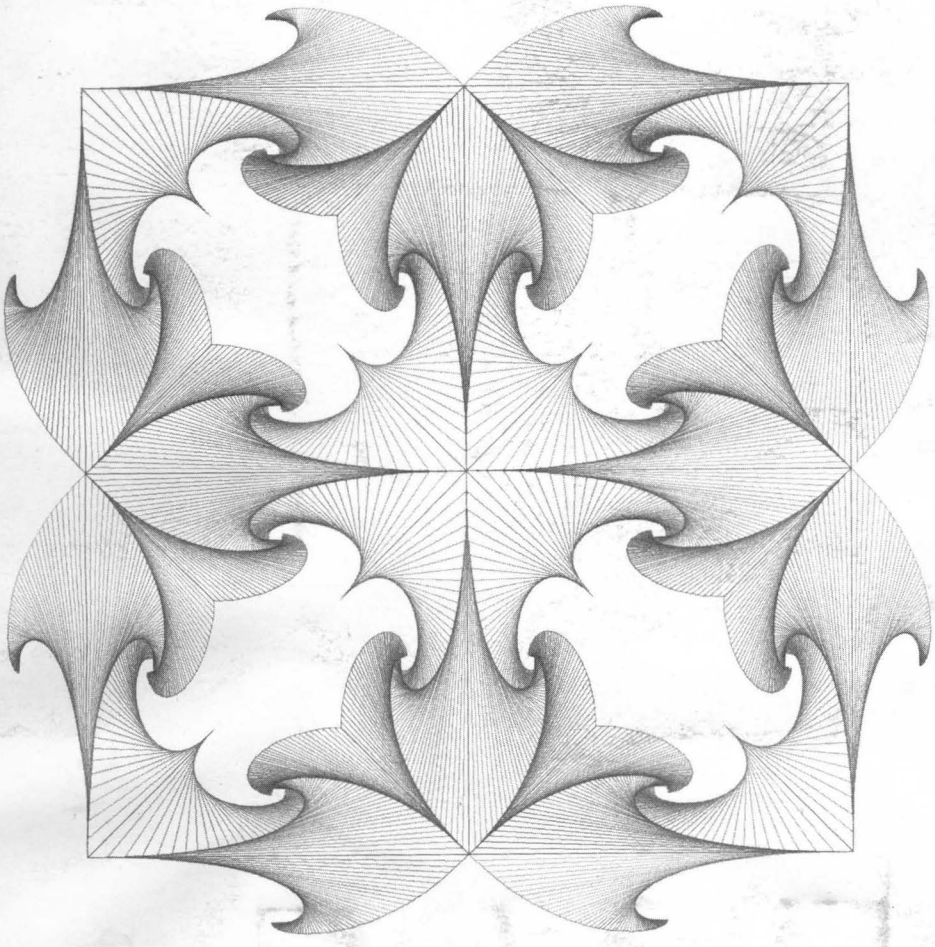
April, 1971

Vol. 20, No. 4

computers and automation



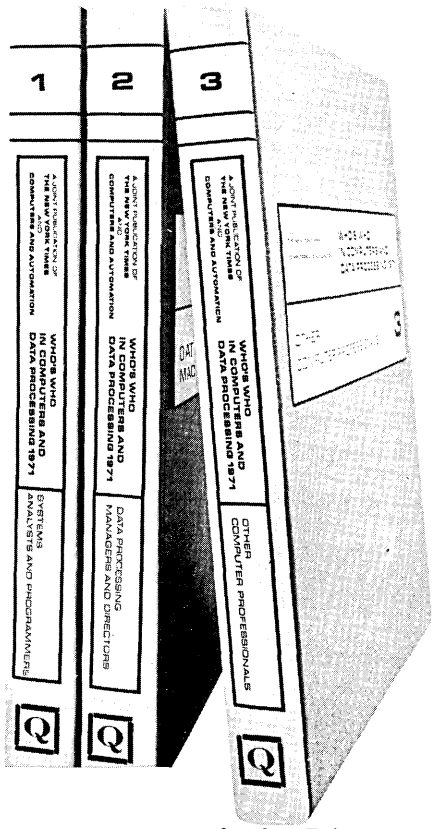
Fleur-de-lys — by computer

IN THIS ISSUE:

The New York Times and
Computers and Automation
announce a practical guide to
the most elusive components in computers and data processing...

PEOPLE

Who they are...
What they do...
Where they do it...



Until now, it has been well-nigh impossible to keep track of the thousands of highly skilled professionals engaged in the world's fastest growing profession.

The painstaking task required to inventory the qualifications and backgrounds of the 15,000 most necessary professionals in every branch of the computer field has now been accomplished. The oldest magazine in the field, *Computers and Automation,* and the information retrieval services of *The New York Times* have pooled their resources to produce the Fifth Edition of

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Who's Who in Computers

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

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ANDERSON, *ed:* Stanford director of eng Products, Inc, I / *pb-h:* - / *h:* 6 01778 / **C64*

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ANDERSON, Marilyn B. (Mrs.) / junior engineer / *b:* 1927 / *ed:* Miami Univ / *ent:* 1949 / *m-i:* P / *t:* free lance programmer / *org:* - / *pb-h:* - / *h:* 2138 Hillcrest Rd, Redwood City, CA 94062 / **C64*

ANDERSON, Richard C. / systems analyst / *b:* 1917 / *ed:* Univ of South Dakota / *ent:* 1960 / *m-i:* A B / *t:* specialist controllers staff / *org:* Burroughs Corp, 6071 Second Ave, Detroit, MI 48232 / *pb-h:* - / *h:* 16090 Kinross, Birmingham, MI 48009 / **C64*

ANDERSON, Stanley Gordon / systems analysis / *b:* 1940 / *ed:* MS , Univ of Illinois / *ent:* 1965 / *m-i:* R ial impact / *t:* information estern Electric Co Inc, 60540 / *pb-h:* ACM, W328 Liberty, Win-

sident / *b:* 1929 / orcester Polytech president / *org:* Ave, Waltham, tee on Numeri- insor Rd, Sud-

auditor / *b:* Univ / *ent:* processing , PO Box *h:* 10256

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

Vol. 20, No. 4
April, 1971

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815 Washington St.,
Newtonville, Mass. 02160
617-332-5453

Computers and Automation is published monthly (except two issues in November) at 815 Washington St., Newtonville, Mass. 02160, by Berkeley Enterprises, Inc. Printed in U.S.A.
Subscription rates: United States, 11 monthly issues and two issues in November (one of which is a directory issue) — $18.00 for 1 year, $36.00 for 2 years; 12 monthly issues (without directory issue in November) — $9.50 for 1 year; $18.00 for 2 years. Canada, add 50¢ a year for postage; foreign, add $3.50 a year for postage. Address all U.S. subscription mail to: Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160. Second Class Postage paid at Boston, Mass.
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computers and automation

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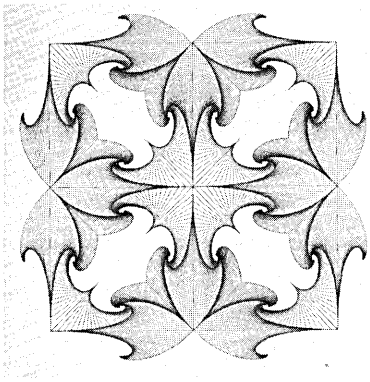

Front Cover Picture

The drawing on the front cover was another of the entries in the Eighth Annual Computer Contest of "Computers and Automation" (see the August 1970 issue). The artist is Steve Derby, 2411-B West Orangewood, Phoenix, Arizona.

The drawing was produced using a GE 435 computer, a Calcomp Plotter, and a FORTRAN program.

Departments

Key

[A] — Article
[C] — Monthly Column
[E] — Editorial
[F] — Readers' Forum
[G] — The Golden Trumpet
[N] — Notice
[R] — Reference Information

C.a EDITORIAL

The Most Important of All Branches of Knowledge

It may be that there is a branch of knowledge which is the most important of all.

If so, I would maintain that it is a subject which used to have the name "wisdom" but nowadays does not have a recognized scientific name, or in any college a recognized department or faculty to teach it. This subject currently is a compound of common sense, wisdom, good judgment, maturity, the scientific method, the trained capacity to solve problems, systems analysis, operations research, and some more besides. Its earmark is that it is a general subject, not a special one like chemistry or psychology or astronautics. Useful names for this subject at this time are "generalogy" or "science in general" or "common sense, elementary and advanced".

Many editorials published in "Computers and Automation" have in one way or another discussed or alluded to this subject:

Examples, Understanding, and Computers / December 1964
The Barrels and the Elephant: Crackpot vs. Pioneer / May 1965
Some Questions of Semantics / August 1965
Perspective / April 1966
Computers and Scientific Models / May 1967
New Ideas that Organize Information / December 1967
How to Spoil One's Mind – As Well as One's Computer / August 1968
The Catching of Errors by Inspection / September 1968
Tunnel Vision / January 1969
The Cult of the Expert / May 1969
Computers, Language, and Reality / March 1970
Computers and Truth / August 1970
The Number of Answers to a Question/March 1971

In the editorial "The Cult of the Expert" we offered a leaflet that belongs in this subject, "Right Answers – A Short Guide for Obtaining Them". More than 600 readers asked for a copy; so clearly this subject is interesting to the readers of C&A.

This subject is related to computers and the computer field in at least two ways:

First, many of the general principles which this subject contains can be investigated in experimental or real situations by means of a computer. In fact, far more can be investigated by computer than can possibly be investigated by ordinary analytical mathematics.

Second, since computer professionals are in charge of computing machines, many people consider these professionals responsible for the worthwhileness of the results of computers. Because of "garbage in, garbage out", computer professionals have a responsibility to apply common sense and wisdom in at least three ways:

Input – in the selection and acceptance of the data with which they begin;
Processing – in the processing through a system;
Output – in the interpretation and use of the answers.

Then the computerized systems will produce strong structures that human beings can use and rely on, and not weak structures which will crash with false information or ridiculous results.

This issue of "Computers and Automation" contains an article, "The Most Important of all Subjects, and its Relation to Computers", which deals with this subject. For more than a dozen years I have been studying this subject – ever since I searched in a very large and good public library for a textbook on common sense or wisdom and found none at all. There is, however, a great deal of information to be gathered on this subject because a large number of great men, ancient, medieval, and modern, have made remarks and comments (usually while talking or writing about something else) that belong in this subject.

The subject of wisdom is particularly important in these modern days. The subject has been neglected, while special sciences have been cultivated. Investigators have pursued the special sciences with the enthusiasm of a child with a new toy. Specialized science and specialized technology have rendered our earthly world almost unrecognizable:

All major cities on the planet are only a few hours apart by jet plane.
Millions upon millions of people who otherwise would be dead are alive because of miracle drugs, – thus creating a population explosion;
Nuclear weapons if used can destroy mankind and civilization in a few hours, etc.

To deal with so many diverse, vast problems we need wisdom. To use wisdom we should study it.

The staff of "Computers and Automation" have decided that it is desirable to make the drawers full of information we have been collecting on this subject more accessible and more widely distributed. We have decided to publish twice a month a publication of newsletter type called "The C&A Notebook on Common Sense, Elementary and Advanced". See the article in this issue, and the announcement on the back cover for more details. (The first few issues of the Notebook are free.)

We invite you, our readers, to join us in the pursuit of this subject, as readers of the Notebook, and as participators with us in the research and study.

Wisdom is a joint enterprise – and truth is not shaped so that it can fit into the palm of any one person's hand.

Edmund C. Berkeley

EDITOR

C.a

READERS' FORUM

DATA PROCESSING MANAGEMENT ASSOCIATION OBSERVING 20TH ANNIVERSARY

The Data Processing Management Association (DPMA) will observe its 20th anniversary in 1971.

The association's membership has climbed to nearly 30,000 members belonging to 265 chapters in the U.S., Canada, and other countries.

The Data Processing Management Association (DPMA) was founded in 1951 as the National Machine Accountants Association. Its first organizational meeting was held in December 1949 when a group of 30 machine accountants met at the now razed Morrison Hotel in Chicago.

The name "machine accountant" was chosen to identify those associated with the operation and supervision of punched-card accounting machines.

The constitutional conference was held in Chicago in September, 1951, with a total attendance less than 100. The State of Illinois granted the association its official charter December 26 of that year.

By 1955, the organization had taken on an international character with the admission of Montreal as the first Canadian chapter. With the rapid advances in information processing techniques brought about by the introduction of computers, the nature of the association changed as membership swelled from the ranks of management of electronic data processing.

The association assumed its present name in June, 1962; R. Calvin Elliott, DPMA's executive director, was selected to head up the association's administrative operations in May, 1960.

The association holds an annual international conference and business exposition. Seminars and educational programs are presented at the local or regional level. DPMA international headquarters also provides other services.

Among these are a number of "firsts," which have been put forward by the association not only for its membership but for the entire EDP industry.

One is the Certificate in Data Processing (CDP) which is recognized as the most highly regarded certification program in its field. It is dedicated to the advancement of data processing and information management by the establishment of high standards based on a broad educational framework and practical knowledge.

Applicants for the CDP examination must have two years of college credits and three years of EDP experience. More than 11,000 out of 19,400 applicants have passed the examination since the first one given in New York University in 1962.

Another educational program is the Registered Business Programmer Examination, which seeks to identify those reaching a level of competency as senior programmers. There are no academic or experience eligibility requirements for this examination.

Both of these examinations were developed by the DPMA certification council and are given annually in about 100 test centers in colleges and universities in the U.S. and Canada.

Another first is a manual, "Guidelines for the Operation of Private Data Processing Educational Institutions", which is designed to help eliminate many of the problems which have risen with these rapidly growing schools. It was developed by a DPMA standards committee, consisting of representatives of computer equipment makers, educators, private school administrators, and supervisory agencies.

DPMA's "Future Data Processors" program, an introductory course for high school students, is the most extensive voluntary secondary education campaign ever launched by an organization with the objective of stimulating interest in EDP.

The association also publishes a survey of data processing courses offered by colleges and universities.

It is co-author of "Automatic Data Processing, Principles and Procedures," an introduction to EDP at the college level. The book, now in its second edition, has been called "the most complete introduction to one of the fastest-growing fields."

DPMA published in 1971 "An Executive Briefing on the Control of Computers," a new book for corporate executives on how to get the most out of computer operations without being a computer expert.

It also publishes "Guidelines to Data Processing Management," a compilation of contributed papers by prominent national consulting firms and a "reference bible" to sound EDP management practices. It also publishes a monthly magazine to keep its membership abreast of EDP developments.

In other areas, the association each year awards a number of $2,000 grants to Ph.D. candidates preparing a doctoral dissertation in the field of data processing, reserving the right to make the paper available to its membership and the EDP community. In colleges and universities, local chapters sponsor and encourage the formation of student organizations interested in EDP. Individual chapter members serve as counselors for the Boy Scout computer merit badge program.

One of DPMA's most recent efforts has been the development of an audio-visual program as a very useful adjunct to its educational objectives.

Currently, DPMA is making available to chapters and other interested groups the following films: "Presentations to Management," "Human Relations and the EDP Manager," "Man's Most Magnificent Machine," "Wunderin Willie Builds a Computer," and "The Key," the latter being an authoritative description of the CDP program.

THE COMPUTER, BROKER OF THE FUTURE: A Speculative Forecast

"In the future, the present complementary relationship between computers and stock brokers will in all probability be replaced by an increasingly competitive relationship. This transformation is likely to occur because the computer will soon have the capability to displace the broker in each of his essential occupational functions."

Dr. Oswald D. Bowlin and Dr. William P. Dukes
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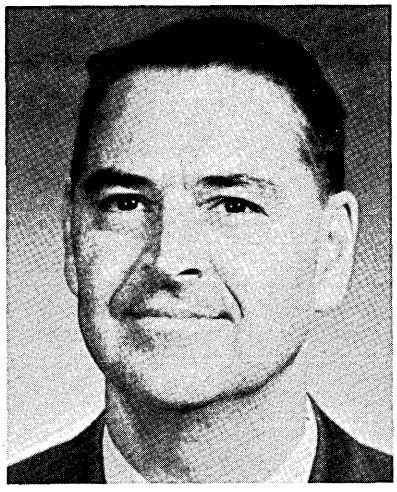
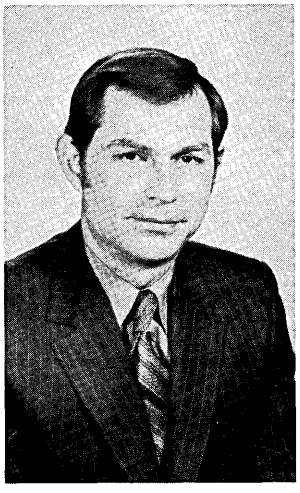




Dr. Oswald D. Bowlin (left) is the Chairman of the Dept. of Finance and a Professor of Finance at Texas Tech University. He holds a B.A. and M.S. degrees from Texas A & M University, and a Ph.D. from the University of Illinois.

