first arrived.

9. Final Recordings. See 8 above. There were apparently no recordings at this small airfield of the radio contact; but the airport personnel reportedly stated that they thought everything was normal.

10. Wreck Information. I have no information as yet on what the mock-up did or will reveal. The FAA investigation is presumably still in progress and the findings will be submitted to the National Transportation Safety Board for review, evaluation, and reporting. This will not be finished for some time, but when it is I will get the report. This much I do know as of now: there has been no hint to the board of foul play. To me, and I'm sure to you, this implies very little. If there was sabotage or tampering, it would have been clever and concealed so that it would not be revealed, unless a criminal type of investigation were deemed necessary. To the best of my knowledge at this point, that was not even considered.

As you can see from the above attempt to answer your questions, further detailed inquiry is needed.

At a social dinner shortly after Mr. Reuther's death one labor official remarked, "Well, they finally got Walter." I talked with another labor official in Washington and he seemed disinclined to say anything except that to him it was a clear case of pilot error. He did acknowledge, though, that the maintenance crews for Executive Jet Corporation were not in his organization and he knew nothing about them. He also said that the two pilots aboard were "hot shot", ex-military, and probably rather bold.

I made two trips to talk with certain knowledgeable people in Baltimore about what the rumblings in the underworld are with regard to this thing. Baltimore is a rather active UAW center. It seems abundantly clear that AFL/CIO officials had bitter times recently with UAW, and Reuther castigated Meany publicly and privately many times in their dispute over social ills which Reuther wanted AFL/CIO to take into their consideration.

Organized labor has a history of bloodshed and violence and Reuther was no stranger to it. He was hard-headed, dictatorial, and at the same time humanitarian. The flight that led to his death was directly connected with one of his social and humanitarian ideals which he was about to see culminated. The Black Lake project was well under way; and he and the architect Oskar Stonorov were going to spend that weekend finalizing the construction bugs. It was a center for UAW members to attend on scholarships where they would study labor relations and negotiating techniques. There were recreational facilities and quarters for their families, and it was to be a dream come true for Reuther. He had become so engrossed in it that he had been spending weekends there with his wife and bodyguard just to watch its progress. The bodyguard who died in the crash was William Wolfman, Mrs. Reuther's nephew.

On the evening of May 9, the plane waited half an hour in Detroit airport for Stonorov, who was late. As a result the plane descended for a landing in Onaway half an hour later than the intended time. The descent was in bad weather, with poor light, and poor visibility. Because it was a jet, landing speed had to be high.

I do not have information at this time about the altimeter; that question remains unanswered.

PART 3.
PRESENT APPRAISAL

EDMUND C. BERKELEY, EDITOR
COMPUTERS AND AUTOMATION

That the crash was an accident seems likely -- but is not proved.

That the crash was intended or planned seems possible -- but is not proved.

If there existed a plan by an enemy or enemies of Walter Reuther to murder him, it would appear that other possible techniques more certain of accomplishment might have been used. For example, it would have been possible to arrange an ambush at the airport. That would have been more certain of success; and the assassins would have had a good chance to escape because of the nature and the location of the airport far out in the country. But that would have the great disadvantage of not appearing to be an accident.

If and when more information becomes available, we will seek to report it in Computers and Automation.

ACROSS THE EDITOR'S DESK

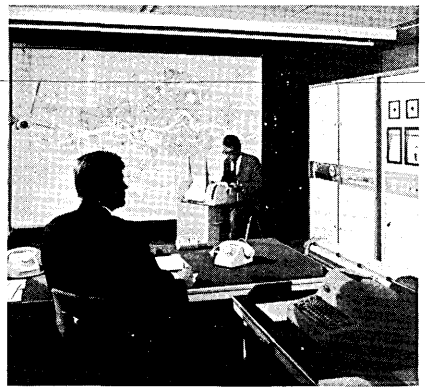
APPLICATIONS

HOLLAND CONTROLS CHEMICAL AIR POLLUTION IN ROTTERDAM AREA

Holland apparently has discovered a successful strategy for coping with the discharge of poisonous chemicals into the atmosphere. The densely populated and highly industrialized region known as the Rijnmond, located between the harbors of Rotterdam and the North Sea, has attracted a large number of oil refineries, petrochemical and chemical plants which constantly fill the atmosphere with various quantities and types of pollutants.

One method employed to counter air pollution here is constant measurement of the atmospheric sulphur dioxide content, which may be taken as the norm for the total pollution level. If this shows that a fixed threshold value is being exceeded (and if winds for rapid clearing of the pollution are not imminent) a warning is sent out to industry through a semaphore network. A large number of restrictions will then be voluntarily imposed by industry on itself.

Thirty-one detector masts, located in the Rijnmond region and popularly dubbed "sniffing poles", test the air 64 times each hour for the dreaded SO_2. Their findings are reported electronically via telephone lines to a computer at the warning center at Schiedam. By comparing the average values with calculated values from the same measuring points at the same time on a previous day, a figure is obtained that indicates the trend of the alteration in the SO_2 content at each individual measuring point.



The control panel in the warning center at Schiedam shows the positions of all the measuring points in the Rijnmond region by lights. At the right of the picture is the computer with typewriter linked to it. The computerized sulphur dioxide monitoring system was developed by N.V. Philips Gloeilampenfabrieken of Eindhoven. The firm worked closely with technological and scientific specialists of the Netherlands State Institute for Public Health and the Technological University of Eindhoven. The equipment measures wind velocity and force in addition to the air pollution.

Recently, the amount of sulphur compounds in the atmosphere above the region has gone down significantly. The quantities of nitrogen oxides have been maintained at a constant level. Much of the success achieved by the air pollution measuring network in the Rijnmond region is due to the close cooperation between the industries concerned and the Rijnmond authorities, even though this cooperation still is voluntary.

NINE MAJOR NYC BANKS ARE USING "ELECTRONIC MONEY" NETWORK, KNOWN AS CHIPS

Nine major banks in New York City are using a computerized communications network that handles interbank transfers of 15 to 20 billion dollars a week. The transfers involve over 3,000 separate transactions a day on behalf of foreign banks with a total of more than 4,000 accounts. John F. Lee, executive vice president of the New York Clearing House Association (NYCHA) which runs the computerized system for NYCHA member banks, believes it represents the first true use of "electronic money" within the commercial banking system.

A typical example of an interbank transfer could be a European bank ordering transfer of an amount of money from its account in a New York bank, with which it has correspondent relations, to an Australian bank's account in another New York City bank.

The network consists of 42 Burroughs TC 500 terminal computers that are located in the nine banks and are linked by leased telephone lines to the central computer, a Burroughs B2500, installed in the Clearing House building. The "electronic money" network — called CHIPS, for Clearing House Interbank Payments System — has been on-line and handling accounts since early April of last year. CHIPS has eliminated more than 15,000 of the checks each week that had been necessary for interbank payments — and has eliminated the need for messengers to move these checks over the streets in Lower Manhattan's financial district.

"With CHIPS", Mr. Lee said, "We have conquered the technological aspects of an 'electronic money' system, and the path is now clear for expansion...."

AIR FRANCE'S $20 MILLION ALPHA 3 RESERVATION SYSTEM AVERAGES 3 SECOND RESPONSES

The Alpha 3 reservation system, recently inaugurated by Air France (Paris), handles a daily traffic volume of 200,000 to 300,000 messages. At peak times the computers process 36,000 messages per hour. An average reservation request can be completed by the computer and a response transmitted to the booking agent in three seconds.

Besides the Air France reservations, the Alpha 3 system also handles interairline reservations for passengers transferring from Air France to connecting airlines, automobile rentals, and hotel reservations. The system also provides information, on request, concerning fares, customs, health and police formalities in the various countries served by Air France.