Dr. William Dukes (center) is an Associate Professor of Finance at Texas Tech University. He received his M.B.A. degree at the University of Michigan, and his Ph.D. at Cornell University.

Dr. William Ford (right) is the Dean of the Inter-American School of Business Administration at Transylvania University. He holds a B.A. degree from the University of Texas, and M.A. and Ph.D. degrees from the University of Michigan.

Dr. Bowlin, Dr. Dukes, and Dr. Ford have all published numerous articles in the field of finance.

The seemingly irrepressible force created by the advent of the digital computer has only begun to revolutionize American business. With the advent of third generation computers and the capability to interconnect these computers, the system of exchanging securities via brokers may soon become a thing of the past.

Up to now, most changes caused by the computer have been the result of its speed in computation, its ability to reduce human error, its indefatigability, and the fact that it has made practical a series of calculation procedures which could never have been implemented with the machinery of the pre-computer age. Moreover, the computer has had the important economic effect of creating and destroying occupational categories. For example, whole new occupational specialties such as keypunch operators, computer programmers, and computer hardware specialists have been introduced. On the other hand, the computer has also served to reduce the effective demand for workers who maintain and operate less efficient types of data processing machinery.

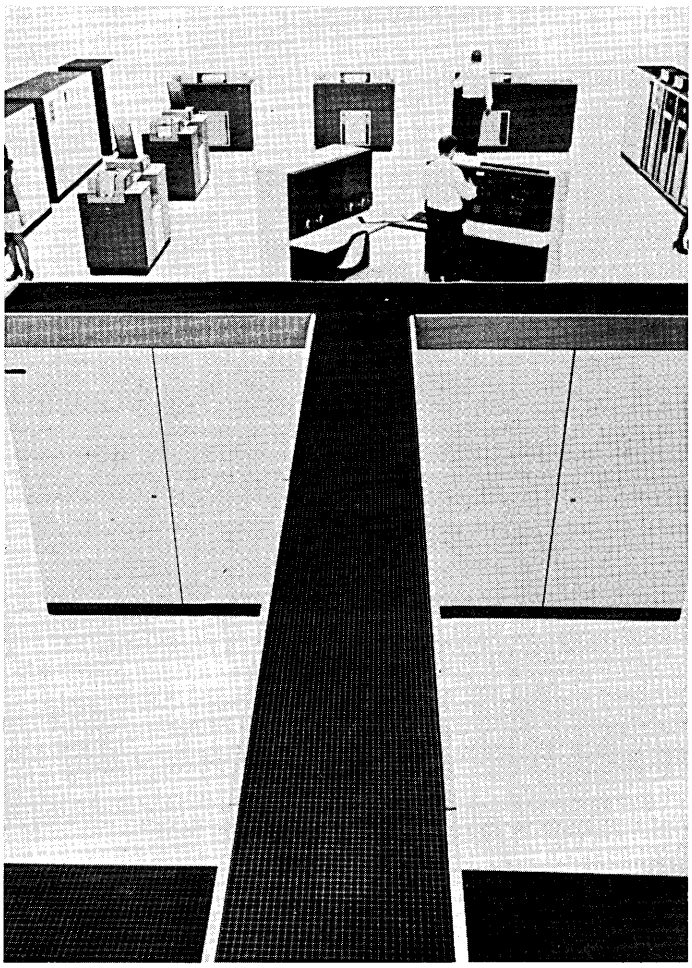
Present Role of Computers in Securities Markets

In securities markets, the computer has to date generally complemented the activities of stock brokers and traders. The nature of this relationship can best be discussed in the context of a simplified schematic diagram. In Figure 1, individuals and institutions approaching the market as *sellers* are represented by the rectangles on the left side of the diagram. Relatively large rectangles represent the sell orders of major institutional investors and well-to-do individuals who trade in round lots. The very small scale rectangles represent the normal selling activities of smaller institutions and individual odd-lotters. On the right hand side of the diagram, the circles of various sizes represent the corresponding array of small to large scale investors who are approaching the market at a given moment as *buyers.* The triangles on both sides of the diagram represent brokerage houses that gather buy and sell orders from institutions and individual investors throughout the market. The block in the center represents a conventional stock exchange in which buy and sell orders are matched through time-honored labor intensive methods. Finally, the output vector labeled *M* indicates the stream of price and volume data generated by the stock exchanges and disseminated via their ticker tapes, telecommunications networks, news wires, etc.

This process of trading securities provides a substantial amount of employment for floor traders, stock brokers and their logistic support personnel. The computer has been used mainly to speed communications between brokers and the floors of stock exchanges; as a means of expediting the follow-up handling of transactions and billings; and as a

A DAY AT THE STOCK EXCHANGE

TODAY



TOMORROW?

research tool in the analysis of investment opportunities. In the future, however, the present complementary relationship between computers and stock brokers will in all probability be replaced by an increasingly competitive process. This transformation is likely to occur because the computer will soon have the capability to displace the broker in each of his essential occupational functions. This paper presents a speculative note on the evolution of a fully automated securities exchange system that would eliminate the need for stockbrokers.

The Economic Imperative

It will be useful to begin by considering the basic economic rationale for the further development of the "Third Market" in securities. In recent months, total daily volume on the New York Stock Exchange (NYSE) has averaged roughly 10 million shares with the average share price varying between $43 and $49; approximately 60 percent of all transactions have come from institutional investors. A round-lot transaction in a stock selling for $44 a share would rate a commission of one-half of one percent plus $19 on both the buying and selling sides, or $41 for each side of the transactions. If we assume that the 10 million share volume is in the form of round-lot transactions, with each order of 1000 shares or less, the daily commissions earned would amount to $8.2 million.[1] However, part of any day's trading will be in large block transactions of over 1000 shares, on which quantity discounts are allowed. For example, if large block trading amounts to about 1 million shares per day, total brokerage fees would be reduced to approximately $7.9 million on a total volume of ten million shares.

New Commission Rate Schedule for Brokers

A new commission rate schedule has been proposed to the Securities and Exchange Commission (SEC) by the NYSE.[2] The proposed increases range up to 50 percent for most orders of $5,000 or less, and significant increases are even proposed for some transactions as large as 10,000 shares.[3] The Exchange estimated that the new rate schedule will generate about $500 million more in commissions than under the present schedule.

Under the new rate structure, then, average daily commissions would rise to almost $10 million on a 10 million share day. The amount by which daily commissions fall short of $10 million will depend on the number and size of large block trades on which discounts are allowed.

With approximately 250 business days and daily commissions approaching $10 million, the 60 percent of total brokerage charges applicable to institutional investors should amount to roughly $1.5 billion per year.

In addition, as more of the country's increasing wealth is funneled into financial institutions, daily volume could easily reach 20 million shares a day. Prior to 1965, volume exceeded 10 million shares on only five trading days.[4] In 1966 the NYSE estimated that an average daily volume of 10 million shares would not be reached until about 1975. However, within the last two or three years, brokers have come to view a 10 million share day as inadequate to support the industry. With the rapid growth of financial institutions, even the 15 million share day is no longer exceptional, and a daily volume of 20 million shares may not be far off. With an average volume of 20 million shares, brokerage charges to institutions would amount to at least $2.5 billion a year.

Since institutional investors are presently using computers for their normal business activities, a rather substantial amount of brokerage charges might be saved by exchanging securities via these computers as well. These savings, coupled with economies in the personnel and telephone time achieved in executing transactions via the computer, should exceed the marginal costs of operating the automated system which is described below.

Revision of the System: Implementation

This section of the study presents a thumbnail sketch of plausible procedures for the design, development, and implementation of a *com*puterized *brok*erage *net*work (hereafter, COMBRONET). Again, it is assumed that institutional investors and the various computer vendors will continue to make progress toward the development of compatible hardware and software systems. Once the mating of computers has been achieved by electronic means, the process of exchanging securities through this medium might proceed roughly as follows.

COMBRONET (*Com*puterized *Bro*kerage *Net*work)

During the early phase of its development, users of the COMBRONET would employ the price and volume data quoted in the NYSE and other conventional markets to establish their bids and offers. Then, each potential *seller* would simultaneously transmit his preferred selling price to the entire COMBRONET. This transmission of information, of course, would occur either via long-distance telephone lines or a tele-communications system. Potential *buyers* would also transmit their preferred bids to the network and the synchronized programs of their COMBRONET computers would then go to work to consummate trades. If the preferred buying and selling prices of two parties should happen to coincide, they would instantaneously be notified and the transaction would be completed. Assuming that preferred buying and selling prices of COMBRONET clients did not match, the programmed system would then search for a mutually agreeable price that falls within the limits the parties to the transaction chose to apply.

A Theoretical Transaction

For example, assume that a group of institutional investors are electronically tied into the COMBRONET system as illustrated in Figure 2. Firm B_4 has decided to buy all, or any part, of a 10,000 share block of, say, Eastman Kodak. It has established a desired price of 60 but would go as high as 63. The COMBRONET program then functions to identify, say, Firm S_3 as having the closest compatible order to purchase Eastman Kodak on the network. Assume further that Firm S_3 has decided to sell its entire holding of 8,000 shares of Eastman Kodak at a preferred price of 65,

[1] This does not include consideration of the temporary surcharge or service fee instituted in the spring of 1970.

[2] *Wall Street Journal*, 1 July 1970, p. 12.

[3] *Ibid.*

[4] Taylor, Henry J. "Stock Price Rise Likely" Syndicated column in *Lubbock Avalanche-Journal*. Lubbock, Texas, 24 July 1970, p. B-6.

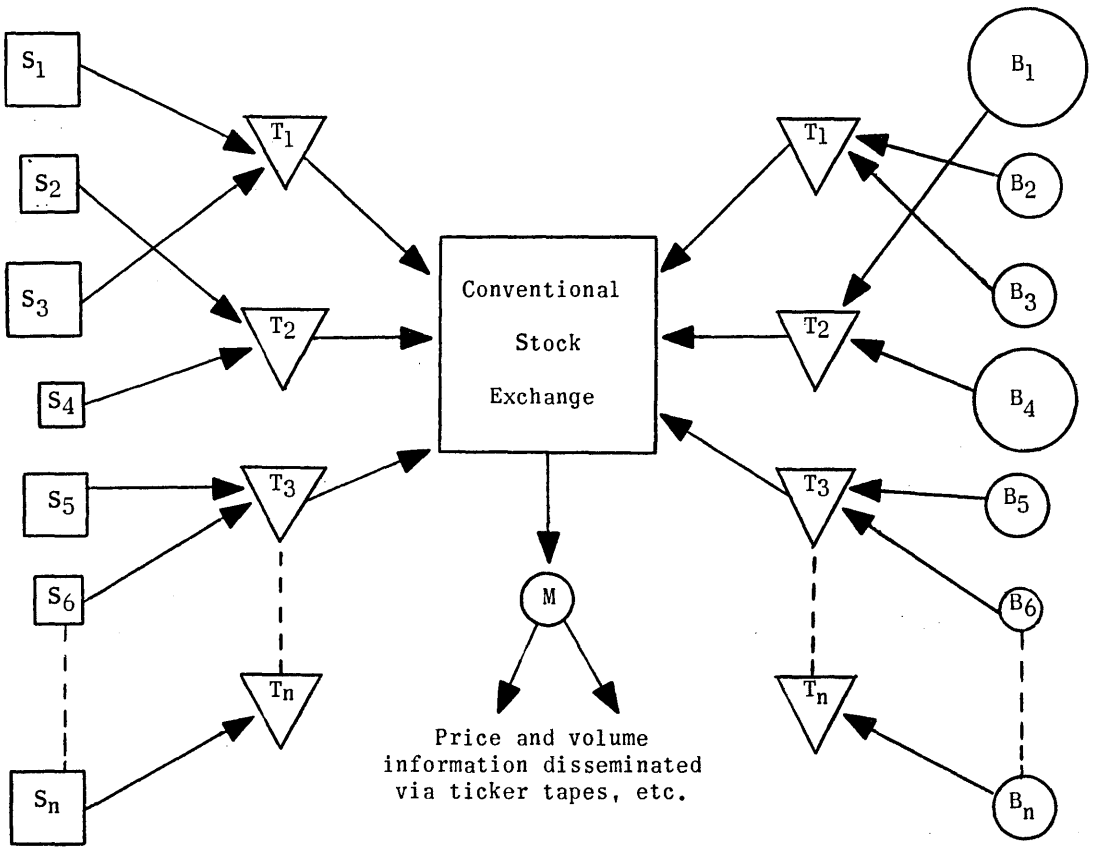


Figure 1

The Present Configuration of Major Securities Markets

Note: The symbols S_1, $S_2 \ldots S_n$ represent institutions and individuals approaching the market as sellers of a particular security; B_1, $B_2 \ldots B_n$ represent the corresponding set of buyers; and T_1, $T_2 \ldots T_n$ represent the network of brokers.

but would be willing to trade at a price as low as 62. The computer system would try 60 and 65 then 60 1/8-64 7/8 and, by an iterative process, continue to narrow the price spread at 1/8th intervals until the agreeable range is determined to be 62-63, at which time the difference could be split the transaction completed at a price of 62½. Each party to the transaction, of course, retains individual control of the iterative sequence by setting limits to the range of negotiable prices in its own program.

Reducing Paperwork — and Fraud

In addition, as a bonus, COMBRONET could be programmed to record, store and electronically transfer evidence of ownership with much less need for physical handling of certificates and other "back office" functions. This would greatly reduce problems of fraud, pilferage, and accidental loss in the physical handling of securities. Stock certificates, like gold, might then best be buried at Fort Knox. They would be physically gone, but not forgotten, thanks to the computer's memory circuits.

Since computerized trading of securities among institutional investors would substantially reduce the volume of shares exchanged in traditional markets, more volatile price fluctuations could be expected to develop. This would eventually undermine the usefulness of price information taken from conventional sources. To compensate for such an eventuality, the COMBRONET could inaugurate a second phase of its development by issuing a running account of its own previous transactions. This information could first supplement and eventually displace the price and volume data gathered from traditional sources.

COMBRONET as a Specialist

The COMBRONET could also be modified to perform the function of the specialist. For example, a cooperative users' fund could be established which would allow the system to be programmed to trade against pronounced deviations from the market trend. Thus, the cooperative fund's program would dictate on-balance buying during periods of heavy sell-offs in a security, and on-balance selling when speculative buying pressures obtain.

Development of this program would require detailed analyses of the past behavior of the specialists most successful in maintaining an orderly market during crisis periods, such as the Eisenhower heart attack and the Kennedy assassination. By incorporating the techniques of these individuals, the users' fund should be able to improve the over-all stability of security markets. To assure the success of the program, a handful of the most effective specialists

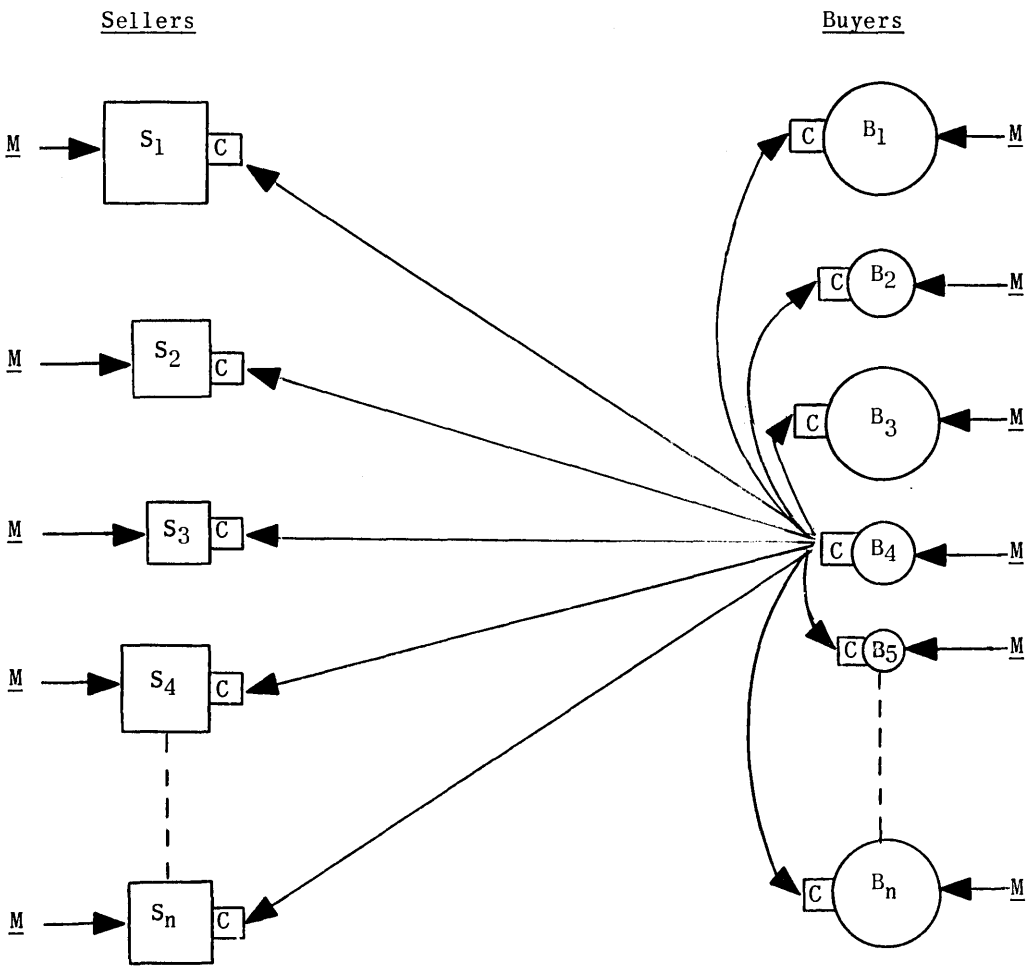


Figure 2

The First Generation COMBRONET

Note: The symbols B_1, $B_2 \ldots B_n$; S_1, $S_2 \ldots S_n$; and M correspond to Figure 1. The symbol C represents each institution's computer program which ties the organization to the COMBRONET.

from conventional markets could be invited to serve as program managers and offered a share of the proceeds of the fund.

The "Third Market" in One Giant Computer

Finally, as the number of subscribers to the COMBRONET is expanded to include most large investors, it might become more economical to centralize the entire "Third Market" in one giant computer. This would involve having each institution tied only to the central computer, rather than directly to all other individual subscribers.

Referring back to Figure 1, this would complete the computerized and automated transformation of the securities exchange industry in the following specific manner. First, the brokerage house (T) with all of its related employees and paraphernalia would gradually disappear as a functional unit in the system. Second, the human sounds, odors, and activities of the present conventional stock exchange would be replaced by the humming sounds of a third generation computer. All buy and sell orders for securities would be transmitted directly from institutional and individual investors to the central computerized brain of the fully mature COMBRONET. The computer would be elaborately programmed to instantaneously consummate transactions and to record, store, and transmit all information relating to such transactions.

It would be fitting, for nostalgic reasons, to locate this computer somewhere on Wall Street, perhaps beside an artificial buttonwood tree.

The Score at the End of Round One

At this point it may be useful to descend from the "iffy" world of assumptions and theoretical scenarios. In the real world, the first round of the battle between the broker and the computer has already been completed. Although brokers may have mistaken it for friendly or inconsequential sparring, they should recognize that a technical knockout may very well be the end result of the match.

The first step toward the implementation of a COMBRONET was taken some years ago when a subsidiary of Standard and Poor's began putting price and volume data on tapes that could be fed into a computer system. This allowed computers to be programmed to answer specific questions about individual securities, and to compare their performance with that of other issues. In fact, computers are now being used to indicate buy and sell decisions based on fundamental and/or technical factors.

In addition to using computers for analytical work and storage of data, a system is currently being developed for security trading purposes. In 1969, Dana L. Thomas reported the beginning of such a system with the formation of Institutional Networks Corporation (instinet).[5] More recently, McClintick indicated that Instinet is being used by subscribers to block-trade directly with each other.[6] Other firms, for example AutEx Service Corporation, are also developing major automated communications and trading systems.[7] These systems can be regarded as precursors of the more comprehensive COMBRONET described above.[8] The rapidly developing "Third Market", therefore, clearly has the potential to reduce listed stock trading through the conventional markets in the United States and, eventually, in foreign countries.

Reaction from the NYSE

The NYSE is counterpunching with its own Block Automation System (BAS), and thereby trying to head off Third Market competition. But the counterpunch is not enough. Exchanges must translate this automation into reduced costs to the institutional investor to meet the competitive threat posed by COMBRONET. Only if COMBRONET costs to institutional investors should exceed conventional commission charges, can brokers afford to lower their guard.

A review of the commission rate structure is presently being conducted by the NYSE and the SEC. One of the purposes of the review is to consider selective increases in commission rates for large block transactions. This may indicate that the Exchange membership has failed to realize the potential impact of the competitive threat posed by the Third Market. Higher commission rates may simply accelerate the development of a low-cost COMBRONET system, just as high prices for natural raw materials have historically stimulated the development of synthetic substitutes.

Another purpose of the review is to restructure commission rates in order to charge a higher proportion of brokers' expenses to the small investor. This could also result in a backlash, Insofar as the rate structure becomes oppressive to the small investor, he may turn increasingly to other institutions as an outlet for his savings. In addition to currently available options, such as mutual funds and certificates of deposit, he may also soon be able to trade securities on the Third Market through the facilities of large financial intermediaries and, ultimately, via telephone orders directly to the COMBRONET. The reviewers of commission rate structures would do well to keep these points in mind in setting the new fee schedule for small investors.

Changes in Competitive Conditions

In the jargon of economists, a policy of *raising* brokerage fees to investors may have been a rational reaction to rising costs when brokers enjoyed a monopoly position in the trading of securities. But the emergence of the Third Market is changing the competitive conditions in which brokers operate. To be specific, it is increasing the price (i.e. fee) elasticity of demand for their services. This, in turn, may cause higher fees to produce *smaller* rather than *larger* profits, precisely because higher fees are encouraging the growth of the Third Market and may soon give birth to the COMBRONET.

From the brokerage houses' point of view, this line of reasoning can only lead to one conclusion. They must look to lower costs of operation, rather than higher fees, as the way out of their cost-price squeeze. This will require replacing antiquated labor intensive methods of exchanging and handling securities with a more modern, computer-intensive system of operations. If they fail to perceive and act on this insight, institutional investors will do the job themselves by forming a COMBRONET-type system. That will sound the death knell for brokers.

Barriers to the Implementation of COMBRONET

There are a number of technical, legal, and psychological barriers which would have to be overcome before a COMBRONET-type system could be fully implemented. The technical barriers have already been discussed briefly. In order to establish the COMBRONET market, the various institutional investors who would unite to form the network would have to obtain compatible machinery and programs to facilitate the necessary interchange of information.

Remedial Legislation Needed

It is also probable that the establishment of a COMBRONET system would run afoul of the maze of regulations governing the exchange of securities. It will, therefore, probably be necessary to seek some remedial legislation to facilitate these new modes of exchanging securities in the Third Market. The same problem applies to the commercial banks that are anxious to add the securities brokerage function to the "full service" concept they are developing. If these institutions could obtain appropriate remedial legislation, our "cashless" society would soon evolve into one large automated system. It would be capable of handling all the financial needs of an individual, including the exchange of securities, using nothing more than a credit card to consummate each transaction. The demise of stock brokers' services to small investors would be a logical by-product of such a process.

Also, as the COMBRONET system is developed, previously used regulatory authority becomes obsolete. In particular, regulation of securities trading may begin to slip under the aegis of the Federal Communications Commission, and out of the grasp of the Securities and Exchange Commission. This may create friction between these regulatory agencies, and cause additional problems for developers of the COMBRONET; but that is another story.

Finally, it will take some time for individual and even institutional investors to become accustomed to the concept of trading securities via the computer, and without the benefit of personal contact with a broker. The machine, after all, cannot take a client out for cocktails and lunch at a Wall Street brokers' club – or console the client when the bottom has fallen out of his corner of the market. □

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[5] Thomas, Dana L. "Computerized Gunslingers", *Barron's*, 24 March 1969, p. 34.

[6] McClintick, David, "Big Board Will Expand BAS", *Wall Street Journal*, 11 June 1970, p. 5.

[7] *Ibid.*

[8] It should also be noted that computerized trading is displacing conventional brokerage activities in real estate and commodity markets. For a brief discussion of these developments see Robert Strand's *UPI* release dated July 30, 1970.

USING THE COMPUTER TO STEAL

"The typical computer centre offers an open invitation to the thief or vandal; most computer systems are not presently protected against destruction, or unauthorized access or manipulation."

Harvey S. Gellman, President
DCF Systems Ltd.
74 Victoria St.
Toronto 210, Ontario

I am not a gambler, yet I am willing to bet any computer user that his computer installation is vulnerable to theft and other abuse. I am confident that I would win my bet almost every time. Does this sound farfetched? It is not.

There are plenty of examples to show that most computer installations today have inadequate controls to protect them against theft or damage to programs or data. Here are two examples:

> Between 1959 and 1963, the manager of data processing for a stockbroker embezzled over $80,000 from the company by having cheques made payable to fictitious payees. The inadvertent return of a cheque revealed the thefts.
>
> A group of enterprising individuals in an investment firm embezzled customer funds and then told the customers that a service agency had processed their accounts incorrectly. Because the public is ready to believe a cry of "computer error", considerable time elapsed before the raid was discovered.

This last example reminds me of the story about the man who looked at wildly incorrect results printed by a computer and said, "You know, it would have taken forty mathematicians working for three years to produce a mistake like this."

The typical computer centre offers an open invitation to the thief or vandal. My objectives are to describe the problem, show how serious it is, and suggest an approach for solving it. I will deal with damage to computer systems as well as fraud, because the action I will recommend will provide protection against both of these hazards.

What Is the Problem?

The problem can be stated simply: most computer centres do not have adequate data security. This means the computer systems are not protected against destruction or unauthorized access or manipulation.

The list of potential hazards includes: (1) accidental or malicious damage to computer programs or data stored in computer systems; and (2) theft of assets or private information.

Even though these hazards relate to computer installations, they are rarely the fault of the computer. A computer will have breakdowns, but these are usually repairable. The main hazards are due to people who fail to use proper operating and control procedures.

With computer systems, one employee can perform functions that were previously assigned to several business units. Unless there are proper controls, knowledgeable but unscrupulous employees can manipulate programs for their own benefit, and incompetent employees can cause damage by making errors.

What are the Risks?

The risks can be high. An organization can lose large amounts of money, vital information without which it cannot function, or secret information that may be of value to competitors. Unless an organization takes adequate steps to protect its computer systems from destruction, malfunction or manipulation, it can be badly hurt. In one organization, for example, a disgruntled member of the

computer room staff used a small magnet and erased information on nearly every reel of magnetic tape that contained the company's files and programs.

Who Suffers?

Who suffers most from these hazards – large or small organizations? I believe that all are almost equally vulnerable. The large organization's spectacular losses involving large sums of money get more publicity, but many incidents occur in small companies which feel the effects just as much as large ones. Small companies find it difficult to implement effective controls because the knowledge of how to manipulate the computer system may be concentrated in only one person.

No organization is safe. University computer systems have been used by unauthorized people who have tapped telephone lines and broken the code.

The Human Resources Administration, a New York antipoverty agency lost about $2 million during the first nine months of 1968 through phony Youth Corps payroll cheques processed by a computer at the rate of 100 a week. A policeman discovered a batch of the cheques when investigating an illegally parked, overdue rented car.

It is therefore clear that all organizations are vulnerable and their losses or damages can have serious effects on their customers and their employees.

Who Are the Culprits?

Who does the stealing or the damage? The list includes:

1. Computer centre personnel who are authorized to have access to computer equipment or files (machine operators, programmers, librarians, repairmen, etc.)
2. People who create or handle incoming or outgoing data.
3. Outsiders who wish to penetrate the system.

Here are some examples.

- A manager of claims in a government-sponsored medical aid scheme introduced false doctor claims and directed the payment cheques to an office he had rented in a fictitious name.
- Programmers have stolen information from a payroll system for use in union bargaining.
- Programmers have stolen information from a payroll system and sold it to a life insurance company agent.
- Programmers and operators have sold name and address lists.
- At a large Canadian department store, a systems analyst placed orders for expensive appliances and coded them as "special pricing orders". Using his knowledge of the system information flow and procedures, he intercepted the documents as they reached the "special pricing orders" desk. He changed the list price to a nominal price of six or seven dollars and then put the forged documents back into the regular stream. The appliances were delivered to him and he paid his account promptly. The practice was discovered by systems consultants called in to review the adequacy of the system's internal control procedures.

It is important to recognize that an inspired bungler can sometimes do more damage than a thief or vandal. If a computer centre does not have proper procedures and controls, then a programmer or machine operator can make serious mistakes. For example, he could erase a magnetic tape file containing several years' historical data.

Why Is the Problem Still Unsolved?

We have enough examples of inadequate data security to show that serious abuse is possible and that this problem deserves the attention of executives. Why then have most organizations not yet solved the problem? Stringent controls in non-computer systems are traditional, so why do managers fail to establish similar controls for computers? Especially when we all know that to err is human, but to really foul things up requires a computer.

Several reasons come to mind. The first is that in the early days, computer systems were developed haphazardly. People were happy when their computer programs finally appeared to work correctly; they had little patience with the problems of data security.

A second reason for lack of security is that some executives think that computer programs are complex and therefore difficult to manipulate. They do not realize that a skilled programmer can quickly alter computer programs to suit himself, do his stealing, then return the programs to their original state.

A third reason for lack of control is that senior executives who are responsible for their organization's computer systems have more pressing problems to worry about. They worry about the steady stream of complaints from users who get inadequate service from the computer centre. They also worry about their own lack of understanding and control of the data processing activities and simply abdicate responsibility to their data processing manager.

Perhaps a fourth reason senior executives ignore the problem is because their expenditures for computer systems usually total less than 1% of sales. They should be more concerned, because the effect of computers on their company's performance can be significant. Just as I was willing to bet that most computer centres are vulnerable to theft and other abuse, I am equally willing to bet that most senior executives do not know how much money is being wasted, how much profit is being produced and what weaknesses exist in their computer systems.

The fifth reason is that many presidents do not realize how vulnerable their organizations are. A few months ago, for instance, there was a fire in the office building occupied by a large Canadian corporation. The computer centre floor escaped damage. When newspaper reporters asked the company president what would have happened if the computer centre had been damaged by the fire, the president stated that it would have had virtually no effect on the company. That company's systems personnel were astonished by their president's statement, because they knew that if the fire had reached the computer centre, the accounts receivable and other vital records would have been destroyed.

The fact that many managers have the false impression that their auditors will protect them is a sixth reason for lack of data security. I submit that the auditor cannot protect them unless his knowledge of computer systems approaches that of the skilled programmer who sets out to modify data or programs without being detected. Is it realistic to expect auditors to have this kind of specialized skill, in addition to their other necessary skills?

Finally, many other people remain unworried about the

data security problem. They think that computer fraud or destruction occurs so rarely that they can safely ignore the problem. But these occurrences are not that rare. Many cases are hushed up. I will show later that the problem is probably growing more serious.

The unworried people seem to believe that these cases occur in fiction rather than in real life:

> Those of you who saw the movie "Hot Millions" a few years ago may recall the key event one night when Peter Ustinov saw the cleaning lady hit the computer with her fist. The door on top of the computer opened and she was able to heat her teapot on the hot electronic equipment. Ustinov then used her method to unlock the computer and introduce false information into the computer's storage units. He thereby arranged to have dozens of cheques for large amounts paid out to his fictitious companies all over Europe.

In real life, events may be less amusing:

- A vice-president of a stockbrokerage firm embezzled about $250,000 by personally creating punched cards to transfer credits to his own account from the company's interest revenue account.
- A few months ago, five men, including a bank vice-president, were charged with defrauding two banks of more than $1 million by using a computer. Deposit slips for cash deposits were made out when the embezzlers were actually depositing cheques. Since cash deposits are recorded for immediate credit, cheques subsequently drawn appeared to be covered by the false cash deposits. If the deposits had been correctly made as cheque deposits, the computer would not have credited the money to the account immediately, so that when withdrawals were made the computer would have indicated insufficient funds available, with an uncollectable cheque on deposit. Ordinarily, a teller or branch manager would notice cheques deposited as cash and refuse to accept them. In this case, an assistant branch manager (one of the thieves) accepted the cheques. The scheme was uncovered by accident when a bank messenger failed to deliver a bundle of cheque deposits to the clearing house, leaving $440,000 worth of cheque withdrawals uncovered.

The Problem Is Getting Worse

Managers should be more concerned about data security because the problem will get worse unless something is done about it.

The importance of data security is growing because:

1. The growth in size and complexity of computer systems makes errors harder to detect.
2. Computer systems eliminate many of the paper records.
3. There is a growing reliance by managers on computers, not just for financial data, but also for marketing, production, engineering and forecasting information.
4. There is a continuing shortage of skilled systems personnel and this leads to the hiring of unqualified people who are incapable of designing adequate controls.

Data Security in Time-Sharing Systems

The advent of time-sharing computer systems has also made the data security problem more difficult. In time-sharing systems, each user can have an electric typewriter, or a TV-tube terminal connected by telephone lines to a remote computer.

Such systems involve large, complex sets of computer program instructions. These programs are prepared by people – none of whom is perfect. The complexity of these programs makes it extremely difficult for the designer to eliminate loopholes or "security trapdoors". A computer expert can penetrate such systems.

Professor E. L. Glaser of Case Western Reserve University in Cleveland, is such a skilled, experimental penetrator. After learning the standard operating procedures for the system and then thinking about it for a few hours, he has been able to break into a system after five minutes at a terminal.

In one system that Professor Glaser tested, the security system was considered to be good, but he discovered one "trapdoor" in a relatively short time. He wrote a simple program which went through every file in the system, found the owners' names and passwords, extracted all passwords and stored them in a new file after scrambling them so they could not be recognized. He was then able to read any file at any later time.