Air France's $20 million computer-complex is centered around three Sperry Rand UNIVAC 1108 Multiprocessor computers installed in the airline's computer center in Paris. An 18,000 mile communications network links the computer center with offices in 18 European and four North American cities having 70 visual displays and 120 teletype terminals used by reservation agents. In the near future, additional cities in Europe, North Africa and the rest of the world will be added to the network.

WORLD HEALTH ORGANIZATION LAUNCHES GLOBAL POLLUTION DETECTION SYSTEM

The World Health Organization (WHO) has worked for 15 years to get international approval of an air pollution detection and warning system. The go-ahead finally came in May 1970 at the 23rd World Health Assembly. Working with the health specialists are experts at the World Meteorological Organization (WMO) — which, like WHO, is a specialized agency of the United Nations. The WMO, concentrating on what are considered still unpolluted areas of

the world, will keep track of what is termed "background pollution."

WHO's task is to collect and analyze data on real pollution in the cities and other populated areas and to issue warnings whenever necessary. The system selected is similar to WHO's influenza warning program.

The air pollution system is based on: two international centers, in London and Washington; three regional centers, in Moscow, Nagpur and Tokyo; and 20 laboratories situated in strategic points around the globe.

WHO's computer will receive worldwide data on air pollution levels caused by the six major pollutants selected last October by 30 international experts. These are: (1) sulphur dioxide; (2) particles such as dust, soot, etc.; (3) carbon monoxide; (4) oxidants (which result from reactions induced by sunlight on automobile exhaust); (5) nitrogen oxides (also emitted by motor vehicle exhaust and central heating systems; and, (6) lead, a highly toxic product added to motor fuel to prevent "knocking".

SHO's computer will compare reported levels of these pollutants to the danger levels programmed into it by health experts and sound the alarm where necessary.

CONSTRUCTION OF NATIONAL ACCELERATOR LABORATORY MONITORED BY COMPUTER

An IBM System/360 Model 75 at Argonne National Laboratory is helping monitor construction of the buildings and other conventional structures of the world's largest scientific research instrument — the National Accelerator Laboratory. The computer tracks the progress of 12,000 activities ranging from the pouring of concrete for sidewalks to building an enclosure for a ring of special magnets in the accelerator system that will be 1¼ miles in diameter. The magnets are the main component of the research instrument, a 200 billion electron volt proton synchrotron. The accelerator will be used to explore the fundamental structure of matter.

The four-year construction effort is scheduled for completion in 1972 at a cost of $250 million. The Laboratory, located about 30 miles west of Chicago, is operated by a group of 51 universities for the U.S. Atomic Energy Commission. The contractor is formally known as Universities Research Association, Inc., of Washington, D.C.

SMALL COMPUTER TRANSLATES PRESCRIPTION DATA INTO EYEGLASS LENSES

Aniseikonia, according to Webster's Dictionary, "is a condition, whereby the image of an object formed in one eye differs in size or shape from the image of the other eye. It is an anomaly of binocular vision, whereby the ocular images of the two eyes differ in size, in shape, or in both."

At American Optical Corporation, Ophthalmic Lens Development Department (Southbridge, Mass.), a Digital Equipment Corporation PDP-8/I small computer is solving complex calculations so that Aniseikonic prescription information can be trnaslated into instructions to be used in the eyeglass lens fabrication process.

When the ophthalmologist or optometrist prescribes magnification as well as refractive corrections, an Aniseikonic lens is used. These corrections are required by the Aniseikonic patient, who in many instances, cannot function normally in his study or work without such special corrective lenses. Complex Aniseikonic prescription calculations are further complicated because there are many corrective solutions. The PDP-8/I is replacing a programmable desk-type calculator. The small computer permits a much higher degree of reliability.

EDUCATION NEWS

UNDERSTAND COMPUTERS BY PLAYING "BUGS & LOOOPS"

An M.I.T. computer expert and his wife have developed a new game — Bugs & Looops. The game's developers feel that it is important for all of us whose lives are increasingly influenced by computers to understand what they can and cannot do. They chose a game to explain computers because, as they put it, "A game doesn't scare people."

Originally designed to give computer experience to students in schools without computers, Bugs & Looops is based on a very simple computer that the players operate by hand. The computer uses colors instead of numbers. Bugs & Looops teaches the basic ideas involved in computers in gradual steps.

The kit includes a series of four games, each slightly more complex than the last. The first game in the series can be played by eight year olds, while the full game is challenging to adults. The game kit contains 8 transparent plastic cubes, a pad of programming sheets, a computer board, and an easy to understand instruction and educational booklet. It is manufactured by Creative Specialties, Inc., 83 Prospect Street, West Newton, Mass. 02165.

COMPUTER-ASSISTED INSTRUCTION IN THE RIGHT-TO-LEFT ARABIC WRITING SYSTEM

A computerized instruction system in the right-to-left Arabic writing system is in operation at The University of Texas. Dr. Victorine Constantin Abboud devised the computer-assisted instruction program as her doctoral dissertation at UT Austin. Her initial problem was the widely held belief that computers did not or would not write from right to left. Secondly, there was no graphic pattern — much less a type set in existence — for transferring the Arabic script and cursive systems into computer language.

The Arabic alphabet has 28 letters. Of those, 22 letters have three forms and six can have two forms each, depending on their position in a word. Add to that the fact that diacritical points and slashes further contribute to Arabic calligraphy as a fine art in itself. Dr. Abboud drew in the letters by filling in square areas on a pattern. In efforts to eliminate all extra drawings which could be spared, she developed an overlay technique so that a letter section could be used in making up several letters. Her graphic designs and overlay techniques alone form a significant contribution, but she developed a viable learning system as well.

Dr. Abboud built her CAI program around the order of learning itself — listening, speaking, reading and writing. "After the first hour the student can write words with a sense of accomplishment," Dr. Abboud says. After just the first explanatory material, he is saying Arabic words. The program is broken into four cycles. A student can learn in from four to eight hours of CAI program and four hours classroom instruction material that consumed up to six weeks of classroom instruction. One student became so intrigued with the fun that learning can be that on his second visit to the CAI lab he brought three friends with him.

To measure how the instruction compared with other instruction methods, UT Austin beginning Arabic students with 12 class hours of instruction including the CAI program

were comparison tested with students from Georgetown University and the University of Michigan. Though the students at the latter two schools had completed 24 to 30 class hours of instruction, the UT Austin students "had much better sound discrimination and writing skills," their professor found. The program has been studied by many visiting scholars including a group interested in the pooling of U.S. and European CAI information. The possibility of using the program as an introductory part of Arabic language training for servicemen has been suggested by the Department of Defense.

RESEARCH FRONTIER

SPEECH "TAILORED" FOR TALKING COMPUTERS

Recent work by three Bell Laboratories scientists makes it practical to store large vocabularies of synthetic speech in talking computers. L. R. Rabiner, R. W. Schafer and J. L. Flanagan have devised a method of producing computer-spoken synthetic speech using about 1/50th the amount of digital information normally required. The method includes the techniques of speech analysis, concatenation (linking words together, and synthesis and is a research toward providing computers with a practical means for supplying answers by voice.

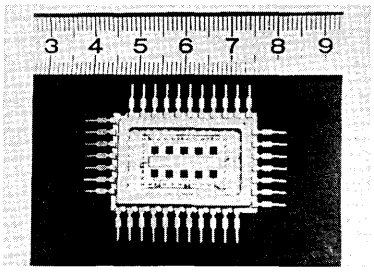
Individual words spoken by a human are analyzed, converted into numerical information, and stored in a computer. Pre-programmed instructions tell the machine to link the stored data into the numerical equivalent of sentences, and then convert this digital information into synthetic speech. This synthetic speech can be fed to an ordinary loudspeaker or transmitted over a conventional telephone system. Different sounding speech can be produced by telling the computer to lengthen or shorten words; insert pauses; and superimpose pitch variations for the sentence.