In another case, Professor Glaser tested the security measures of a new commercial time-sharing system. The security measures were again considered to be good, but again he found a number of "trapdoors". Within five minutes at a remote terminal he was able to "crash" the whole system, bringing it to a complete halt.

Another newly recognized hazard is that signals are transmitted from a computer installation unless the computer room is shielded. In one test, a truck equipped with sensitive receiving equipment, as well as processing and printing facilities, was parked near an unshielded computer centre. A high-speed printer driven by these signals produced the same output as was printed in the centre.

When you think of the possibilities, both in the movies and in real life, perhaps you will agree with me that those managers who are not worried about their data security are deluding themselves.

Some Managers Are Getting Worried

During the past year, I have found that some executives are becoming concerned about some aspects of the problem. One indication of this concern is the fact that a new data security service introduced in Toronto six months ago is selling very well. This service provides safe, off-site storage of magnetic tapes, disks, punched cards and other documents.

Perhaps people have been buying this protection because they have read about bomb scares and the increasing level of violence in our society. Because some people consider computers a potential threat to individual freedom, there have been a few attempts to destroy them. An example, right here in Canada, was the destruction of the computer centre by militant students at Sir George Williams University in Montreal.

Some managers are becoming more conscious of the need to protect their computer systems. Perhaps eventually it will be as difficult to get into a computer room as into a safety deposit vault or a high security military area.

What Can Managers Do?

First, the manager must recognize that his most powerful weapon against fraud or damage is control. An adequate set of controls will not be achieved unless the manager takes the following steps:

1. A study of the data security needs of his organization, measurement of the risks, and the cost of disruptions or losses;
2. A determination of how well the existing data security system meets these needs;
3. The development and implementation of a data security system that covers security of computer programs and data.

The manager might use his own computer personnel to develop this data security system, but it is probably unrealistic to expect these people to rigorouslv check their own work for security weaknesses. A fresh look should be taken, by computer experts. These experts will, in most cases, have to be outside consultants if a comprehensive and objective appraisal and an effective design are to be obtained.

The study should be authorized by the chief executive. This exertion of influence by the chief executive is essential. He cannot afford to abdicate his responsibility to his data processing manager.

All responsible executives have an obligation to their companies to ensure that an adequate data security system is implemented. They should ask themselves the following questions:

1. Do we maintain computer files which, if lost, could stall our day-to-day operations and involve a loss of a substantial amount of money?
2. Could someone alter one of our computer programs without detection?
3. Could someone alter our financial records without detection?
4. Could someone enter our computer room and damage the system?
5. Do we know the estimated cost of recreating our current computer data files if they were destroyed?
6. Do we have a periodic independent review of our data security function by computer experts?

The manager's answers to these questions will help him determine the severity of his data security problem. In most cases, I am sure he will find that his company is more vulnerable than he expected.

Conclusion

No security system is perfect, but at a relatively low cost, companies can provide considerable protection for their computer systems. For example, an effective packaged program to provide system and program security has recently come on the market. The acceptance of this inexpensive and easy-to-use "software package" has been excellent and it has been selling very well.

The examples I have given provide a warning of things to come – unless senior executives take faster and firmer steps to control what is happening and what could happen to their computer systems. Solutions are available, but the problems will not be solved until the chief executive and other senior executives direct their attention and initiative to this potentially serious situation. □

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 714

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      F O L L Y
    × D O E S
    N O U S S E
  L F D G Y E        NUYF = MAIG
L T U N A A
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Solution to Numble 713

In Numble 713 in the March issue, the digits 0 through 9 are represented by letters as follows:

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

The message is: Man is the child of error.

Our thanks to the following individuals for submitting their solutions – to **Numble 712**: Marijoe Bestgen, Riverdale, N.Y.; Edward A. Bruno, D.D.S., North Bergen, N.J.; Gordon and Debbie Bruno, Cliffside Park, N.J.; T. P. Finn, Indianapolis, Ind.; John H. MacMullen, Eden Praire, Minn.; G. P. Petersen, St. Petersburg, Fla.; Harold L. Smith, Thomson, Ga.; Thomas J. Usher, Pittsburgh, Pa.; and Robert R. Weden, Edina, Minn. – to **Numble 711**: John LaMartina, Baltimore, Md. – to **Numble 707**: G. P. Petersen, St. Petersburg, Fla.

THE SCIENCE OF INFORMATION MANAGEMENT

"A well-structured, meaningful data base is the key ingredient of a successful management information system."

Col. Carl J. Weinmeister III
Dept. of the Air Force
Washington, D.C. 20330

The advent of third generation computers, with their time sharing capability, faster memories, reliable lower-cost random access devices, sophisticated communication terminals, and powerful operating systems, has made possible the development of dynamic information management systems. Amazing advances have been made in the development of reservation systems for airlines and hotels, and the new systems being used in the supply and financial fields. Personnel systems have been developed and other managerial areas have been selectively computerized. The computer has been utilized effectively in many military areas, especially for flight planning and targeting.

Colonel Weinmeister heads the staff section that is responsible for developing the operational information system for the CINCPAC Director of Operations. He has previously worked with the Air Force and the JCS command and control systems. As a command pilot with 7500 hours of flying time, an instructor pilot in both the Training Command and the Strategic Air Command, and a veteran staff officer from squadron to JCS level, Colonel Weinmeister is familiar with the problems of managing information from the point of view of both the producer and the user. His study of information management includes both business and military applications.

Colonel Weinmeister holds a B.B.A. degree from Emory University and an M.A. from George Washington University.

Difficulty in Developing MIS Systems

Many of the applications mentioned above have been referred to as management applications. There has been a desire to develop information systems that provide "all" management information. The military approached the information system concept under the title of "command and control" or "command, control and communications." Command and control has become a synonym for a computer system. Millions of dollars have been expended by both industry and the military to develop management information systems.

Yet, these systems generally have fallen short of anticipated goals. Why have management information systems been so difficult to develop? Management information systems use the same computers and the same computer technology as those that have been so successful in selected business applications. The feasibility studies are similar and the programmers are just as intelligent as the programmers in the successful systems. The one factor that is different is the data base. If one examines the eminently successful business applications, one finds the following characteristics: (1) each application began with a structured data base; (2) the information extracted from the data base is repetitious (i.e., issuance of bank statements, completion of seating for an airline flight, etc.), (3) queries are standard within each application. Large central data files evolved for many of these applications and electronically sophisticated remote consoles are utilized to query the data base; however, these queries are generally limited to a few specific questions. The stock market computer systems

present an excellent example of programmer questions that are usually asked about a specific data base.

Definition of a Successful MIS

If these systems are not management information systems, then one may ask what is the definition of such a system. The author offers the following: "A successful management information system is a system designed to provide to operational management accurate information upon which to make sound decisions that will result in the success of the endeavor". The author defines a successful management information system because success is the object of such a system. An unsuccessful system is a liability that speeds the failure of the organization.

There are two other characteristics in the definition that should be emphasized. First, the system is management oriented and, second, the data, whether it be manual or automated, must be accurate and available to the manager. From this definition it can be seen that in a management information system the data base must be one that mixes various staff agencies data. The system must cross staff lines just as the manager crosses staff lines. In addition the queries posed in a true management information system will be varied, unstructured, ad hoc, and often one time in nature. The queries will be designed to get to the bottom of a problem that is troubling management now!

The first hypothesis of this article is that management information systems and command and control systems have failed because of inadequate attention to data base construction. In the past, the computer analyst asked operating management to define the objectives of the system that operating management wanted. Then the computer technician endeavored to develop a system to meet these objectives. When the system queries could be clear cut (i.e., maintain a supply level equal to two weeks sales) the problem was simple. As the system queries became more complex (i.e., Why is district 2 showing a profit and district 3 is not?) the data base became more sophisticated and the ability to manipulate it more difficult. The data base is the key to a successful management information system.

The second hypothesis of this article is that a new science of information management must be developed before really successful, large management information systems can evolve. Like any other business science, this new science of information management has its theories and practical application of the theory to the problem.

The plan of approach of this article is: (1) to define some informational theory that appears germane to the development of information management systems; (2) to outline data base criteria; and (3) to outline a method of developing expertise in data base management.

Information Theory

A well-structured, meaningful data base is the key ingredient of a successful information system. Yet, too often, certain attributes of successful construction of a data base are overlooked because they appear to be so fundamental. It is the old problem of becoming so involved in the complex that the simple items are ignored. Most scientific investigation starts with statements of theory. The several information theories outlined below provide a foundation for the concepts to be enumerated later.

1. Data is factual and objective. Data consists of facts and figures that are basic elements of information. Data are often meaningless until they are properly structured.

2. Information is the arrangement of data and non-data into a meaningful form. Non-data is purely subjective, such as a commander's judgement or an estimate of the likelihood of a certain event. Information is composed of data and non-data that is combined in a manner to provide the background upon which options can be developed and decisions made.

3. Information must be understood. It must be understood by the individual having the responsibility and authority to act upon it while the conditions which the information depicts still prevail.

4. Data are supplied in many forms. Sometime it appears that ADP specialists consider only the data that is found in a computer. To develop a productive information system one must consider data in many forms – oral, written, and digital. Indeed, all data found in the computer existed in some other form before it was changed to digital data.

5. The value of information varies with its usefulness. Usefulness changes with time. The knowledge that sales are increasing in a given area is most useful; however, the knowledge that they increased two months ago is of lesser and possibly of minor value. The degree of usefulness (from "critical" to "of marginal value") should be a prime determinant in choosing methods and frequency of collection, transmission and storage.

6. Information use changes with age. All information passes through a continuance of stages of currency, from absolute currency, through historical to forgotten. The use of this data/information varies with currency. Aircraft launch data is needed immediately to know where the aircraft are. The same launch data may be used later for historical data to develop trends in late take offs and aborts.

7. A data hierarchy exists. This hierarchy is dependent upon the information needs at the various steps within the hierarchy. All data that are needed at the lowest level are not required at superior levels. In developing data systems, summary data from the lower level are normally extracted for transmission to the superior levels. This is a normal occurrence in developing reports for a manual system. Another method sometimes used in automated systems is to require that a mirror image of a limited number of data elements be transmitted from the subordinate file to the superior one. The type of data hierarchy to be avoided is one in which *all* data elements are transmitted to the top resulting in an inverted information triangle.

8. The more pertinent the information available, the better the decisions. Having the correct data in the correct place at the correct time is of paramount importance. This does not mean that all possible data should be available. To the contrary, an undisciplined information gathering system may provide so much data that the desired information is lost in the maze of useless data. All information managers must be constantly examining data and non-data. The extraneous must be eliminated and the desired which is not available must be captured and utilized.

9. Most information contains some errors. One of the paramount tasks of all gatherers of data and processors of

information is to lower the error rate. The recognition that errors exist and knowledge of techniques that can be used to correct these errors must be constantly before the information manager. Time injects errors into data, for data are constantly changing. There is a sign in the Commerce Building in Washington, D.C., that tabulates the population of the U.S. as of the time one is reading the sign. The chance is very small that this information would be precisely correct at any time; yet, because it is a model, it is very close to the actual population.

Data Base Design Criteria

Once information theory is recognized, data base design criteria must be evaluated. Both the operating manager and the analyst must be aware of capabilities and limitations of manual and automated techniques. In an automated system there is a tendency to become so involved in ADP technology that the system loses its personality as an information system and becomes merely a data processing system. Constant reference to the data base and design criteria can help in avoiding this problem and developing a responsive system.

Some design criteria are:

1. The goals and objectives of the system must be set by operating management. The top level manager knows what goals he desires his organization to accomplish. The management information system should enable the manager to determine if these goals are being attained. Middle managers develop objectives that must be accomplished so that the top manager's goals are obtained. The management information system should also aid middle managers in evaluating their progress. The goals and objectives of the management information system are therefore developed directly from the goals and objectives of the organization. This is the reason that only the operating manager can develop objectives of the management information system. Once developed, these objectives must be documented, and this documentation must later be used to evaluate the success of the system. After the operating manager has set the objectives, the information analyst/technician can aid him in determining whether to evaluate these objectives by manual means or through automated procedures.

2. The orientation of the management information system must be determined prior to development. The management information system encompasses all disciplines within the organization, although not in equal depth for each application. The management information system must be mission oriented, and must be designed to support the primary objective of the organization. The particular disciplines most affected in a particular organization depend upon the primary objectives of the organization. For example, in an operational activity, primary emphasis is naturally on operational aspects, and the Commander may need only relatively infrequent summary type information on personnel and logistics. (However, his staff activities concerned with these functions may require more detail.) On the other hand, the Commander of a vast logistics complex would be vitally interested in the details of the logistics operation, but would likely only have a general requirement for knowledge of operational matters. Sales organizations would be sales-oriented while a manufacturing organization would be production-oriented. Since both sales and production could exist in a complex organization, it becomes self-evident that the orientation of the various sub systems will vary within the organization. But they should support one another within the system, and the top level system should be oriented toward the primary goal of the organization.

3. The data hierarchy within the system must be established. There is a tendency in ADP circles to say, "Send me the file. I want to know everything." This approach not only is costly because it creates an inverted triangle with greater and greater amounts of data at the higher echelons, but it is also self-defeating because it hides the important data in an avalanche of trivia at the higher echelons. Once again the objectives of the systems at each level must be evaluated and the required data determined. This data might be supplied as summaries (reports of activity for a selected period of time) or as a mirror image of selected data elements from which the higher echelons can extract their own information.

In the development of the system, the technique for transmission of the data must also be determined. Certain data elements might be transmitted simultaneously to all echelons. For example, daily sales in a sales-oriented system or air strikes accomplished in an operational military system. Other data elements should be evaluated and reviewed at each level before transmission to the higher level. For example, the sales to miles traveled ratio or the effect of the days strike upon enemy capability, may not require simultaneous transmission. The first type of transmission may be described as parallel reporting, the second as series reporting. As the data hierarchy is recognized and the objectives of each level are examined, the needs of the management information system can be more clearly determined.

4. The need for reports vis-a-vis standard or ad hoc queries should be evaluated. With the advent of automated systems the old concept of periodic reports had to be evaluated. The manual reports system provided a data base from which significant information could be extracted. The automated system should provide a resident data base. As information is needed it should be extracted from the resident data base. The user of an ADP supported system that employs third and fourth generation techniques of data handling must reevaluate his concept of reports. He should think in terms of information products and actual queries. As he develops his organizational and management information system objectives, he should think in terms of what questions are usually asked and what data should be available to answer those questions. The information system should be designed so that problem areas are immediately apparent. Perhaps his ADP products will ultimately give trends and signal variations from the norms. By the astute combination of manual data, automated data bases and executive judgement, the possibilities of a successful management information system are exciting.

5. The manual and automated data bases should be combined. A management information system exists in every organization. This system provides the information upon which decisions are made. If an organization calls upon an ADP software company to install an automated management information system, the requesting organization should realize that it is only asking for more sophisticated tools with which to accomplish a task that the

organization is already doing. The computer has just brought this function more clearly into focus. Since the management information system already exists, the problem of automation becomes one of doing the job better and determining where the data will be translated from manual to digital data. And, once this translation has taken place, what the simplest techniques are to extract data in manual form, and how to extract it at the last possible moment in a form that will be understood by the ultimate user.

6. The system design must ensure that data are accurate, current and accessible. Information users quickly lose confidence in data which is obviously inaccurate either because of improper data input or because of outmoded data which should have been replaced. Accuracy may be checked at input, by preprocessor checks and by manual comparison. The more the data are used the more accurate it will become. In very large data processing systems that are used primarily for historical purposes, errors may exist for years without detection. The most effective method of data purification remains data use.

Currency of data is a relative quality depending upon the function of the system. The update cycle is the key to currency. A real-time system is required for flight following of combat aircraft missions with take off, refueling, vectoring, etc. called into the local command center. Such systems use both oral and digital input to the information system. After landing, strike results along with other key data may be summarized each twenty four hours and passed to superior levels of command. This level may have a currency requirement of 24 hours plus, special reports on hot news, or, the superior headquarters could require that a "mirror image" of key data be transmitted on an "as occurring" basis. The superior headquarters could then generate its own summaries, or the update cycle might be monthly, or even yearly. In this case the file is probably historical and begins to fall outside of the limits of a management information system.

In this discussion of currency it is germane to review the suggested definition of a successful management system. It is a system designed to provide to operational management accurate information upon which to make sound decisions that result in the success of the endeavor. Said another way, the data and information must be processed rapidly enough so that the results are available in time to influence the process being monitored. Such a system is a real-time information processing system.

Accessibility is a basic requirement of a management information system because data which are not accessible cannot be used; so, there is no need to have it. Whether one is discussing a manual filing system or an automated one, well-defined systems of indexing and record construction are required. The orientation of the controlling system was discussed above. Both for the primary orientation and the subordinate areas, families of files will exist. For example, in an operational military system there will be a family of files which are concerned with reporting of air, sea and ground activities. By the same token, another family of files will be concerned with status of the forces that are available. These two files must be constructed so that specific items of data can be extracted from each and combined to provide the answer to a specific question. Flexible file structures using random access techniques are imperative. Near English retrieval languages with remote typewriters and/or cathode ray tube entry terminals will allow non-ADP trained personnel direct access to the data. Third and fourth generation technology have returned the ADP file to the ultimate user. The need for an ADP technician to act as an interpreter between the machine and the untrained user is greatly diminished.

The advent of multiprocessing, multiprogramming, greater use of random access devices, and larger, less expensive core storage have made many first and second generation ADP techniques obsolete. Also, many ADP personnel who have failed to keep abreast with the technology and the utilization of it are also obselete. This point is emphasized because new ADP thinking must be employed to develop the accessibility to ADP files required for a management information system.

7. Standardized data elements, codes, procedures and techniques must be used. The USA Standards Institute (USASI) is the major force in establishing voluntary standards for industry, specifically the USASI Sectional Committee X3 is responsible for computer and information processing standards. Acceptance of standards is voluntary; however, as information systems grow larger and more complex the acceptance of standards becomes more important because non-standard systems will become more and more expensive. The federal government has gone much further in establishing standards. The Office of Management and Budget provides overall policy guidance for Federal standardization but many other government agencies are also involved. Particularly the National Bureau of Standards, which implements standards in the Federal Government. The Federal Government adopts USASI standards whenever possible. The key idea here is that standards are being established and must be used in any management information system so that data may be exchanged and standard hardware and software may be utilized.

8. Dollar costs of information products should be determined. Each item of information should have a price tag. The requestor of information should be aware of what his information cost and be able to evaluate whether the information is worth the price. In the past, determination of costs has been mainly subjective and has been in terms of total system cost with very little attention to individual items of information. With the advent of multi-programming and multiprocessing, more than one job can be run on one computer concurrently. This process would seem to complicate record keeping; however, since the computer can do more than one thing at a time, the operating system can be programmed to keep up with how the time is used. The result is that the user can now receive a more exact accounting of the computer and peripheral equipment usage than ever before. When these costs are combined with the manual data costs and overhead costs, the information manager can develop an information product price tag. Once such a costing program is instituted, the manager should be able to estimate the cost of new information products. Periodic checks can determine the validity of such estimates.

9. The management information system must have flexibility. The top manager's job is to accomplish his mission, whether that mission be to make a profit, improve the ecology or win a campaign. The problems that the manager encounters are constantly changing. If the information system is to respond to the manager's needs, then the structure must be flexible enough so that elements can be removed and added as conditions dictate. There will be fundamental elements that will always be in the data base.

The system should also contain a simple query capability so that the operating manager can get to his data without the aid of an ADP technician.

Data base design criteria can be established. The operating manager does not have to be an ADP technician to understand what can and what cannot be done by means of ADP. The operating manager must clearly define his organizational goals and objectives. The goals and objectives of his information management system will evolve directly from those of the organization. The operating manager and the information manager together must decide whether to use manual techniques, ADP techniques or a combination of the two to solve the management information problem. Because of the dynamic nature of management the system is never complete, but must be designed so that it can be constantly evolving and using the newest techniques soon after they are introduced. For this reason the information system must be under constant scrutiny.

The Information Scientist/Manager

If a science of information can be supposed to exist, then one could assume that the person with expertise in this area is an information scientist. However, as in most business sciences, the information handler must apply his inexact science in an artful manner; so we refer to the information scientist as an information manager.

All managers are information managers to one degree or another; but, as is the case in other areas of management, some become more astute managers of information than others. And, it would seem to follow that the astute information managers are astute because they understand the operational side of the organization and are able to apply informational theory in solving problems. They have information expertise. They know how to build a data base, whether it be manual or automated.

This is an area of expertise that has not been recognized in the rush toward automating structured systems. Considerable emphasis has been placed on computer hardware and computer programming, but very little consideration has been given to the building of the data base and the employment of data base management expertise. If one is to have an effective management information system, it is more important to have a competent data base manager than it is to have a competent computer facility manager. There exists, in most organizations, the need for an Office of Information Management. This office should:

1. Develop and maintain a professional level of expertise in information management to assist users in selecting effective methods of information display.
2. Determine the information requirements for the whole organization.
3. Minimize reporting workloads of agencies which generate information by eliminating duplicate reporting, designing effective, practicable reports and reporting procedures, and reducing the reporting of "so what" type information.
4. Accept requests for information from users. If the data exists to provide the requested information to the user, provide that information. If the data does not exist, the Office of Information Management should determine the best way to get the data, modify any existing input mechanism, and define a new input mechanism as required. As this is being done, coordinate with other staff agencies to see if this data element is needed elsewhere.
5. Determine the cost of information that is supplied to users. The cost of producing information is a part of the cost of operating the organization. These costs should be allotted to users based upon how much of the information resource each department uses. The Office of Information Management should develop the ability to measure costs and be able to suggest cost trade-offs that will provide the best information at the optimum price.
6. Determine the interface between manual and automated data storing facilities and determine the best method of storage at the various levels of the organization.
7. Select the storage medium (i.e. automated versus manual) and, define storage and retrieval procedures.
8. Evaluate the utilization of individual data elements and eliminate those elements which are not used, thereby maintaining the minimum structure required to meet the needs of the organization.
9. Evaluate the file structure to determine the best method of obtaining and storing data elements.

Accomplishment of the above assures that the Office of Information Management is conducting a continual feasibility study for each data structure that it maintains. Cost effectiveness, as concerns methods of storage, must continually be considered.

Conclusion

With the development of data processing techniques much emphasis has been directed toward computer technology, hardware and programming. Less emphasis has been placed on the data that are actually in the files. The choice of data has, in many cases, been left to the discretion of the user who is unskilled in information management and in storage and retrieval methods. Before management data systems can be successful, it is imperative that theories and concepts of data base management be developed and employed by experts in this field. A new science of information management must be investigated and offices of information management established at appropriate levels within organizations to ensure effective utilization of the myriad of data elements that exist within organizational files. Both manual and automated files must be examined. The computer can be utilized as a management tool, but new manual and automated techniques must be employed, and revolutionary thinking must be accepted, before management information systems will become a reality.

It has often been said that people today, especially the young, are so much smarter than people were in the past. Yet, when one reflects on the accomplishments of our forebears and realizes what they accomplished with the primitive technology that they had, one wonders what they would have done had today's technology been available to them. . . . What would have been the magnitude of Thomas Jefferson's genius if it had been amplified by the technical tools that are available today?

Many great challenges lie before our people today. The development of effective management information systems is one of these challenges. □

MORE AND MORE PEOPLE

"The combination of more people, high levels of consumption, and general apathy has yielded a harvest of bad air, poisonous water, urban and suburban blight, and abuse of our wilderness, oceans and farmlands."

E. Allen Arnold, Actuary
The Wyatt Co.
635 Sacramento St.
San Francisco, CA 94111

The world's most urgent problem is over-population.

The Problem

Millions now are starving or slowly dying of nutritional deficiency diseases. Professor Georg Borgstrom of Michigan State University, an authority on agriculture and nutrition, states:

> If the entire world's food supply were parcelled out at the U.S. dietary level, it would feed only about one-third of the human race. Yet there is in the well-fed nations a great deal of nonsensical talk about abundance.
>
> Already short of food, the world is adding 70 million people to its feeding burden each year – the equivalent of an entire United States every three years. The population increase is outstripping the gains in world food production despite all the triumphs of agriculture since World War II.

The Environment

Even affluent nations already are suffering from the effects of population growth. The combination of more people, high levels of consumption, and general apathy has yielded a harvest of bad air, poisonous water, urban and suburban blight, and abuse of our wilderness, oceans and farmlands. Only belatedly has our environment become the subject of widespread concern.

The short and long-range effects of population growth at geometric progressive rates transform this current problem into a crisis, whose solution requires the acceptance of forecasts of many factors affecting this planet's future. The projection of population trends, in particular, is essential if the magnitude of the problem is to be recognized.

Population and Actuaries

A primary reason for the considerable controversy surrounding the population crisis is the lack of agreement on statistics. For example, Charles McCabe, a syndicated columnist who believes that there is no population crisis, stated in his July 16, 1970 column in the *San Francisco Chronicle:*

> The most scholarly guess as to world population is in the work of N. Keyfitz and W. Flieger, called *World Population,* published in 1968. Based on the only reliable information which they could find – for Europe and the U.S. – the authors estimated the population of the world to be 947 million people in 1965.
>
> For exactly that same year the United Nations Demographic Yearbook estimated the world population at 3285 million, which is the figure usually accepted by population experts.
>
> Facts about population are sadly lacking. Polemics based on guesswork make no sense at all. They create needless anxiety, which is one thing we could use less of.

While the present world population cannot be measured as closely as we would like, variations of this magnitude are incomprehensible.

Population measurement and projection are a part of actuarial science.

It is suggested that a new committee of the Society of Actuaries could apply actuarial talent and skills to the analysis of the population crisis. The committee's value would lie in its competence to review the estimates of others and to improve them, when appropriate, by proper extrapolation of the underlying data. Its lack of economic, political or religious bias should establish respect for such estimates.

If the crisis truly threatens civilization, then the committee's contribution to mankind could be enormous.

*Based on an article which appeared in the October, 1970 edition of "The Actuary", the newsletter of the Society of Actuaries, 1740 Broadway, New York, N.Y. 10019.

A New Analysis of the Population Problem

For those who doubt the existence of a population crisis or that Canada and the United States are deeply involved, two books are recommended reading. The first of these is a paperback *The Population Bomb* by Dr. Paul Ehrlich (Sierra Club – Ballantine Books 95¢). Dr. Ehrlich is a Stanford University biologist who is dedicated to awakening the population to the consequences of excessive reproduction. The second book authored jointly by Dr. Ehrlich and his wife Anne is *Population Resources Environment:* Issues in Human Ecology (W. H. Freeman & Co. $8.95). Particularly in the second book the Ehrlichs' enthusiasm and direct style and the dramatic conclusions derived from the statistics combine to make an exciting volume on what normally would hardly be an exciting subject.

The World Today

Their summary of the present world situation (Chapter 13) follows:

1. Considering present technology and patterns of behavior, our planet is grossly overpopulated now.
2. The large absolute number of people and the rate of population growth are major hindrances to solving human problems.
3. The limits of human capability to produce food by conventional means have very nearly been reached. Problems of supply and distribution already have resulted in roughly half of humanity being undernourished or malnourished. Some 10-20 million people are starving to death annually.
4. Attempts to increase food production further will tend to accelerate the deterioration of our environment, which in turn will eventually reduce the capacity of the earth to produce food. It is not clear whether environmental decay has now gone so far as to be essentially irreversible; it is possible that the capacity of the planet to support human life has been permanently impaired. Such technological "successes," as automobiles, pesticides, and inorganic nitrogen fertilizers are major causes of environmental deterioration.
5. There is reason to believe that population growth increases the probability of a lethal world-wide plague and of a thermonuclear war. Either could provide an undesirable "death rate solution" to the population problem; each is potentially capable of destroying civilization and of driving *Homo sapiens* to extinction.
6. There is no technological panacea for the complex of problems composing the population-food-environment crisis, although technology, properly applied in such areas as pollution abatement, communications, and fertility control can provide massive assistance. The basic solutions involve dramatic and rapid changes in human attitudes, especially those relating to reproductive behavior, economic growth, technology, the environment, and conflict resolution.

These alarming conclusions may be automatically rejected by some readers, but it seems unlikely that even the most biased reader would fail to be convinced that the lack of proper nutrition now is taking a large toll, that future major famines threaten, and that the "Limits of the Earth" (Chapter 4) at least will restrict most human consumption to lower levels than we now enjoy in the developed countries.

Additional Sources of Food

Chapters 4, 5 and 7 discuss the adequacy of food supplies and the possible additional sources of food. One popular idea, the "Green Revolution," which would apply modern agriculture methods in undeveloped countries, is shown to be overly-optimistic. Improvements are possible, but the results to date have been disappointing and the potential increase in production is limited.

Recent attempts to extend agriculture to untilled lands have been unsuccessful. Khrushchev's "virgin lands" program in Kazakhstan, an attempt to plant grain in an arid area, has been ruined. Other projects in Turkey and Tanzania have been abandoned. The fertility of the Amazon basin has proved non-existent for agricultural purposes.

A third popular idea, that of farming the seas "offers no hope at all" say the authors, and increased catches of fish are unlikely. The Ehrlichs conclude that "There is a real possibility that the total yield will decline rather than grow, and we will be extremely fortunate if by 1980 the yield per capita is as high as today's."

The following quotation summarizes the food problem:

> It is certainly evident that no conceivable increase in food supply can keep up with the current population growth rates for long. We emphatically agree with the report of the President's Science Advisory Committee's Panel on the World Food Supply, which in 1967 stated: "The solution to the problem that will exist after about 1985 demands that programs of population control be initiated now."

The food supply is not the only major human ecological problem; it is discussed here because of its obvious relationship to population. *Population, Resources, Environment* covers almost all aspects of human ecology, present and future. Other subjects include:

- The quality of our life, which depends upon its quantity and upon its relationship with its environment;
- The psychological effects of overcrowding;
- The increased probability of war;
- The "greenhouse effect," which means that a high layer of polluted air might transform our climate;
- The depletion of our soil, minerals and usable water supplies.

The Ehrlichs' analysis of each subject is thorough, fair and convincing.

The conclusions necessarily drawn from their analyses are alarming, but the Ehrlichs are not alarmists. Their analyses merely make the facts and figures speak for themselves. The message is: "A new way of thinking is required if man and our planet are to survive in harmony." □

Postscript from the Editor: Mr. Arnold discusses a professional role for his actuarial colleagues in contributing to a solution to the population crisis. What about computer people? How can they help find solutions to the problem of over-population? We would like to hear ideas and comments from our readers.

COMMON SENSE, WISDOM, GENERAL SCIENCE, AND COMPUTERS

The Most Important of all Subjects, and its Relation to Computers

Edmund C. Berkeley
Editor, Computers and Automation

Outline

1. The Most Important of All Branches of Knowledge

Suppose you and I should ask our friends or our colleagues or the well-informed men that we know:

> What is the most important of all subjects? the most important of all branches or divisions of human knowledge?

What would they answer?

Some of them would deny that there was a single such subject, saying "It depends". But others would be willing to concede there might be one subject more important than all others, and candidates for this subject might well be:

mathematics; or
science; or
getting along with people; or
making money; etc.

Some might even say "computers" -- though that would be rather easy to disprove.

I think an excellent case could be made for the proposition that there exists a subject that is most important, and which we could identify as a compound of common sense, wisdom, judgement, maturity, the principles for correct solving of problems in general, and associated topics.

2. The Distinguishing Characteristics of This Subject

The characteristics of this subject, from the modern point of view, are these:

1. Generality: It affects and in fact it permeates all other subjects -- in the same way as mathematics, logic, statistics, the scientific method, etc., all do. This means to say the subject is not special; for example, all special terms like water or dinosaur or molecule or pump or city are outside of the territory of this subject (unless the words are used metaphorically, as in "A bird in the hand is worth two in the bush").

2. Content: It deals generally with facts, knowledge, proofs, analysis, synthesis, evidence, experiments, deductions, inductions, fallacies, language, communication, etc.

3. People: It deals with the behavior of people in regard to knowledge and contemplated actions; it deals with belief, disbelief, argument, decision making, study, understanding, etc.

4. Computers: It allows and encourages experiments using computers; and experimental testing of a principle of the subject (such as "a stitch in time saves nine") could be performed with computer programs.

5. Operational: The subject is operational, in the sense that experience, tests, and operations (with and without computers) enable decisions to be made about what is true and what is false. Furthermore, the subject has a tendency to focus around the history of mistakes, and the methods for avoiding them.

3. Names for This Subject, Including "Common Sense, Elementary and Advanced"

I know of no good name for this subject, although I have been hunting for one for a dozen years. If I were to invent a name, I think I would choose "generalogy", to refer to the science of what is true in general, in both an applied and a pure sense — for I do not wish to make the same sort of distinction as is made between applied mathematics and pure mathematics.

Old names for this subject exist; all of these old names have connotations which are not nowadays applicable:

Common sense — this term is not broad enough and not deep enough;
Wisdom — this term has a poetical overtone, and sometimes even mystical and religious overtones;
Problem solving — this term is too limited;
Science in general or general science — this term is too limited;
Interdisciplinarianism — an invented word, which refers to what is common to interdisciplinary studies, and this term also is too limited.

The name which I think most quickly conveys the meaning to an uninitiated listener is:

common sense, elementary and advanced.

The names for this subject that will be used from time to time in this article are:

common sense
common sense, elementary and advanced
wisdom
science in general
generalogy.

"Generalogy" of course is an invented new name for the subject; and the usual fate of invented new names is to be left like dried-out seaweed high on the beach, as the waves of language ebb in other directions. It may be that the name "generalogy" will eventually be adopted; it is too early to predict.