When computers are able to talk as easily as they now can print or display information, they may provide a whole new range of communications services.

HITACHI DEVELOPS ULTRA HIGH-SPEED LSIs

Hitachi, Ltd. of Japan has announced the development of an ultra high-speed, large-scale integrated circuit. The LSIs, considered the first major breakthrough in electronics since the introduction of integrated circuits, will cut down the size of computers to one-tenth that of current models and also increase computing speed 20 times. The average order processing speed would be stepped up to 200 nsec or five million computations per second. The LSIs will have an average propagation delay time at each circuit "gate" of 1.1 nsec — the fastest to date.

An enlarged view of the new LSI, in the photo below, shows 10 emitter coupled logic (ECL) chips bonded to the multi-layer printed substratum by ultrasonic waves — a new technique developed by Hitachi. The procedure, called "face-down bonding" has proven highly reliable and initial production is now geared to 10,000 units monthly.



Hitachi's new LSIs will be the key component in a new high-speed computer being developed as one of the projects initiated by Japan's Ministry of International Trade and Industry.

MISCELLANY

WEAPONS AND FERROMAGNETIC OBJECTS DETECTED BY A NEW MAGNETIC SEARCHER

A magnetic searcher, developed by the Schonstedt Instrument Co. of Reston, Va., detects ferromagnetic objects on a person passing between two stands or through a doorway. The device, designated Model SD-2 Magnetic Surveillance System, consists of two stands containing sensitive magnetic-field sensors, an electronic unit, and a signal bulb. Magnetic material carried by a person passing between the stands lights a bulb at a remote station. The SD-2 is sufficiently sensitive to detect keys, watch bands, etc. However, its sensitivity can be adjusted with a simple control to detect only larger objects.

The stands (which are positioned up to four feet apart) each contain sensors for head to foot detection capabilities. The sensor poles are readily removable from their bases for mounting around doorways (metal door frames do not significantly affect SD-2's performance). The cord for the remote indicator plugs into the electronic unit and can be any length. The device is placed into operation by operating a toggle switch, pressing a pushbutton, and zeroing the meter. the SD-2 is passive in performance and does not radiate energy or fields which affect magnetic tape or photographic film. Various options are available for permanent and concealed installations.

Uses include detection of weapons carried by persons entering aircraft loading ramps, courtrooms, prison visitor areas, etc. The searcher also detects magnets or magnetized articles being carried into computer tape storage areas, or iron or steel parts removed from an assembly room. Further information on the new searcher may be obtained by writing to: Schonstedt Instrument Co., 1775 Wiehle Ave., Reston, Va. 22070.

NEW PRODUCTS AND SERVICES

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
Digital		
Honeywell 1640 Series	Four minicomputer-based systems for small, medium and large time-sharing use / series includes: ability to handle from 16 to 64 simultaneous users and to handle and track up to 960 subscribers; magnetic tape units, line printers and punched cards for batch processing; and dedicated lines and/or remote connections via telephone coupling / each system in series can be expanded with various optional equipment	Honeywell Information Systems 60 Walnut Street Wellesley Hills, Mass. 02181 Attn: Frank Seery
MODCOMP Computer Family	For real-time measurement and control applications / 16-bit MODCOMP computers (nine models) have an 800 nsec main memory ranging in size from 4,096 to 65,536 words with shared memory configurations containing up to 122,880 of separate memory and from 8,182 to 122,880 words of shared memory / 200 nsec read-only memory (ROM) is the basic control element	Modular Computer Systems 2709 North Dixie Hwy. Ft. Lauderdale, Fla. 33308 Attn: Terry Byrne
UNIVAC 1106 Multiprocessor System	"Fail safe" system for multiprocessing at moderate prices / basic system includes: two 1106 processors, each having 4 input-output channels; minimum storage of 131K, 36-bit words; main storage read/restore cycle time is 1.5 usec; shared memory interface for access to each 32K main storage module by the two processors	Sperry Rand Univac Div. P. O. Box 500 Blue Bell, Pa. 19422 Attn: Peter R. Sigmund or Michael M. Maynard
Special Purpose Systems		
MDS/JCC (Medical Data Systems/Joint Camera Computer) System	Nuclear medicine computer system capable of both static and dynamic studies / includes computer (8K) and scope display that interface directly with gamma cameras / monitors camera data continuously, translating organ image data into digital representations; stores all diagnostic information on magnetic tape for retrieval (immediately or later) for computer analysis and presentation on the scope / system is expandable	Medical Data Systems 426 Fisher Building Detroit, Mich. 48226
Syncomp Micro/1	Specifically for use by civil engineering firms / performs full computations of engineering, subdivision, earthwork, management, and accounting functions / a full library of related programs and total capability systems also available	Synergistic Computer Systems, Inc. 2736 W. Orangethorpe Ave. Fullerton, Calif. 92633
Transaction Register System	A small computer which collects data given to it by a tiny magnetic scanner called DataWand / using DataWand, salesclerk scans coded merchandise tags / entire transaction process takes less than 20 seconds with "keyless" cash register / prices and items are recorded on magnetic tape, taxes computed, charge cards or account numbers checked and stock numbers recorded / system produces a completely detailed sales slip	Transaction Systems, Inc. 490 San Antonio Rd. Palo Alto, Calif. 94306
Memories		
Model DSU Data Storage Unit	For temporary storage of ASCII, Baudot and other codes / capable of storing from 4,000 to 40,000 data words (characters), receiving and transmitting them at speeds to 300 baud, or with an automatic buffer, up to 9600 baud / applications include message switching systems and accumulation of data at low speeds or random intervals for later retransmission at high speed	Pulse Communications, Inc. P. O. Box 1225 Alexandria, Va. 22313
RS64 fixed-head disk storage unit	For PDP-11 computer / fast random access to data at a price comparable only to core memory / control unit and one disk capable of storing 65,536 16-bit words / word transfer rate is 16 usec/word / average access time is 16.9 msec	Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754 Attn: Dennis C. Goss
VRC 6100 Series Drum Memory	Low cost drum memory system compatible with majority of mini and midicomputers / average access time 8.7 msec for 60 Hz; 10 msec for 50 Hz/ models for 8-bit, 12-bit and 16-bit word computers / field expandable	Vermont Research Corp. Precision Park N. Springfield, Vt. 05150

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Memories, continued)		
Mod+ 30	Core memory replacements for System/360 Model 30, 40, and 50 computers / upgrades Model 30 computers from 16K bytes to 96K bytes and are plug in replacements for IBM core / systems for lease or sale	Fabri-Tek, Inc. Memory Products Div. 5901 County Road 18 Minneapolis, Minn. 55436
Model TMY	Computer-compatible tape memory for minicomputers and data terminals / IBM-format read and write modes; packing densities of 200, 556 and 800 bits per inch, ensuring data interchange with standard-size computer tape transports	Ampex Corp. 9937 West Jefferson Blvd. Culver City, Calif. Attn: Chris Hoppin
Software		
CLASS-SET	For storing, sorting, and typesetting classified advertising matter / special identification codes at start of tape and each ad permit random entry of ads as they come in, intermingled with other typesetting matter handled by the system	Composition Systems Inc. 325 Central Ave. White Plains, N.Y. 10606 Attn: Charles Fizer
Generalized Table File Maintenance System (GTFM)	OS utility system for generating, maintaining and referencing data tables / tables processed through a special update program / table size can be increased without increasing core requirements / changes and additions are edited for data type, range, etc.	Computer Services Corp. 23225 Northwestern Hwy. Southfield, Mich. 48075 Attn: Ronald J. Laubert
GETPUT	A random access program for users of FORTRAN V on the UNIVAC 1108 EXEC 8 operating system / operating with mass storage files such as FASTRAND, the package of subroutines are completely compatible with the FORTRAN V unformatted input/output statements / may be used to access either temporary or catalogued mass storage drum files	Axicom Systems, Inc. P. O. Box 648 Paramus, N.J. 07652 Attn: H. L. Roberts
PS-8 system	For use with any model PDP-8 with 8,192 words of core memory / a modification to the expandable software operating system for the PDP-8 / significant reductions in programming time; permits development of longer programs; permits its use with time-shared versions of the PDP-8; and permits mixing of assembly level languages with higher level languages	Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754 Attn: Dennis C. Goss
PORTFOLIO	For use by brokerage houses, banks, mutual funds, etc. / program makes buy/hold/sell recommendations / designed to optimize large securities portfolios	Sci-Tek, Inc. 1707 Gilpin Ave. Wilmington, Del. 19806
SCORE III COBOL PROGRAM GENERATOR	Available now for the RCA Spectra 70 with TSOS (Time Sharing Operating System), and the Honeywell 200 Series with OS/200 / requires a minimum of 32K (supervisor included)	Atlantic Software Inc. 312 Lafayette Bldg. Philadelphia, Pa. 19106 Attn: Robert P. Wolk
System/360 Data Extract Package	Selects individual records from existing data files according to user specified selection criteria / processes four types of fields: alphanumeric, packed-decimal, binary, and single/double precision fixed-point numbers / operates in 8K bytes	MEQA 2200 Leavenworth San Francisco, Calif. 94133
Peripheral Equipment		
Brush 1100 Graphic Plotter	X-Y plotter is compatible with remote time sharing computer terminals / accepts 8-level ASCII code at teleprinter rates / plots lines up to 3" long between points, on a 4-digit absolute coordinate basis / can be used on-line or off-line	Brush Division Gould Inc. 3631 Perkins Ave. Cleveland, Ohio 44114
Cassette Tape System	Designed as low cost replacement for paper tape input/output systems / includes dual transports with single controller; 300 bytes/second transfer rate; 250 kilobytes of storage per cassette (300); 3.0 ips read/write speed; 800 bpi data packing density	Interdata Inc. 2 Crescent Place Oceanport, N.J. 07757 Attn: Ron Patterson
Microplot 1000 Digital Microfilm Plotter	For graphic data processing with emphasis toward scientific community / accepts digital positioning and intensity inputs from a computer or other sources of digital data / records graphical information onto microfilm	Beta Instrument Corp. 20 Ossipee Rd. Newton, Mass. 02160 Attn: Tony Addonizio
Mini-Computer Printer, Model 880E	For printing requirements of the mini-computer user / on-line and off-line applications / has full line 80 character buffer; impact to print six copies; and a speed of 400 lines a minute (80 character line width)	Shepard Division of Vogue Instrument Corp. 131 St. & Jamaica Ave. Richmond Hill, N.Y. 11418

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Peripheral Equipment, continued)		
Model 2575A Coupler/Controller	Programmable, two-way communications link for up to four digital devices / connect by means of cables and interface cards / signals are converted to a standard code, 8-bit ASCII, and exchanged via a data bus in the 2575A; code conversions take place on interface cards, which plug into the data bus / interface cards available for wide variety of computers and peripherals	Inquiries Manager Hewlett-Packard Co. 1601 California Ave. Palo Alto, Calif. 94304
PMR/50 Portable Microfiche Reader	Provides clear, 8½" x 11" images / weighs only 7½ lbs.; measures 13" x 13" x 7½" / on-off button regulates high or low screen illumination / plugs into standard electrical outlets	DASA Corporation Andover, Mass. 01810 Attn: Douglas Cameron
Totally Teletype Compatible Telecommunications Display, the CC-335 TOTELCOM	Portable, self-contained CRT display terminal / completely interchangeable with Model 33 and 35 Teletypes / fully compatible with existing Teletype programs, programming practices, and input-output formats regardless of central computer utilized	Computer Communications, Inc. 701 West Manchester Blvd. Inglewood, Calif. 90301 Attn: Al Astor
UniComp Model 522, keyboard display unit	Self-contained device contains keyboard, CRT display, memory, power supply and communications interface / the stand-alone system can be substituted directly for Teletype equipment / selectable transmission rates / displays 1998 characters, full or half-duplex operation / over 20 editing operations	UniComp Inc. 18219 Parthenia St. Northridge, Calif. 91324
VT06 Alphanumeric Display Terminal	For use with all DEC computers; also compatible with computers that support ASCII terminals / transmits data over standard phone lines and data sets at half or full duplex at various switch selectable rates up to 2400 Baud / 97 character keyboard / 1800 character display	Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754 Attn: Dimitri Dimancesco, Jr.
Computing/Time-Sharing Centers		
Batch to On-Line System Conversion	A 7-day conversion service for customers who wish to "query their tapes" / service produces a customized interactive Inquiry System for each client; any magnetic tape can be used as its data-base / available nationwide from GT&E Information Systems' APL network	APL General Sales Dept. 433 Latona Ave. Trenton, N.J. 08618
Margin Monitor (off-line version)	Management tool offers smaller banks pricing, reporting and analysis data on their collateral holdings / off-line version substitutes mailed reports for the direct computer connection / subscribing banks establish data base of loan collateral information in BankCom's computer / variety of periodic reports to select from	Bank Computer Network Corp. c/o J. Bernstein Assoc. Inc. 37 West 57th St. New York, N.Y. 10019
Computer-Related Services		
ARGOS, financial analysis system	Investment system which continuously monitors every security transaction on the New York and American Stock Exchanges / delivers the information to CRT display terminals in customers' offices / system has six basic financial information displays and several optional displays	LV Computer Systems, Inc. 211 E. 43rd St. New York, N.Y. 10017 Attn: Charles K. Butler
Census Tract Data	Available from the first count of the 1970 Census of Population and Housing / enumeration district and city block group data (which appears in first count) has been aggregated by a special computer program into census tracts — important in statistical studies / available in either tape or microfilm form	National Planning Data Corp. 65 Broad St. Rochester, N.Y. 14614 Attn: John W. Branch
JETPLAN	Computerized flight planning service (see Computers and Automation, April 1970, p.57) being expanded to cover all overseas airports of entry / service thus available to airlines, supplemental carriers, and corporate jet fleets that operate internationally / JETPLAN stores computer-to-computer world-wide weather information in addition to routine data	Lockheed Aircraft Svce. Co. Ontario International Airport Ontario, Calif. 94661 Attn: Jim Bull
Remote Terminal Service	A remote portable terminal rental and computer program access service / based on proprietary software developed for Allis-Chalmers operations / programs to provide information in manufacturing, finance, design, sales and personnel administration / available nationwide	Allis-Chalmers Data Services Division Milwaukee, Wis. 53201 Attn: Bob Houlehen