4. The Definition of This Subject

Let us try to define the subject which is here alluded to:

> Generalogy is the branch of knowledge which deals with the principles, concepts, laws, methods of solving problems, techniques, etc., (1) which are common to at least several branches of knowledge, (2) which are largely or completely independent of the subject matter of specific branches of knowledge, and (3) which are not included in certain general subjects which are already widely recognized and studied such as mathematics, logic, and statistics.

The last specification that excludes mathematics, logic, and statistics is not a logical exclusion, because these subjects are of course inside and not outside generalogy (or general science); they most certainly apply to every systematic and verifiable branch of knowledge. But these subjects have for centuries attracted the attention of human beings; and so they have historically been distinguished as subjects which ought to be systematically taught and learned. So here we shall touch on these subjects only lightly and from time to time.

The other two specifications may be summarized into a much shorter definition:

> Generalogy is the branch of knowledge dealing with what is true in general.

But this definition, when one first encounters it, is not very clear, and the longer definition is to be preferred.

Generalogy is the subject in which belong, for example, the following concepts:

process, event, state, system, living system, feedback, evolution, relevance, dependence, generality, status, report, strategy ...

and, for example, the following statements:

-- A stitch in time saves nine.

-- Over and over again in the study of the history of evolution, it appears that what can happen does happen.

-- Fortune favors the industrious.

-- It is an ill wind that blows no good.

-- There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy.

-- A good way to produce understanding of something is through a well-designed sequence of examples from simple to complex. Etc.

Knowledge always involves knowers, that is, entities, or agents, or organisms that have knowledge and therefore know. In our time, the 1970's, the main knowers are of course human beings. But animals also know, and programmed computers know. Knowledge basically consists of ideas and relations among them which are:

Expressed in signals of some kind;
Stored in a brain (or in a computer);
Able to be manipulated reasonably; and
Accessible to the organism so that the organism can use these internal signals to guide (or be guided in) his or its behavior in the external world.

An important part of generalogy consists of the relations of knowers to knowledge. These relations include: belief and disbelief; ignorance, becoming informed, being informed, forgetting; etc. Also the emotional attitudes of human beings towards knowledge are important for an understanding of principles in general science; for example, "There are none so blind as those that will not see."

The relation between knower and knowledge also involves time, history, etc. An organism's knowledge can increase and can decrease. A so-called "branch of knowledge" (like geometry) is rather abstract. The actual knowledge that different persons have of geometry is extremely varied, and depends on time, prior events, and many other factors.

5. The Case of the Differences in Kinds of Corn

A knowledge of "generalogy" can make the difference between success and failure in an undertaking.

Let us consider "The Case of the Differences in Kinds of Corn". This case history is taken from "Plants, Man, and Life", by Edgar Anderson, botanist and educator[1]:

> One of our leading authorities ... was concerned with two related strains of corn, one with a higher average row number than the other. The plants also looked somewhat different and the leaves looked wider, so he set out to get exact information on this point. He took the leaf above the ear, found its midpoint, and measured the diameter there. He did this for fifty plants of each strain, calculated their averages, and determined mathematically the chances that such an average difference might have come about just

anyhow and did not represent a really characteristic difference between the sorts. The chances turned out to be pretty high, and so in his published account of the matter, he was careful to state that he had certainly not demonstrated a difference in the leaf, even after all that work.

Now the simple everyday facts about the leaves of the two strains were as follows. The two sets were of quite a different shape. One was broader and rounder at the base with a slight tendency to be wider in the middle, and it was nearly always shorter than the other. One could easily demonstrate the differences in the two sorts, just by stripping off a series of leaves from one set and then a series from the other and laying them down on the earth of the cornfield in two parallel rows. With ten minutes of this kind of work, it was clear that all the leaves of one strain were different from all the leaves of the other. Having seen half a dozen of each kind, one could easily classify at least nineteen out of twenty specimens which had been gathered by an assistant and brought in without a label. One of the results of this basic difference in shape was to make one set a little wider than the other on the average, though the greater width did not necessarily show at the midpoint. With his uncertain reflection of the basic difference in shape, my friend had been struggling in his efforts to get a clear mathematical answer.

We may compare his problem rather exactly to that of separating a pile of oranges from a pile of apples. Apples and oranges being what they are, it might take some fancy mathematics to prove that the two sets of measurements probably came from different kinds of things. If we are willing to study the two fruits before we start out measuring them precisely, then we can see the myriad little differences between apples and oranges, and any normal child can separate the two lots in a moment.

All of this was lost on my friend, not because he did not have a good mind, not because he was not industrious, but simply because he had not learned to look at a corn plant or, for that matter, any other plant. He was a most intelligent person, but he had never been given even the beginnings of training in natural history. I found to my horror that although he had spent his adult life studying corn, he understood almost nothing of its technical architecture. Yet he was one of our very best corn geneticists and a man to whom students came, up until the day of his death, from all over the world. He had been convinced as a young man that the taxonomic method was old-fogyish, and he would have none of it.

This case is a splendid example. It suggests a number of principles of general science:

-- A man can be an expert in one part of a subject, yet ignorant and blind in another part.

-- There is an art to observing well; apparently one of the places to learn it is natural history and taxonomy.

-- An expert can disdain and scorn information offered contrary to the usual pattern in which he acquires his information. (There are none so blind as those that will not see.)

-- Mathematics contains no rules complete enough to tell precisely to what observations mathematics should be applied.

6. The Case of The Arab-Israeli War of 1967

Let's now consider another example.

In May 1967, the governments of Egypt, Syria, and Jordan took certain aggressive actions towards the government and country of Israel. They declared that Israel had no right to exist; they marshaled their armies on the borders of Israel. On May 18, President G. A. Nasser of Egypt demanded that the United Nations Emergency Force stationed along the armistice line (set ten years before) between Egypt and Israel be removed. Secretary General U Thant of the United Nations immediately acquiesced and removed the force on May 19. On May 22 Nasser's armies occupied territory previously barred by the UNEF, including an area called the Gaza strip along the Mediterranean and a fortress called Sharm El Sheikh at the mouth of the Gulf of Aqaba. There the strait is 3 miles wide and Israeli shipping could be barred from passing by artillery fire from the fortress. Israel waited from May 22 to June 4 to see if other countries and the United Nations could prevent Nasser from blockading the Gulf of Aqaba. But the shelling by Egypt of Israeli vessels, and shelling by Jordanians and Syrians of Israel itself produced an Israeli decision. Early on June 5 the Israeli army attacked in force.

Less than four whole days later, the armies of Egypt, Syria, and Jordan had all been beaten; the army of Israel had occupied the whole of the Sinai Peninsula; Israeli troops were on the bank of the Suez Canal; the mountainous southern border of Syria (12 miles wide) from which the Syrians had bombarded Israel for many years was occupied by the Israeli Army; and all the territory of Jordan west of the Jordan River and the entire city of Jerusalem were in the hands of the Israeli Army. Some 35,000 Arab soldiers were dead and thousands more captured; about 700 Israeli soldiers were dead. The war stopped on June 10 through a ceasefire arranged through the United Nations.

There is no question that the governments of Egypt, Syria, and Jordan had made a colossal mistake. Incidentally, Lebanon, the fourth Arab country touching Israel, had refused to participate in any way, and suffered no loss at all.

Among other events, Nasser explained to the Egyptian people that the destruction of the Egyptian air force was the result of bombing in which American and British planes had participated — a great lie, which he did not correct even when he shortly afterwards found out that rapid turn-around time was what appeared to give the Israelis so many more planes than he knew they had.

The area in which this mistake was made involved a large number of branches of knowledge all intertwined: history, economics, politics, military science, psychology, strategy, education, etc. It seems obvious that if the Egyptian government had by some miracle been able to foretell the future, and had known what they knew on June 10, that they

would have been beaten so completely, they would not have chosen to start the war and would not have chosen to blockade the Gulf of Aqaba. But miraculous knowledge of the future does not happen; only knowledge about the probable future is possible. So the following principle of general science is here demonstrated once again:

-- Leaders of groups may be so far removed from wise assessment of real conditions that the decisions they make are colossally wrong.

7. The Case of The Superseding of the Vacuum Tube

Let's consider another example. This is taken from "Management of Interface Problems between Basic and Applied Research" by J. E. Goldman and L. M. McKenzie[2]:

> The transistor ... is a classic case (of successful exploitation of basic research). In the late 1930's the management of Bell Telephone Laboratories made a conscious decision to mount a program of research in solid-state physics with emphasis on semiconductors. The rationale behind this move was a recognition by Bell management that if the vacuum tube was to be supplanted -- which seemed inevitable because of frequency, bandwith, and other limitations -- semiconductor science would be a pregnant field in which to look for its replacement.
>
> World War II and the Office of Scientific Research and Development gave impetus to these efforts through the support of extensive research on semiconductor science, in order to accelerate the pace of development of crystal diodes and mixers for radar frequencies. The term "semiconductor science" was used advisedly. As it came to be recognized later, the interplay of physics, chemistry, and metallurgy was a dominant influence on promoting the success of the ultimate effort.
>
> In the period immediately following World War II, Bell and other laboratories, notably Purdue, continued their wartime research in semiconductor science. The program at Bell was in itself board, ranging from a theoretical understanding of properties of electronics and holes in semiconductors to preoccupation with techniques of how to make better and purer materials.
>
> In 1947 Bardeen and Brattain revealed the discovery of the point-contact transistor, to be followed later by the junction transistor in collaboration with Shockley and ultimately by a family of new and better devices all based on the transistor effect. During the period from 1946 when the first device was invented through the middle 50's when the transistor was already a billion dollar business -- in turn breeding other large businesses -- Bell expanded very significantly its efforts in the science and technology of semiconductors, even though the basic invention had already been made.
>
> It is fair to say that this very extensive expanded effort may have played a more vital role in catalyzing the development of the industry than the original invention. During this period zone refining was invented, the surface barrier transistor was developed, and many other large and small inventions that perfected the transistor were made ....
>
> The outcome has been revolutionary, but the foresight of the Bell management in the early days of atomic physics to stress basic research in the solid state was a calculated decision which set in motion the interconnected train of accomplishment. ... Again, the brilliant essays which were written during the early years of the quantum theory by Karl Darrow for the enlightenment of the Bell staff are signposts of the intellectual investments made all along the way which prepared men in management to make decisions. ...

This case constitutes another splendid example. It leads to a number of conclusions:

-- It is possible for technical management to make a conscious, successful decision to develop a new science and technology which becomes very important.

-- It is possible to arrange great success in exploring an area where three sciences come together such as physics, chemistry, and metallurgy.

-- An environment of good communication, ample resources, extensive scientific and engineering ability, good technical management, and important basic research problems to work on, can be highly creative and inventive in a controlled direction.

-- The story of the development of transistor technology suggests the possibility of the engineering of wisdom.

8. The Relations of this Subject to Computers

Over 2000 branches of special knowledge and special science can be aided by the application of computers. The aids include: summarizing; classifying; sorting; matching; merging; making experiments with pseudo-random numbers or even fully random numbers; analyzing; etc.

The most general of all branches of knowledge — common sense, wisdom, generalogy — is no exception. Many of the general principles which this subject contains (see the example in the next section) can be investigated by computer programs, both in any experimental situation, and in real situations.

In addition, since professional computer people are in charge of computing machines, plain ordinary people necessarily consider the professionals to be responsible for the worthwhileness of the results of computer calculations. Because of "garbage in, garbage out", a computer professional is to some extent compelled to apply at least some common sense and wisdom to what he does. He has to select and appraise the input data; and he must be satisfied with the reasonableness of the output results.

9. Computer Testing of Principles of Common Sense, Wisdom, and Science in General

Interestingly enough, a great many of the princi-

ples of generalogy, common sense, and wisdom can be studied, analyzed and tested on a computer with a suitable computer program.

On our PDP-9 computer (Digital Equipment Corporation) we have tested:

> To him that hath it shall be given, and
> from him that hath not it shall be
> taken away even that which he hath.

We tested this by inventing a "world" of 36 squares like a checkerboard, and inventing two species of abstract animal, with different rates of birth, death, and relative capture. On one occasion we filled one half the world (the top three rows) with a species of "cat" at 3 to a square, and one sixth of the world (the bottom row) with a species of "rat" at one to a square. After about 80 time periods (using a pseudo-random move generator), rats had occupied the entire world with a population of 218 rats, and cats had become extinct.

So we can report that the principle is true sometimes; but often and under surprising conditions:
To him that hath not it shall be given.

10. The Importance of "Generalogy" – Common Sense and Wisdom

From one point of view, this subject is so trite, and obviously familiar, that it is hardly worth talking about; many everyday varieties of plain common sense are of course included in this subject.

But from a deeper point of view, this subject is strange and unfamiliar because nowadays its study is unfashionable: it is not recognized with a name of three or four syllables ending in some suffix like "logy" or "ics"; no nearby college or university teaches courses in the subject. The learning of this subject is essentially left to the school of hard knocks. Besides, many branches of wisdom have never been adequately investigated with the scientific method.

Yet this subject is enormously important to human beings. This subject may well yield more and bigger fruit than do mathematics or logic or statistics. The reason is that much the same kinds of mistakes occur throughout hundreds of human activities, such as living, manufacturing, investigating, governing, managing, etc. And the cost of mistakes -- the failure of human beings to understand and apply common sense, wisdom, and general science -- reaches an absolutely huge cost. Sometimes the cost includes the lives of thousands of human beings.

The subject of generalogy (wisdom) has become of even greater importance to all men and women in these modern days. Specialized science and specialized technology have rendered the earth, our ordinary world, almost unrecognizable:

1. All major cities on the planet are only a few hours apart by jet plane.

2. Millions upon millions of people are alive because of miracle drugs recently invented — yet the resulting slashing of the death rate has produced a population explosion.

3. Nuclear weapons if used can destroy mankind and civilization in a few hours. Etc.

To deal with so many different vast problems people need wisdom. To use wisdom people should study it.

Epilogue: The C&A Notebook on Common Sense – Elementary and Advanced

For more than a dozen years I have been studying this subject -- ever since the time I went to the main Public Library at 5th Ave. and 42nd St., New York, and looked for a good textbook on "Common Sense" or "Wisdom" -- and could not find anything at all like that. So I decided I had better try to put together such a book myself. Therefore, for at least 12 years, I have been collecting data, pieces of information, observations, experiments, hypotheses, proffered principles, and questions to be investigated -- that belong to this subject; and other members of the staff of C&A have begun to collect also.

Much of this material is being gathered into a book which has now acquired five working titles:

1) Science in General and Problem-Solving
2) Common Sense: Elementary and Advanced
3) The Natural History of Mistakes and Methods for Avoiding Them
4) Interdisciplinarianism
5) The Science and Technology of Wisdom

The book has been under contract with John Wiley and Sons, New York, since 1967. The folders of material for the book now fill three file drawers each two feet long. The first draft of the book is more than 600 manuscript pages long. It begins to look as if the material will not even fit into three books!

We have found an enormous quantity of information that is extremely interesting. Why? Because a large number of great men, many ancient, many medieval, and a great many modern, have noticed much about this subject -- and they, while talking or writing about something else, have made remarks that belong in this subject.

The staff of "Computers and Automation" have decided that it is desirable to make the information we have been uncovering much more accessible and more widely distributed. We have decided to publish twice a month something of newsletter variety called for the present "The C&A Notebook on Common Sense, Elementary and Advanced". (See the announcement on the back cover for more details.)

If you, our readers, would like to look over our shoulders as we seek to investigate, collect, and test common sense, wisdom, and good judgment, -- checking some of it out from time to time on a computer -- we invite you to join us, both as readers and as participators.

"Wisdom is a joint enterprise, and truth is not shaped so that it can fit into the palm of any one person's hand".

References

1. Edgar Anderson / Plants, Man, and Life / reprinted by the Press of the University of California, Berkeley, Calif. / hardbound, 1967/ see p 178.

2. J. E. Goldman and L. M. McKenzie / "Management of Interface Problems Between Basic and Applied Research" in Research Program Effectiveness edited by M. C. Yovits and others / Gordon and Breach Publishers, New York, N.Y./ hardbound, 1966 / see page 4.

The Right of Equal Access to Government Information

NATIONAL COMMITTEE to INVESTIGATE ASSASSINATIONS
927 15th St. N.W.
Washington, D.C. 20005

This is the text of a suit brought by the National Committee to Investigate Assassinations against the Department of Justice of the United States.

The interest of this suit lies in the fact that a commercial journalist, Robert F. Kaiser, (according to statements in his book "RFK Must Die: A History of the Robert Kennedy Assassination and its Aftermath" published by E. P. Dutton, New York 1970) obtained access to the FBI file of 4000 pages on the death of Senator Robert F. Kennedy. But access to this file has been denied to the Committee to Investigate Assassinations, and consequently the committee has brought suit.