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Control Data Corp., Minneapolis, Minn.	U.S. Navy	Installation of 3-6000 Series and 6-1700 systems at the Naval Weapons Laboratory and Naval Ship Research and Development Center	$15.2 million
Control Data Corp., Minneapolis, Minn.	Volkswagenwerk AG, Wolfsburg, Germany	CDC 6500 system, 1700s & 1500 series in Research & Development Center; will control 60 teststands in automobile element tests	$14 million
Univac Division of Sperry Rand Corp., Blue Bell, Pa.	Naval Ship Systems Command	Production of AN/UYK-7 computers to be installed on the SSN-688, new class of attack submarine & DLGN-38, new class of guided missile nuclear destroyers	$9.9 million
Sanders Assoc., Inc., Nashua, N.H.	IBM, Federal Systems Division	Subcontract to develop submarine processor systems on new submarine class	$3.6 million
Univac Division of Sperry Rand Corp	University of Paris, Paris, France	Univac 1100 system for use in scientific research program, Laboratory for Theoretical Physics and High Energy	$2.5+ million
Computer Technology, Inc., Dallas, Tex.	Vought Aeronautics Co., div. of LTV Aerospace Corp.	A-7E Night Carrier Landing Trainer; 2 systems to train Navy pilots for night landings on aircraft carriers.	$1.6 million
Univac Division of Sperry Rand Corp., New York, N.Y.	University of Maryland, College Park, Md.	New Univac 1108 for academic & business functions of 44,000 student grades, payroll for 15,000 & accounting functions	$1.4 million (approximate)
Management Systems Corp., subsidiary of American Biomedical Corp., Dallas, Tex.	Oak Cliff Savings & Loan Assn., Dallas, Tex.	Data processing services, including financial accounting for Oak Cliff Savings & Ft. Worth Savings & Loan	$1.25 million
Univac Division of Oy Sperry Rand AB Finland	Silja Line, Turku, Finland	Two Univac 9400 systems for automating passenger & vehicle bookings between Finland and Sweden	$1.2 million
Cubic Corp., San Diego, Calif.	Lockheed Missile & Space Co., Sunnyvale, Calif.	Space vehicle telemetry, communications and command equipment	$1+ million
	Air Material Area, Warner Robins Air Force Base, Ga.	A follow-on contract for engineering services & repair of avionics equipment for the A.F. Geodetic & Aerial Photomapping system	$1 million
Computing and Software, Inc., Los Angeles, Calif.	Montreal and Canadian Stock Exchange	Processing of financial & statistical information & producing timely reports of market activity for financial media	$1 million (approximate)
Massachusetts Institute of Technology, Cambridge, Mass.	Council on Library Resources	Grant to support 1-year experimental operation of Project INTREX, a computer-based technical library system that could be a prototype for future libraries	$400,000
Standard Register Co., Dayton, Ohio	General Services Administration, Federal Government	141 Source Record Punch data collection units for GSA motorpool locations across the country; punches & prints at one time	$297,000
EMR Computer, Minneapolis, Minn.	National Bureau of Standards, Washington, D.C.	An EMR 6135 Computer System to control experiments & process data in an analytical chemical laboratory	$240,000+
Informatics Tisco, Inc., subsidiary of Informatics, Inc., Canoga Park, Calif.	National Institute of Mental Health	Abstract and index documents from the world-wide mental health literature	$217,000
Planning Research Corp., Los Angeles, Calif.	State of Michigan, Executive Offices	Development of a master plan for a statewide automated management information system	$135,000
Interdata, Inc., Oceanport, N.J.	Macro Data, Inc., Chatsworth, Calif.	Eight Model 4's to be involved in LSI testing & automatic layout systems	$120,000+
Comserv Corp., Minneapolis, Minn.	Memorex Corp., Santa Clara, Calif.	A manufacturing materials control system providing production control, engineering, and accounting with control information	$100,000+
Computer Communications, Inc., Inglewood, Calif.	Mead Data Central, Inc., Dayton, Ohio	Two CC-70 Computer Communicators to be interfaced to IBM 360/40 system; will be used to control a nationwide network of on-line information retrieval stations	$100,000
Analysts International Corp., Minneapolis, Minn.	The St. Paul Companies	Development of a data processing software system for payroll, personnel, & statistical applications for an IBM 360 computer	$90,000
Incoterm, Marlborough, Mass.	British Overseas Airways Corp.	Computer display terminals into BOAC's BOADICEA system offering full passenger reservation service & departure control	—
Recognition Equipment GmbH, subsidiary of Recognition Equipment Inc., Dallas, Tex.	Commerzbank AG, Frankfurt, Germany	Lease of an optical character recognition system for updating the bank's files from information typed at branch locations	—
Computer Congenerics Corp., Oklahoma City, Okla.	Air Training Command, Randolph Air Force Base, Tex.	A second programmer training contract to teach classes on the IBM System/360 Disk Operating System and COBOL	—
Scan-Data Corp., Norristown, Pa.	Information Control, Inc., OCR Service Bureau, Kansas City, Kans.	Model 200 multi-font OCR system equipped with self-teaching software; automatically defines any typed or printed font	—
Recognition Equipment Inc., Dallas, Tex.	Bank of England, England	A Bar Code Reader/Sorter system to segregate new bank notes flawed in printing	—
Information Science, Inc., New City, N.Y.	Owens-Corning Fiberglas Corp.	Design & installation of a corporate-wide Personnal Data System for employees	—

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B 2500 system	H. Daroff & Sons, Inc., Philadelphia, Pa.	An on-line, real-time order entry system in the garment industry; will maintain an accurate perpetual inventory and automatic credit checking
Burroughs B5700 system	Remote Computing Corp., Los Angeles, Calif.	Doubling job-handling capacity to meet increasing needs & allow for anticipated increase in the number of time-sharing users
Control Data 3150 system	Nieuwe Rotterdamsch Courant, Rotterdam, The Netherlands	Payroll functions, personnel reporting, production reporting & administrative data processing
Control Data 3300 system	Hughes Aircraft Co., Fullerton, Calif.	Use as the central computer of a test bed facility; Phase II of the Marine Tactical Command & Control System at Camp Pendleton, Calif.
Control Data 7600 system	Los Alamos Scientific Laboratory, Los Alamos, N.M.	A second computer system to process nuclear energy research and development data (system valued at $6.3 million)
Datacraft DC 6024/3 system	Instituto Geofisico del Peru, Lima, Peru	Use in data acquisition & processing, primarily of scientific data in connection with infrasonic atmospheric waves, seismology and other geophysical research activities
Honeywell Model 110 system	Burke Concrete Accessories, Inc., Burlingame, Calif.	Payroll, accounts payable, accounts receivable, general ledger & inventory control applications
	Deseret Book Co., Salt Lake City, Utah	General ledger, accounts payable, accounts receivable, payroll & inventory control applications
Honeywell Model 115 system	Norwesco Computing, Mountlake Terrace, Wash.	Customer invoicing services for garbage companies; will expand into other service bureau operations
	Tatham, Laird and Kudner, Chicago, Ill.	Media research, media sales & evaluation, production accounting, media buying, production invoicing and payroll in advertising
Honeywell Model 125 system	Chandler Leasing Div., Pepsico Service Industries Leasing Corp., Lexington, Mass.	Lease-accounting applications for all facets of capital-equipment leasing, including loan accounting, customer billing, financial reporting, etc.
Honeywell Model 8200	Mack Trucks, Inc., Allentown, Pa.	Production and operations support, inventory analysis, forecasting and some simulation
IBM System/3	Albert N. Solomon & Co., Allston, Mass.	Order processing, sales analysis, retail sales reporting, accounts payable and payroll
	Goodson-Tyler & Associates, Gary, Ind.	Accounts receivable and payable, payroll, general ledger and account analysis
	Kansas Bank Note Co., Fredonia, Kans.	Fulfillment of printed form needs; inventory/cost control; equipped with magnetic disks for information storage and retrieval
	Miracle Adhesives Corp., Bellmore, Long Island	Production planning, stockholder records, cost analysis, customer billings, etc.; will also be used for inventory and production control
	Schnepp & Associates, Decatur, Ill.	Handling inventory, billing, sales analysis, order processing and other accounting tasks
IBM System/360 Model 20	Synetics, Inc., Charlotte, N.C.	Job costing, sales analysis, inventory control and general ledger work for six printing companies
IBM System/360 Model 44G	Wichita State University, Wichita, Kans.	Better service to students and staff in classroom and research work
IBM System/360 Model 65	International Harvester Co., Motor Truck Div., Ft. Wayne, Ind.	An inventory locator system enabling salesmen and dealers to locate new trucks, increasing sales potential and improving customer service
IBM System/360 Model 85	Central Electricity Generating Board, London, England	Providing an additional computer facility to meet increased computing work load of the winter months
UNIVAC 1106 system	Bonnierdata AB, Stockholm, Sweden	Processing 1,500,000 subscribers' inquiries, production and inventory control, general accounting (system valued at about $1.8 million)
UNIVAC 9200 system	Hunkin Conkey Co., Cleveland, Ohio	Cost accounting, payroll processing, engineering calculations, general accounting
	Robertson Heating Supply Co., Alliance, Ohio	Billing, inventory control, sales analysis, general accounting
	St. Thomas Hospital, Akron, Ohio	Inpatient and outpatient billing, inventory control, medical statistics, general accounting
	Value House, Lewiston, Maine	Inventory, purchasing, accounts payable, and a daily sales analysis
UNIVAC 9300 system	John Meyer Co., Norwich, Conn.	Automated cloth cutting; also for order entry, sales analysis, billing, picking tickets, category analysis, general accounting, payroll processing
UNIVAC 9400 system	The Happich Co., Wuppertal, West Germany (2 systems)	Order handling, inventory control, billing, issuance of shipping papers, payroll, preparation of work plans and schedules; also production control, personnel data files and other applications
	Manufacturers Hanover Trust Bank, London, England	Operation of a bookkeeping system
XDS Sigma 3 system	Whirlpool Corp., St. Joseph, Mich.	Quality and reliability testing of firm's products, which include dishwashers, automatic washers and dryers and washer-dryer combinations
XDS Sigma 5	Memphis State University, Memphis, Tenn.	General-purpose research and instruction; initially about 10% of students, increasing as development of computer-oriented curricula takes place

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 DECEMBER 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 I. United States Manufacturers								
Autonetics	RECOMP II	11/58	2.5		30	0	30	X
Anaheim, Calif. (R) (1/69)	RECOMP III	6/61	1.5		6	0	6	X
Bailey Meter Co.	Bailey 750	6/60	40-250	(S)	32	3	35	0
Wickliffe, Ohio (A) (12/70)	Bailey 755	11/61	200-600	(S)	6	0	6	0
	Bailey 756	2/65	60-400	(S)	13	5	18	6
	Bailey 855	4/68	100-1000	(S)	8	0	8	17
Bunker-Ramo Corp.	BR-130	10/61	2.0		160	-	-	X
Westlake Village, Calif.	BR-133	5/64	2.4		79	-	-	X
(A)	BR-230	8/63	2.7		15	-	-	X
(12/70)	BR-300	3/59	3.0		18	-	-	X
	BR-330	12/60	4.0		19	-	-	X
	BR-340	12/63	7.0		19	-	-	X
	BR-1018	6/71	23.0	(S)	-	-	-	-
Burroughs	205	1/54	4.6		25-38	2	27-40	X
Detroit, Mich.	220	10/58	14.0		28-31	2	30-33	X
(N)	B100/B500	7/65	2.8-9.0		-	-	-	-
(1/69-5/69)	B2500	2/67	5.0		52-57	12	64-69	117
	B3500	5/67	14.0		44	18	62	190
	B5500	3/63	23.5		65-74	7	72-81	8
	B6500	2/68	33.0		4	0	4	60
	B7500	4/69	44.0		0	0	0	13
	B8500	8/67	200.0		1	0	1	5
Computer Automation, Inc.	208/808	6/68	5.0	(S)	143	7	150	130
Newport Beach, Calif. (A) (12/70)	216/816	3/69	8.0	(S)	157	13	170	215
Control Data Corp.	G15	7/55	1.6		-	-	295	X
Minneapolis, Minn.	G20	4/61	15.5		-	-	20	X
(R)	LGP-21	12/62	0.7		-	-	165	X
(9/70)	LGP-30	9/56	1.3		-	-	322	X
	RPC4000	1/61	1.9		-	-	75	X
	636/136/046 Series	-	-		-	-	29	-
	160/8090 Series	5/60	2.1-14.0		-	-	610	X
	924/924-A	8/61	11.0		-	-	29	X
	1604/A/B	1/60	45.0		-	-	59	X
	1700	5/66	3.8		-	-	106-180	C
	3100/3150	5/64	10-16		-	-	83-110	C
	3200	5/64	13.0		-	-	55-60	C
	3300	9/65	20-38		-	-	200	C
	3400	11/64	18.0		-	-	20	C
	3500	8/68	25.0		-	-	15	C
	3600	6/23	52.0		-	-	39	C
	3800	2/66	53.0		-	-	20	C
	6400/6500	8/64	58.0		-	-	85	C
	6600	8/64	115.0		-	-	85	C
	6800	6/67	130.0		-	-	1	C
	7600	12/68	235.0		-	-	1	C
								Total: 160 E
Data General Corp.	NOVA	2/69	8.0	(S)	-	-	748	-
Southboro, Mass. (A) (12/70)	SUPERNOVA	5/70	9.6	(S)	-	-	73	-
	NOVA 1200	2/71	5.4	(S)	-	-	-	-
	NOVA 800	4/71	6.9	(S)	-	-	-	-
	SUPERNOVA SC	6/71	11.9	(S)	-	-	-	-
Datacraft Corp.	6024/1	5/69	54-200	(S)	9	0	9	4
Ft. Lauderdale, Fla.(A) (10/70) DC	6024/3	2/70	33-200	(S)	21	0	21	45
Digiac Corp.	Digiac 3060	1/70	9.0	(S)	25	-	-	5
Plainview, N.Y. (A) (12/70)	Digiac 3080	12/64	19.5	(S)	16	-	-	0
	Digiac 3080C	10/67	25.0	(S)	7	-	-	1
Digital Equipment Corp.	PDP-1	11/60	3.4		50	2	52	X
Maynard, Mass.	PDP-4	8/62	1.7		40	5	45	X
(A)	PDP-5	9/63	0.9		90	10	100	X
(6/70)	PDP-6	10/64	10.0		C	C	23	X
	PDP-7	11/64	1.3		C	C	160	X
	PDP-8	4/65	0.5		C	C	1450	C
	PDP-8/I	3/68	0.4		C	C	2157	C
	PDP-8/S	9/66	0.3		C	C	1020	C
	PDP-8/L	11/68	-		C	C	2350	C
	PDP-9	12/66	1.1		C	C	425	C
	PDP-9L	11/68	-		C	C	41	C
	PDP-10	12/67	8.0		C	C	144	C
	PDP-11	3/70	10.5	(S)	C	C	27	C
	PDP-12	9/69	-		C	C	275	C