U.S. DISTRICT COURT FOR THE DISTRICT OF COLUMBIA

COMMITTEE TO INVESTIGATE ASSASSINATIONS, INC. 927 15th St., N.W. Washington, D.C. 20005 Plaintiff	Robinson, J.
vs.	Civil Action No. 3651-70
U.S. DEPARTMENT OF JUSTICE 10th & Constitution Ave., N.W. Washington, D.C. Defendant	

C O M P L A I N T

(Pursuant to Public Law 89-487; 5 U.S.C. S552)

1. Plaintiff brings this action under Public Law 89-487; 5 U.S.C. S552.

2. Plaintiff is a non-profit corporation, organized under the laws of the District of Columbia, for the purposes of investigating the assassinations of several of our more important national leaders, discovering the identity of those responsible for these assassinations, the reasons why the whole truth relating to them is suppressed, and educating the public and Congress as to true facts regarding these various matters.

3. Defendant is the U.S. Department of Justice.

4. Senator Robert Francis Kennedy, one of our national leaders, was assassinated in Los Angeles in June, 1968.

5. The defendant Department of Justice, by and through its investigative arm, the Federal Bureau of Investigation, made an in-depth study of the murder, which was compiled into a file of approximately 6,000 pages and designated as Office File 56-156, Bureau File No. 62-587.

6. Said FBI file was made available to Sirhan B. Sirhan and his counsel (Messrs. Russell Parsons, Grant Cooper, and E. Z. Berman) for preparation of his defense against a charge of First Degree Murder in Los Angeles County, California, in the wrongful death of Senator Robert Francis Kennedy.

7. Said FBI file was also made available to Mr. Robert F. Kaiser, who paid Sirhan B. Sirhan approximately $32,000.00 for the privilege of writing his "inside story."

8. Mr. Robert F. Kaiser is neither an attorney nor licensed investigator, but rather a journalist and self-styled free lance writer.

9. Mr. Kaiser's "inside story" was published as R.F.K. Must Die: a History of the Robert Kennedy Assassination and Its Aftermath, E.P. Dutton, New York, 1970 (Library of Congress Catalogue Number 74-86074).

10. On page 11, 12, 321, 322 of RFK Must Die, Mr. Kaiser acknowledges the availability to him of FBI Office File 56-156, Bureau File No. 62-587. (See Exhibit A, appended hereto).

11. On October 19, 1970, plaintiff wrote to the Attorney General requesting access to the same FBI File under 5 U.S.C. S552 and 28 CFR 16. As required by regulations of the Department of Justice, the latter was accompanied by a completed form DJ-118 and a check for $3.00. (For a copy of the letter, see Exhibit B, appended hereto.)

12. In a letter dated December 8, 1970, plaintiff again wrote defendant, renewing his position to see the FBI file. (See Exhibit C, appended hereto.)

13. In a letter dated December 7, 1970, defendant Department of Justice, over the signature of the Hon. Richard G. Kleindienst, Deputy Attorney General, refused to make the said FBI file available as it is "not subject to disclosure under the provisions of 5 U.S.C. S522(4) (b) (7)." (Exhibit D, appended hereto.)

14. The request remaining denied after exhaustion of administrative remedies, plaintiff files this complaint pursuant to Public Law 89-487,

5 U.S.C. S552, further alleging that, pursuant to this law, the records must be made available to it, and the Court shall determine the matter de novo, and the burden is on the defendant to sustain its refusal.

Wherefore, Plaintiff prays this honorable Court for the following relief: that Defendant be ordered to produce and make available for copying FBI Office File No. 56-156, Bureau File No. 62-587 and such other relief as this Court may deem just and equitable.

BERNARD FENSTERWALD, JR.
905 16th St., N.W.
Washington, D.C. 20006
Tel. 347-3919
Attorney for Plaintiff

Dated Dec. 15, 1970

EXHIBIT A

COMMITTEE TO INVESTIGATE
ASSASSINATIONS
927 15th Street, N. W.
Washington, D.C. 20005

Bernard Fensterwald, Jr.
Executive Director
Washington, D.C.

BOARD OF DIRECTORS

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Richard Popkin, La Jolla, Calif.
Lloyd Tupling, Wash., D.C.

October 19, 1970

Attorney General John Mitchell
Department of Justice
Washington, D.C.

Dear Mr. Attorney General:

Attached hereto is a completed form DJ-118, a request for access to official records under 5 U.S.C. 552(a) and 28 CFR Part 16.

The records sought are an FBI file with respect to Sirhan B. Sirhan.

If it were not for the fact that the file in question had been made available to writer Robert Blair Kaiser, and had not Mr. Kaiser made this fact known in his new book, RFK Must Die, (please see Attachment), you might be inclined to answer that the records in question were within an exemption in 5 U.S.C. 552. However, as they have been made available to a commercial writer and are the basis, at least in part, for his published book, we can see no reason why they should not be made equally available to our Committee, as 5 U.S.C. 552 require equality of treatment in access to records.

Therefore, we hope that the records can be made available without serious delay.

Most respectfully yours,

Bernard Fensterwald, Jr.
Executive Director

EXHIBIT B

COMMITTEE TO INVESTIGATE
ASSASSINATIONS
927 15th Street, N. W.
Washington, D.C. 20005
(202) 347-3837

December 8, 1970

Attorney General John Mitchell
Department of Justice
Washington, D.C.

Dear Mr. Attorney General:

Enclosed is a copy of a letter to you dated October 19, 1970, with respect to access to records under 5 U.S.C. S552(a); accompanied by a completed form DJ-118.

We have received no acknowledgment or reply from the Department of Justice in the intervening six weeks. Are we to assume that access will not be made available?

Although access to the records is urgently needed in order to prepare for a public hearing, we will delay legal action under the FOI Act a few days in hopes of receiving an affirmative reply from the Department.

Most respectfully yours,

Bernard Fensterwald, Jr.
Executive Director

EXHIBIT C

OFFICE OF THE DEPUTY ATTORNEY GENERAL
WASHINGTON, D.C. 20530

December 7, 1970

Mr. Bernard Fensterwald, Jr.
Executive Director
Committee to Investigate Assassinations
925 15th Street, N.W.
Washington, D.C. 20005

Dear Mr. Fensterwald:

Reference is made to your letter of October 19, 1970 with attachments requesting access to the files of the Federal Bureau of Investigation in the matter of Sirhan B. Sirhan.

I am unable to comply with your request for the

reason that such files are not subject to disclosure under the provisions of 5 U.S.C. 552 (4) (b) (7).

Your check dated October 19, 1970 and drawn on the Riggs National Bank is returned herewith.

Sincerely,

RICHARD G. KLEINDIENST
Deputy Attorney General

EXHIBIT D

"R.F.K. Must Die!"

A History of
the Robert Kennedy Assassination
and Its Aftermath
by
Robert Blair Kaiser

E. P. Dutton & Co., Inc., New York, 1970

Preface

When yet another assassin's bullet took the life of yet another Kennedy, the whole world demanded to know who did it and why. They soon discovered who. It was a young Palestinian Arab refugee with a strange double name: Sirhan Sirhan. But the story of why he killed — which he propounded at the trial — didn't make any sense.

This is a book that tries to make sense of it. It is a book about the assassin and about those who probed him: police, prosecutors, defense attorneys, psychiatrists, psychologists, reporters.

I was one of those reporters. Out of curiosity, mainly, and out of a suspicion that the public would learn something less than the whole truth if it had to rely on either the assassin's unchallenged version or even the police estimate, I wangled my way inside the case.

Once I was inside, I was really in. I was able to talk to Sirhan's family and some of his friends, to sit in on the defense attorneys' conferences with Sirhan, to become a participant-observer in the attorneys' own private working sessions, confer closely with the psychologists and psychiatrists in the case. I had access to police and FBI files, and, most important of all, I was able to visit Sirhan in his cell two or three times a week until he left Los Angeles for San Quentin, condemned to die.

I doubt whether any reporter has ever gotten so deeply inside a major murder case.

Why was I given such entrée? I hesitate to say the answer was simply money. I did promise to provide funds for Sirhan's legal defense, and I probably would have gotten nowhere without such a promise — and delivery. Sirhan wanted a good private attorney and I made it possible for him to hire one. It wasn't that Attorney Grant Cooper demanded a big fee, or any fee at all. In fact, Cooper renounced any proceeds from my writings on the case in favor of the University of Southern California Law School. Still, he needed some resources: the district attorney's office spent $203,656 to prosecute Sirhan. Simple fairness would dictate that Sirhan's attorneys should have a fraction of that for their expenses (otherwise, the expression "fair trial" would have been a sham). And simple common sense told me that there was only one sure source for those expenses, the world press. The world wanted to know, the news media would pay. They did, in a modest way. By the end of the case, I was able to turn some $32,000, approximately half of what I had then received, over to Sirhan's attorneys.

But I provided more than money. I gave myself. The defense attorneys received most of the Los Angeles Police Department files and all of the FBI reports on the case through a legal "motion for discovery." But neither they nor their investigator had time to read and digest all this material. I did. They didn't have the time or the patience to draw out the assassin. I did. Soon, the attorneys began to need me, for, in my total curiosity, I soon knew more about the case than they did themselves. My reporter's dream was complete when Dr. Bernard L. Diamond, the chief psychiatrist for the defense, turned to me as the chief repository of knowledge about the case and began taking me into Sirhan's cell with him for his analysis of Sirhan under hypnosis.

I am not at all sure that every case would lend itself to such heightened personal involvement by a reporter who is trying to write about it. In this case, however, I got access to the assassin, without giving up the right to tell the story as I saw it.

(page 321)

. . . did anybody pay you to shoot Kennedy?

While the lawyers settled down to the weary task of picking twelve jurors and six alternates, I continued to read the Federal Bureau of Investigation's Office File 56-156, Bureau File No. 62-587. It was impressively heavy, comprising at least 4,000 pages of reports from special agents all over the United States who looked into the case of Sirhan Bishara Sirhan "upon request of the Attorney General of the United States under the Civil Rights Act of 1968 and the Voting Rights Act of 1965."

And it was well written. The report of the assassination itself by Amadee O. Richards, Jr., of the Los Angeles office was a model of telegraphic clarity.

> At approximately 12:15 A.M., 6/5/68, Senator ROBERT F. KENNEDY proclaimed victory in California primary election in crowded Embassy Room, Ambassador Hotel, 3400 Wilshire Boulevard, Los Angeles. As SENATOR KENNEDY and party were leaving Embassy Room through kitchen exit, a series of shots were fired by an unknown individual, subsequently identified as SIRHAN BISHARA SIRHAN. SENATOR KENNEDY fell backward onto floor, critically wounded with bullet in brain. SIRHAN wrestled to floor, disarmed and turned over to Los Angeles, California police department (LAPD).

The reports gave me a chance to verify many of the associations Sirhan had already told me about. Here were summaries of FBI interviews with persons who had known Sirhan in school and with some of those who had known him at the ranch in Norco-Corona. Strangely, the FBI couldn't seem to find Frank Donnarauma, the man who had hired Sirhan at Corona, who also had an alias. Henry Donald Ramis-

(Please turn to page 37)

The Golden Trumpet

COMPUTERIZED JUNK MAIL

Congressman Cornelius E. Gallagher
Member of Congress
Democrat, New Jersey
House Office Bldg.
Washington, D.C. 20515

On February 18, I reintroduced my pioneering junk mail bill. The indiscriminate bartering of names between computers engenders confusion. A letter recently received by the head of the San Francisco Suicide Prevention Service read in part:

> "Dear Mr. Suicide: ...a subscription is one of the best ways to benefit the personal financial growth of the Suicide family."

The bill has four main provisions:

1. Register mailing list brokers;
2. Allow the individual to avoid receiving any unsolicited mass mailing, or solely those relating to charitable, nonprofit purposes;
3. Allow the individual to remove his name from specific lists;
4. Require every piece of unsolicited mail to contain identifying information clearly specifying where the sender obtained the name of the recipient.

My bill will provide an answer to two questions which are now merely powerless cries of rage: "How did they get my name?" and "How can I get off that list?"

By showing the citizen that the Age of Aquarius is really the Age of Aquariums, where his life is constantly under the surveillance of computer owners, we will broaden the constituency for privacy.

I myself have received dozens of letters asking for my financial support for Republican candidates.

Perhaps the worst example of the unraveling of "tailor-made junk mail" occurred when Senator Frank Moss, the leader of the anti-cigarette forces in the U.S. Senate, received several complimentary letters and urgent appeals from the American Tobacco Institute.

Every repository of personal information in the Nation is probed for little personal touches to decorate machine-produced letters. The citizens' bill-paying habits, reading preferences, car ownership, Census returns, and every other detail of his private life is turned into a sophisticated and profitable profile.

The direct mail industry may itself become a "Suicide family" without some control. My bill will make a citizen feel more like a person and less like a manipulated, powerless cipher in a computer.

COMPUTER: A HIGHLY SKILLED IDIOT AND NOT A THINKER

I. John L. Anderson
25589 West Hedgewood
Westlake, Ohio 44145

To: Edmund C. Berkeley, Editor

I believe your views on "thinking" by computers contribute to the public misunderstanding of science and technology. The stage is set when the press commonly blames a computer for mishandling ticket reservations or billing — things that are quite likely to have been caused by operator or programmer mistakes. Then follow-up letters written about the mistakes are sometimes mishandled too and this is also recorded in the press. The implication is that a person is wronged and then his appeal is neglected — all by a computer.

Then, in your reply to Parker's letter (C & A, Oct., 1970) you credit the present day computers with "thinking" and making many decisions more wisely than man. (However, your explanation of thinking has the slight flavor of being tailored to fit the computer capability.)

It is not good for the public to infer that the computer is a thinking machine that is willfully unresponsive to human needs. And I believe your stance contributes to that inference.

I think I agree with you that "thinking" is not scientific language. But "thinking" is public language. And it is a most powerful concept — thinking and wisdom set man as a species (Homo sapiens) apart from all else. Regardless of how much you qualify your definition of thinking the public will not be so discriminating. One must be just as cautious about the misuse and misunderstanding of a powerful concept as of a powerful instrument.

You say that if the present behavior of a computer occurred in a human being, he would be classified a wise man and a prodigy. Not so. He would be classified an idiot savant. From the French, meaning literally, skilled idiot, an idiot savant is a person that is in general mentally defective but that displays unusual aptitude or brilliance in some special field.

II. From the Editor

This letter from Mr. Anderson is, I think, a powerful and well reasoned argument. But it rests on a shaky premise. We cannot on grounds of what is "good" depart from what is true.

Take the sentence: "It is not good for the public to infer that the .... is a .... machine that is willfully unresponsive to human needs."

Mr. Anderson inserts in the first space "computer" and in the second space "thinking".

But I could assert that same sentence with other fill-ins:

A. It is not good for the public to infer that City Hall is a political machine that is willfully unresponsive to human needs.

B. It is not good for the public to infer that the Pentagon is a military machine that is willfully unresponsive to human needs.

C. It is not good for the public to infer that the Establishment is a ruling machine that is willfully unresponsive to human needs.

The facts are these: a great many of the creations of man, including societies, institutions, cities, computer systems, and more besides, often produce the appearance of being willfully unresponsive to human needs -- and cause human beings to rack their brains about how to make better systems that are more responsive.

It seems to me we have a better chance to accomplish greater responsiveness by applying "thinking"

produced by computers than we have without computers. And in any case we have no choice: computers are so useful that they are here to stay, as a permanent part of the environment of civilized man.

ADDRESS LISTS BY COMPUTER

Michael Manson
Marketing Manager
Book Development Council and University Mailing Service, Ltd.
London, England

(Based on a report in "The Financial Times", 10 Cannon St., London EC 4, England, January 26, 1971

The basic ingredient of direct mail as an advertising medium is a list of addresses. This list has to be found from somewhere, kept in some form, updated from time to time and processed so that an object may be sent through the mail to each of the addressees on the list.

Traditionally, lists are gleaned from trade and other specialist directories, subscriber lists, membership lists and customer lists. In some cases a collection of directories is the most satisfactory way of holding the addresses, to be typed out each time the list is needed. Addresses may also be kept on index cards, or on mechanically operated plates. In the case of a user having many lists at his disposal perhaps he has access to an index which covers all the separate lists.

Clearly, then, the computer's traditional advantages of storage, speed and selectivity can at a glance be put to effective use in the direct mail industry -- effective from the point of view of convenience, cost, and, in the case of sophisticated systems, sheer capability.

Many direct mail advertisers and professional list-building agencies now hold their address lists on computers because they see advantages over other systems in storage and speed of retrieval. No manual or mechanical system can match a computer for compact storage. The list is now a few tapes or discs rather than banks of plates which take up space, collect dust and eventually deteriorate in quality. No other system can find and print out addresses as quickly as a computer. And when it comes to updating the list, parts of computer records may be changed without scrapping that record and starting again.

Two Questions

Given that storage and speed are one's main requirements from the computer, there are only two questions to answer before computerising any mailing list: is the list big enough and will it be used often enough to warrant the expense? But ease of storage and speed of access are not at the centre of the problem. Many fewer computer applications in the direct mail industry take advantage of the machine's infinitely flexible powers of selection, given only the limitations of human inventiveness.