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
Digital Equipment Corp. (Cont'd)	PDP-15	2/16	17.0	6	C	15	C
	LINC-8	9/66	-	C	C	142	C
							Total: 1350 E
Electronic Associates Inc.	640	4/67	1.2	90	40	130	10
Long Branch, N.J. (A) (12/70)	8400	7/67	12.0	19	6	25	2
EMR Computer	EMR 6020	4/65	5.4	C	-	-	C
Minneapolis, Minn.	EMR 6040	7/65	6.6	C	-	-	C
(N)	EMR 6050	2/66	9.0	C	-	-	C
(12/70)	EMR 6070	10/66	15.0	C	-	-	C
	EMR 6130	8/67	5.0	C	-	-	C
	EMR 6135	-	2.6	-	-	-	-
	EMR 6155	-	-	-	-	-	-
				Total: 103 E	11		Total: 15 E
General Electric	58	5/70	1.0	-	-	-	-
Phoenix, Ariz.	105A	6/69	1.3	-	-	-	-
(N)	105B	6/69	1.4	-	-	-	-
(9/70)	105RTS	7/69	1.2	-	-	-	-
	115	4/66	2.2	200-400	420-680	620-1080	-
	120	3/69	2.9	-	-	-	-
	130	12/68	4.5	-	-	-	-
	205	6/64	2.9	11	0	11	-
	210	7/60	16.0	35	0	35	-
	215	9/63	6.0	15	1	16	-
	225	4/61	8.0	145	15	160	-
	235	4/64	12.0	40-60	17	57-77	-
	245	11/68	13.0	3	-	3	-
	255 T/S	10/67	17.0	15-20	-	15-20	-
	265 T/S	10/65	20.0	45-60	15-30	60-90	-
	275 T/S	11/68	23.0	-	-	10	-
	405	2/68	6.8	10-40	5	15-45	-
	410 T/S	11/69	11.0	-	-	-	-
	415	5/64	7.3	170-300	70-100	240-400	-
	420 T/S	6/67	23.0	-	-	-	-
	425	6/64	9.6	50-100	20-30	70-130	-
	430 T/S	6/69	17.0	-	-	-	-
	435	9/65	14.0	20	6	26	-
	440 T/S	7/69	25.0	-	-	-	-
	615	3/68	32.0	-	-	-	-
	625	4/65	43.0	23	3	26	-
	635	5/65	47.0	20-40	3	23-43	-
	655	12/70	80.0	-	-	-	-
Process Control Computers:	3010	5/70	2.0	2	0	2	5
(A)	4010	10/70	6.0	2	0	2	16
(12/70)	4020	2/67	6.0	172	49	221	59
	4040	8/64	3.0	45	20	65	X
	4050	12/66	7.0	23	1	24	X
	4060	6/65	2.0	18	2	20	X
Hewlett Packard	2114A	10/68	0.25	-	-	915	-
Cupertino, Calif.	2115A	11/67	0.41	-	-	663	-
(A) (9/70)	2116A, 2116B	11/66	0.6	-	-	1156	-
Honeywell	DDP-24	5/63	2.65	-	-	90	X
Computer Control Div.	DDP-116	4/65	0.9	-	-	250	-
Framingham, Mass.	DDP-124	3/66	2.2	-	-	175	-
(R)	DDP-224	3/65	3.5	-	-	60	-
(9/70)	DDP-316	6/69	0.6	-	-	325	-
	DDP-416	-	-	-	-	250	-
	DDP-516	9/66	1.2	-	-	800	-
	H112	10/69	-	-	-	70	-
	H632	12/68	3.2	-	-	12	-
	H1648	11/68	12.0	-	-	20	-
Honeywell	H-110	8/68	2.7	180	75	255	0
EDP Div.	H-115	6/70	3.5	30	-	3-	-
Wellesley Hills, Mass.	H-120	1/66	4.8	800	160	960	-
(R)	H-125	12/67	7.0	150	220	370	-
(6/70)	H-200	3/64	7.5	800	275	1075	-
	H-400	12/61	10.5	46	40	86	X
	H-800	12/60	30.0	58	15	73	X
	H-1200	2/66	9.8	230	90	325	-
	H-1250	7/68	12.0	130	55	185	-
	H-1400	1/64	14.0	4	6	10	X
	H-1800	1/64	50.0	15	5	20	X
	H-2200	1/66	18.0	125	60	185	-
	H-3200	2/70	24.0	20	2	22	-
	H-4200	8/68	32.5	18	2	20	-
	H-8200	12/68	50.0	10	3	14	-
IBM	System 3	1/70	1.1	0	0	-	-
White Plains, N.Y.	305	12/57	3.6	40	15	55	-
(N) (D)	650	10/67	4.8	50	18	68	-
(1/69-5/69)	1130	2/66	1.5	2580	1227	3807	-
	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
	1401-H	6/67	1.3	180	140	320	-
	1410	11/61	17.0	156	116	272	-
	1440	4/63	4.1	1690	1174	2864	-
	1460	10/63	10.0	194	63	257	-
	1620 1, 11	9/60	4.1	285	186	471	-
	1800	1/66	5.1	415	148	563	-
	7010	10/63	26.0	67	14	81	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	2	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7020,2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-

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
IBM (Cont'd.)	7094-I	9/62	75.0		10	4	14	-
	7094-II	4/64	83.0		6	4	10	-
	360/20	12/65	2.7		4690	3276	7966	-
	360/25	1/68	5.1		0	4	4	-
	360/30	5/65	10.3		5075	3144	8219	-
	360/40	4/65	19.3		1260	498	1758	-
	360/44	7/66	11.8		65	13	78	-
	360/50	8/65	29.1		480	109	589	-
	360/65	11/65	57.2		175	31	206	-
	360/67	10/66	133.8		9	4	13	-
	360/75	2/66	66.9		14	3	17	-
	360/85	12/69	150.3		0	0	0	-
	360/90	11/67	(S)		5	0	5	-
	360/195	-	232.0		-	-	-	-
Interdata	Model 1	11/70	-	(S)	-	-	10	-
Oceanport, N.J.	Model 2	7/68	-		-	-	18	X
(A) (12/70)	Model 3	3/67	-		-	-	300	X
	Model 4	8/68	-		480	20	500	X
	Model 5	8/70	-	(S)	-	-	5	-
NCR	304	1/60	14.0		15	2	17	X
Dayton, Ohio	310	5/61	2.5		8	0	8	X
(R)	315	5/62	8.7		400	300	700	-
(9/70)	315 RMC	9/65	12.0		125	45	170	-
	390	5/61	1.9		350	500	850	-
	500	10/65	1.5		1100	1550	2650	-
	Century 100	9/68	2.7		700	250	950	-
	Century 200	6/69	7.5		200	75	275	-
Philco	1000	6/63	7.0		16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	40.0		16	-	-	X
(N) (1/69)	2000-212	1/63	52.0		12	-	-	X
RCA	301	2/61	7.0		140-290	100-130	240-420	-
Cherry Hill, N.J.	501	6/59	14.0-18.0		22-50	1	23-51	-
(N)	601	11/62	14.0-35.0		2	0	2	-
(5/69)	3301	7/64	17.0-35.0		24-60	1-5	25-65	-
	Spectra 70/15	9/65	4.3		90-110	35-60	125-170	-
	Spectra 70/25	9/65	6.6		68-70	18-25	86-95	-
	Spectra 70/35	1/67	9.2		65-100	20-50	85-150	-
	Spectra 70/45	11/65	22.5		84-180	21-55	105-235	-
	Spectra 70/46	-	33.5		1	0	1	-
	Spectra 70/55	11/66	34.0		11	1	12	-
Raytheon	250	12/60	1.2		155	20	175	X
Santa Ana, Calif.	440	3/64	3.6		20	-	20	X
(A)	520	10/65	3.2		26	1	27	X
(12/70)	703	10/67	12.8	(S)	165	30	195	1
	704	3/70	9.8	(S)	37	10	47	10
	706	5/69	19.0	(S)	36	12	48	7
Scientific Control Corp.	650	5/66	0.5		23	0	23	X
Dallas, Tex.	655	10/66	2.1		137	0	137	0
(A)	660	10/65	2.1		41	0	41	0
(6/70)	670	5/66	2.7		1	0	1	X
	4700	4/69	1.8		19	0	19	4
	DCT-132	5/69	0.9		45	0	45	23
Standard Computer Corp.	IC 4000	12/68	9.0		8	0	8	6
Los Angeles, Calif.	IC 6000	5/67	16.0		9	0	9	-
(N) (12/70)	IC 7000	8/70	17.0		4	0	4	5
Systems Engineering Laboratories	810	9/65	1.1		24	0	24	X
Ft. Lauderdale, Fla.	810A	8/66	0.9		211	5	216	32
(A)	810B	9/68	1.2		75	1	76	26
(6/70)	840	11/65	1.5		3	0	3	X
	840A	8/66	1.5		36	2	38	X
	840MP	1/68	2.0		31	0	31	2
	Systems 86	-	10.0		0	0	0	2
UNIVAC Div. of Sperry Rand)	I & II	3/51 & 11/57	25.0		23	-	-	X
New York, N.Y.	III	8/62	21.0		25	6	31	X
(R)	File Computers	8/56	15.0		13	-	-	X
(1/69-5/69)	Solid-State 80 I,II, 90,1,11,& Step	8/58	8.0		210	-	-	X
	418	6/63	11.0		76	36	112	20 E
	490 Series	12/61	30.0		75	11	86	35 E
	1004	2/63	1.9		1502	628	2130	20 E
	1005	4/66	2.4		637	299	936	90 E
	1050	9/63	8.5		138	62	200	10 E
	1100 Series (except 1107,1108)	12/50	35.0		9	0	9	X
	1107	10/62	57.0		8	3	11	X
	1108	9/65	68,0		38	18	56	75 E
	9200	6/67	1.5		127	48	175	850 E
	9300	9/67	3.4		106	38	144	550 E
	9400	5/69	7.0		3	0	3	60 E
	LARC	5/60	135.0		2	0	2	-
Varian Data Machines	620	11/65	0.9		-	-	75	X
Newport Beach, Calif.	620i	6/67	0.5		-	-	1300	400
(A) (12/70)	R-620i	4/69	-		-	-	50	30
	520i	10/68	0.4		-	-	150	330
	520/DC	12/69	1.6		-	-	25	25
	620/f	11/70	.5		-	-	7	125
Xerox Data Systems	XDS-92	4/65	1.5		10-60	2	12-62	-
El Segundo, Calif.	XDS-910	8/62	2.0		150-170	7-10	157-180	-
(R)	XDS-920	9/62	2.9		93-120	5-12	98-132	-
(12/70)	XDS-925	12/64	3.0		20	1	21	-
	XDS-930	6/64	3.4		159	14	173	-
	XDS-940	4/66	14.0		28-35	0	28-35	-
	XDS-9300	11/64	8.5		21-25	1	22-26	-
	Sigma 2	12/66	1.8		60-110	10-15	70-125	-
	Sigma 3	12/69	2.0		10	0	10	-
	Sigma 5	8/67	6.0		15-40	6-18	21-58	-
	Sigma 6	6/70	12.0		-	-	-	-
	Sigma 7	12/66	12.0		24-35	5-9	29-44	-
	Sigma 9	-	35.0		-	-	-	-

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. This month's Numble was contributed by:

Stuart Freudberg
Newton High School
Newton, Mass.

NUMBLE 711

```
    M A N Y
  + C A N
  = N R E U
× A R G U E        VG = UT = SG
    M R R E E
  A Y G Y V
A T O O R
Y O N G R
Y N E N E
= Y T A R Y Y S M E    50743  51905  68268
```

Solution to Numble 7012

In Numble 7012 in the December issue, the digits 0 through 9 are represented by letters as follows:

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

The message is: Discretion is the handmaiden of truth.

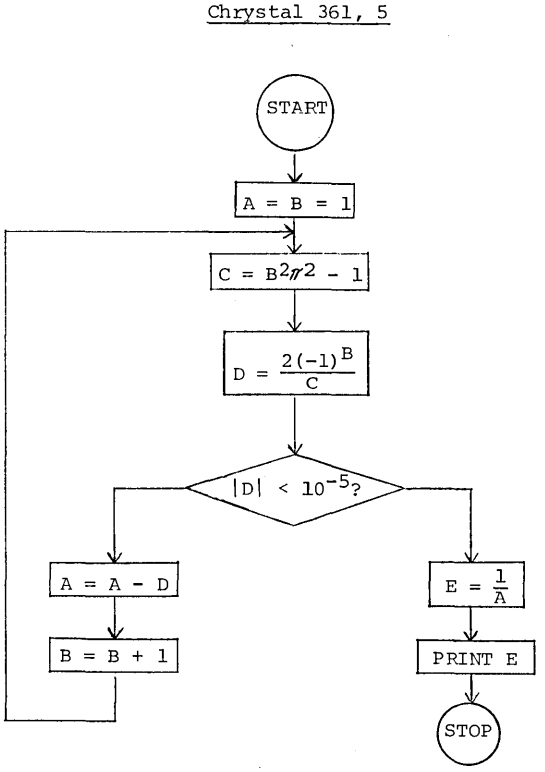
Our thanks to the following individuals for submitting their solutions – to Numble 7011: C. L. Agrawal, Claymont, Del.; Marijoe Bestgen, Riverdale, N.Y.; James M. Breadner, Agincourt, Ontario, Canada; A. Sanford Brown, Dallas, Tex.; Murray A. Chayet, Tucson, Ariz.; T. P. Finn, Indianapolis, Ind.; Marsha M. Jacobs, New York, N.Y.; Jack Walsh, Baltimore, Md.; Robert R. Weden, Edina, Minn.; and Brian C. Whitaker, San Diego, Calif. – to Numble 7010: R. C. Jensen, Endicott, N.Y.; Rita Joynt, Springfield, Ill.; G. P. Petersen, St. Petersburg, Fla.; Michael Richter, Venice, Calif.; and Vincent Roach, New York, N.Y.

C·a PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 711: CHRYSTAL OR CRYSTAL

"Now, what do you make of that?", asked Harry, pointing to a flow chart on the blackboard.



"I don't know", Jack replied. "Is this our next assignment?"

"No. It was left from the previous class. Maybe it's a flow chart for buying glassware. Look at that heading."

"If that's what it is, someone better learn how to spell."

What function is E?

Solution to Problem 7012: The Busy Programmer

The number on the program representing the year and date was 68196. This corresponded to July 14, 1968.

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.

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(like new)

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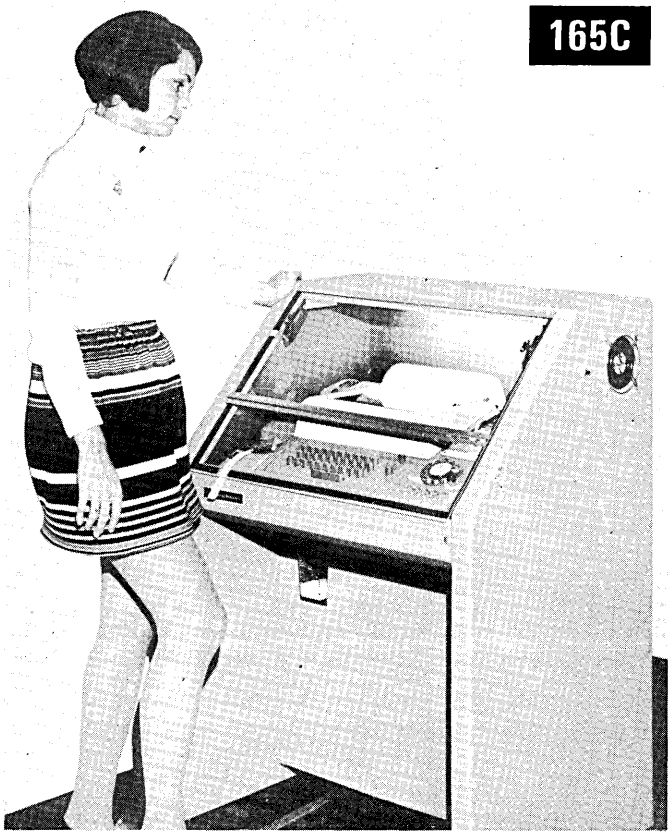
Prince George's County Central Purchasing Division
Courthouse Annex
Upper Marlboro, Maryland 20870

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

4 good numbers to quiet any noisy machine



Telex

34-0376

Simply dial the Telex number and give full particulars* on the noisy machine bothering you. We will prescribe the appropriate Gates Acoustinet model number to solve your problem.

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