One such application is that operated by Book Development Council and University Mailing Services (BDCUMS) for the book publishing industry. Since direct mail advertising is increasingly found to be the most effective way of advertising academic and educational books, and since many of the problems facing academic book publishers are paralleled by those of other industries, it would seem valuable to describe in some detail the BDCUMS operation and the nature of the industry which created it.

The British book publishing industry produces some 30,000 new books each year (about the same number again are published in the U.S., and not far short of that number in West Germany). Of these titles perhaps 50 per cent have, to some degree, a market in higher education. The life of a book is comparatively short. The market for each book is comparatively limited. The unit price of a book is comparatively low and thus postage costs form a large proportion of each title's publicity budget.

Publisher's Needs

All these factors contribute to a situation which does not allow a great deal of money to be spent advertising a single product, and so a publisher of academic books must have at his disposal particularly accurate advertising media. Bearing in mind too that he may publish 100 books on different subjects in a year, that scholarship is becoming increasingly specialized and that more courses are becoming interdisciplinary, it is easy to see that the potential market for a title is becoming increasingly difficult to locate.

To meet these needs BDCUMS has on a computer a list of some 300,000 names and addresses of university staff in the U.K., Western Europe, the Commonwealth, Asia and the Middle East. Each year they are all sent a grid of some 1,200 academic subjects and a questionnaire asking them to identify from the grid their precise teaching, research and "other" academic interests, to a maximum of 12 subjects. Replies are added to the file and the list is kept up to date. To give some impression of the density of information available, it is enough to note that 80 per cent of 65,000 academic staff in the U.K. have now completed a BDCUMS questionnaire, 75 per cent of 36,000 university staff in West Germany have also replied, and that the pattern of high response rates is repeated in most other countries.

Advertisers then select, from the same grid of 1,200 subjects, those which correspond to their potential market for a given product. Any combination of territories, subjects and academic levels together create a unique list for that mailing shot with all duplication of subject interest suppressed by the computer -- clearly a consumer may have identified more than one of the subjects selected by the advertiser. At present 75m. different selections may be made from the file of 300,000 addresses.

To achieve this degree of selectivity special programs had to be written and all the addresses are stored on random access disks to keep selection time to a minimum. As addresses are selected they are transferred to tape and finally printed out at a rate of 1,200 lines per minute. While the accessing of addresses is in progress, the core of an IBM 360/50 is used to capacity.

In addition to producing address lists, the computer also prints out the annual questionnaires, provides advertisers with a count for each subject (incidentally putting in their hands an invaluable market research tool) and enables a large and highly trained research staff to keep pace with the mammoth task of updating the file. The whole process is costly, but is worth it from the publisher's point

of view. The more accurate the mailing shot, the less he has to spend on print, materials, labour, and postage. And since a central list of university staff exists, the publisher has no need to maintain his own list. Perhaps the most important factor of all concerns the recipients: since the system is geared in some detail to their needs and since they are involved in that they fill in questionnaires, they now accept the publishers' direct mail advertising through BDCUMS as a service to them.

Master File

How can such a system develop in the future? Plans are being drawn up for new cooperative ways of keeping advertisers' postage costs to the minimum, involving the computer printing-out code figures denoting which combinations of leaflets should be put in which envelope. An agency agreement with an American firm enables BDCUMS to airmail magnetic tapes across the Atlantic and process mailing lists for customers in the U.S. and, one day, if the volume of business warranted, a data link could be established between the two offices. It is hoped that offices will also be set up in other countries outside the U.K. to research and update the address list for that country and housing it on the master file in London.

Finally, a feasibility study is now in progress to determine the viability of a service which would match a computerised list of new products, that is, academic books coded by subject interest and academic level, against a subscriber list of university staff similarly coded. As always, if the demand is there, the computer can cope.

HURRAY FOR THE COMPUTERIZED LETTER!

(literal copy of a letter received by Berkeley Enterprises, Inc., publisher of "Computers and Automation," on March 6, 1971)

Mr. Berkeley Enter Inc
815 Washington St.
Newtonville, Massachusetts 02160

Dear Mr. Inc:

Here's how to help yourself move ahead ... either with your present company ... or in any executive opportunity that may come along for Berkeley Enter Inc.

> Accept with our compliments the famous NATION'S BUSINESS "seminar in print" ... THE THREE STEPS TO MORE SKILFULL MANAGEMENT. This trio of manuals is like a basic "mini-course" in the most successful management techniques being used today.
>
> .....

Cordially,

(signed by a machine in blue ink) Philip S. Sweeney
Director of Circulation

P.S. There are no strings attached to this special offer, Mr. Inc. You can cancel at any time with full refund of your unused subscription (or cancel your invoice) ... but the three book set is yours to keep regardless of your decision on the magazine.

From the Editor of "Computers and Automation:"

We sympathize with the programmer of this computerized letter. It is a rough life ... and is going to get rougher as people and companies help themselves "move ahead."

THE GOLDEN TRUMPET

This department of Computers and Automation is devoted to providing a "golden trumpet" for any computer people (and probably some other people) who wish to argue and perhaps shout their views — and who thus collide with other people's opposing views. In this way we can give a voice to some parts of public opinion. However, name-calling and other logically fallacious arguments will be drastically edited or cut before publication.

Most discussions here will be on topics related to computers and society.

For more information about "golden trumpets", see the parable "The Golden Trumpets of Yap Yap" by Mike Quin, reprinted in "Computers and Automation", February 1971, on page 42.

NCTIA — *Continued from page 34*

tella. (The FBI didn't find him until April 6, 1969.) But all these persons seemed to have been processed in an automatic way with no real guiding intelligence behind the perfunctory series of questions they were asked.

The reports then, added up to very little, except where they disclosed the identity of certain persons associated with Sirhan whom he had concealed from McCowan and me. But there was no indication in the reports that any of these persons had less than the greatest love for Robert Kennedy.

What the robots seemed to do best was compile all the numbers that various bureaucrats had conferred upon Sirhan in his short and mostly anonymous life. His passport number: 142 026. His visa number: 1669, issued under Public Law 203-4 (A)1(14). His alien registration number: A10711 881. His unit number in the California Cadet Corps: 138 Battallion, B Company. His Social Security number: 569-30-3104. His number at the State Racing Board: 1-031944. His California driver's license: M-238867. His booking number at the Los Angeles Police Department: 495 139. His booking number at the Los Angeles County Jail: 718 486. And, of course, the serial number of his Iver-Johnson revolver: 53725.

EDITING BY THE STAFF OF "COMPUTERS AND AUTOMATION" - A BOUQUET

James F. Muench
House on the Moors
Gloucester, Mass. 01930

In view of some of the comments on my article that my friends have made (while recognizing the greater importance of reaching those who are not friends), let me amplify on my gratitude to Computers and Automation.

Apparently, meeting your stylistic and logical objections through the many re-writes of the article prior to publication made it possible to state the nature of what I think the computer/community interface to be in a way I never could do before.

I thought I'd been saying these things all along and had been baffled at the density of those with whom I spoke at not seeing reality as I saw it. Thanks to what you've done, and forced me to do, I come to the humiliating point of view: it was me! not the world. This may be a healthy point of departure for further efforts.

Yesterday I received a note from OEO saying the article will be circulated to "appropriate officials in OEO". This could be quite exciting for the computer industry if non-computer people in the new markets start thinking of new uses for the equipment and supporting services . . . and if non-computer people start thinking they're not so ignorant after all and have something to say about design matters too.

In my response to OEO, I'll acknowledge my debt to the editing and will make a point of doing that henceforth.

PUBLISH YOUR ANNUAL INDEX IN DECEMBER

Geraldine Gieger
Esso Research and Engineering Co.
Baytown Research Laboratory
Baytown, Tex. 77520

Please consider publishing the annual index to Computers and Automation in the December issue of the year covered or as a separate item. This is the publication procedure followed by most journals, and it is convenient for the user.

We have subscribed to this journal for a number of years, and the index has been printed and paged in the January issue. Quite often the last page of the index has January material printed on the back of the page.

An index published in this manner is inconvenient for binding at the end of the volume and year covered.

From the Editor

We appreciate your remarks about publishing the index of "Computers and Automation" in the December issue of each year. However, it is impossible timing-wise to include the index in the December issue. The only way we could do this is to index the issues without December of the current year and putting in December of the prior year, and this does not seem desirable.

We do publish the index in the January issue each year in such a way that it can be taken out bodily from the January issue and included in the bound annual volume of the preceding year. When the number of pages of the Index is not a multiple of four, we place on the blank pages information that is bound to get out of date rapidly and that will not be referred to in the future, such as advertising and the calendar of events.

UNDERSTANDING, AND MODELS FOR ACCOMPLISHING UNDERSTANDING

Stuart H. Sanfield
Sperry Rand, Univac Division
P.O. Box 500
Blue Bell, Pa. 19422

I read and have re-read your February editorial: "Not Understanding A Computer", with joy!

Your coupling of understanding with the knowledge and use of models seems to form a basis for a model in which college, industry, and the professional are linked together into a closed loop. Specifically:

* Is it not the purpose of a college education to provide the graduate with a set of models which are applicable to his field of endeavor and with some basic instruction and practice in their use?

* Is it not the responsibility of the company to teach the newly hired, college graduate how to adapt and use the models in the particular company environment?

* Is it not the responsibility of the practicing professional to report via the literature about the effectiveness of the models and the modifications necessarily made to them to accommodate the changes in the technology?

Since the literature is used in the educational process, the link is closed, full circle.

In this context, models provide two important features.

First, they provide a basis for communicating ideas. Otherwise, as is commonly found with the programming environment, one uses the pragmatic realization of the ideas as the basis.

Secondly, models provide a mechánism for evolving the underlying conceptual tools of the profession.

Some of the conclusions which could be drawn from the above are:

1. Graduates are recruited from those schools which teach the "most relevant" models.

2. Graduates are sought from different schools in order to be able to obtain a "mix" of models, i.e., cross pollenization of ideas.

3. Continuing professional development has as its goal the teaching of new models and their uses.

4. A measure of the potential of a professional is the magnitude of the set of models with which he is familiar and has in his "bag of tools."

It should be noted that the use of models tends to be a personal idiosyncrasy and any argument. Opponents of the use of models oftentimes point to them as simple approximations of a complex situation, and thus, why be bothered. Proponents say that they provide some reference point and that any reference point is better than none. For example, a budget can be viewed as a model of cash flow, yet it is surprising how many people either in their personal financial affairs or business activities, or both, do not use budgets.

It would be of interest to learn of the models currently being used within the programming discipline for such things as: (1) describing a computer program; (2) language processors; (3) data management systems; (4) information management system; and (5) operating system. Possibly your magazine could undertake such an assignment.

RELEASE BY HOSPITALS OF MEDICAL DATA ON PATIENTS

Prof. C. C. Gotlieb
Dept. of Computer Science
McLennan Laboratories
University of Toronto
Toronto, Ontario, Canada

The circumstances, if any, under which it would be justifiable for a doctor or a hospital to withhold information regarding a patient from him are certainly difficult to determine. I have discussed this with someone (not a doctor) who is chairman of a government committee (in Ontario) which is examining the security of health records, and I am inclined to agree with his position that there are such circumstances. For example, certain data may be tentative or highly inconclusive and it may be felt that only a technically qualified person could put the right interpretation on it. Another possibility is that the doctor (or hospital) is of the opinion that there are psychiatric issues which would result in an increased hazard to the person if he was aware that certain possibilities were present.

I myself would feel that only in rare circumstances should information be withheld, but I suspect that hospitals will be slow to change their policy of releasing records only to physicians. This is one of the many issues relating to personal records where the rules are still being evolved.

UNIVERSITY OF ILLINOIS INSTALLS CDC 6400 FOR DEVELOPMENT OF COMPUTERIZED EDUCATION

Edward G. Bohanon
Public Relations Dept.
Control Data Corporation
8100 34th Ave.
Minneapolis, Minn. 55420

Control Data Corporation has delivered a Control Data 6400 super-scale computer system to the University of Illinois Computer-Based Education Research Laboratory (CERL) for research and development in the use of high-speed computers as teaching and learning tools.

The $2.6 million CDC 6400 is to be used to continue development of PLATO (Programmed Logic for Automatic Teaching Operations), which designates the Computer-Based Education (CBE) system as well as the overall program at the University of Illinois. Computer-assisted instruction (CAI) retrieval terminals, located in classrooms, connect directly to the central CDC 6400 for lesson material presentation and information feedback.

Since 1959 the PLATO program has been committed to exploring educational possibilities and engineering and economic problems associated with the introduction of modern high-speed computers to the educational process, according to University officials.

In the last decade numerous groups at other universities, research centers and corporations have engaged in studies to utilize computer techniques for instruction, believing that the computer could resolve the conflict between the demand for mass education over a large period of the human life span and the demand for more individualized instruction. The nation spends $50 billion annually on education, and by 1980 the expenditure is estimated to be $150 billion annually.

PLATO proceeds on the premise that existing technology, while valuable for research, has made no significant economical or practical contribution to the nation's educational program. Among approximately 75 projects under way, PLATO is one of very few which have included research and development programs in all aspects of systems design for hardware and software innovations and teaching strategy.

PLATO was developed in two phases, phase 1 investigating the role of the computer in the instructional process, phase 2 designing economic educational systems incorporating the most valuable teaching and learning applications developed in phase 1. PLATO I and PLATO II systems were designed and built at CERL about 10 years ago, and defined a broad set of educational objectives. PLATO III utilizing a CDC 1604 computer system, was installed in 1964 to carry out these objectives, and a network of four associated off-campus demonstration centers was added in 1969. In October, 1970, PLATO IV was initiated, utilizing the CDC 6400 super-scale computer system.

Several key features of the 6400-PLATO system capture the enthusiasm of teachers and students alike, and provide a base for determining the effectiveness of lesson material, teaching strategy and methods of presentations.

The interactive nature of instructional media holds the interest and totally involves students of all ages and grade levels. The student proceeds at his own pace and has a wide choice of alternatives in teaching strategy and method of presentation. Information feedback allows students to ask various questions and provides teachers with detailed descriptions of student progress, which constitute a powerful tool for lesson evaluation and modification. Teachers can prepare, edit or modify lesson material at any student console at any location while other student consoles are in use. Lessons prepared elsewhere may be modified at any participating site, to fit the particular needs of a specific class in college or school.

The 6400 system will serve approximately 1,000 terminals, and when expanded to its full configuration, is designed to handle 4,000 terminals.

CALENDAR OF COMING EVENTS

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. 1-2, 1971: Virginia Computer Users' Conference, Virginia Polytechnic Institute and State Univ., Blacksburg, Va. / contact: Prof. Bruce Klein or Joe Collins, Computer Science Dept., VPI & SU, Blacksburg, Va. 24061

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

April 17, 1971: ACM Allegheny Region Symposium, "Interface 71", University Park, Pa. / contact: Theodore Rotwitt, Pennsylvania State Univ., 315 McAllister Bldg., University Park, Pa. 16802

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 5-6, 1971: 16th Annual Data Processing Conference of Univ. of Alabama Graduate School of Business and Division of Continuing Education, Parliament House Motor Hotel, 420 South 20th St., Birmingham, Ala. / contact: C. E. Adams, Director of Conference Activities, Box 2987, University, Ala. 35486

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: Annual Regulatory Information Systems Conference of the Missouri Public Service Commission, Chase-Park Plaza Hotel, St. Louis, Mo. / contact: Sam L. Manley, Secretary, Missouri Public Service Commission, Jefferson City, Mo. 65101

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 21-22, 1971: Communications Systems Management Association First National Meeting, New York City, N.Y. / contact: CSMA Convention, P.O. Box 2805, Wilmington, Del. 19805

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 1-4, 1971: Seventh Annual Data Processing and Automation Conference, National Rural Electric Cooperative Association, The Riviera Hotel, Atlanta, Ga. / contact: C. E. Aultz, NRECA, 2000 Florida Ave., N.W., Washington, D.C. 20009

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

June 21-22, 1971: Ninth Annual Conference of the Special Interest Group on Computer Personnel Research of the Association for Computing Machinery, Center for Continuing Education, Univ. of Chicago, Ill. / contact: Fred A. Gluckson, EDP Systems Dept., National Bank of Detroit, Detroit, Mich. 48232

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

C.a PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 714: THE NUMBERS GAME

"I've been experimenting a bit with some random number generating algorithms", said Pete, "and I've been getting some rather curious results".

"Yes?" said Joe. "What in particular?"

"I tried a very simple version of the mid-square method – you know, where you start with a certain number, square it, take some digits out of the middle, square those, and so on."

"Yes, but that's not a very good method of generating random numbers. It's too easy to get into a loop."

"I'll say! Even starting with a four-digit number, and taking the two middle digits each time, I expected better results."

"Better than what?" Joe asked.

"Well, I got into a loop after the second operation. I expected this to last a little longer, but I found out after a little study that I had made a poor choice for the starting value."

"If you had started with 2500 you would have kept getting 50 indefinitely."

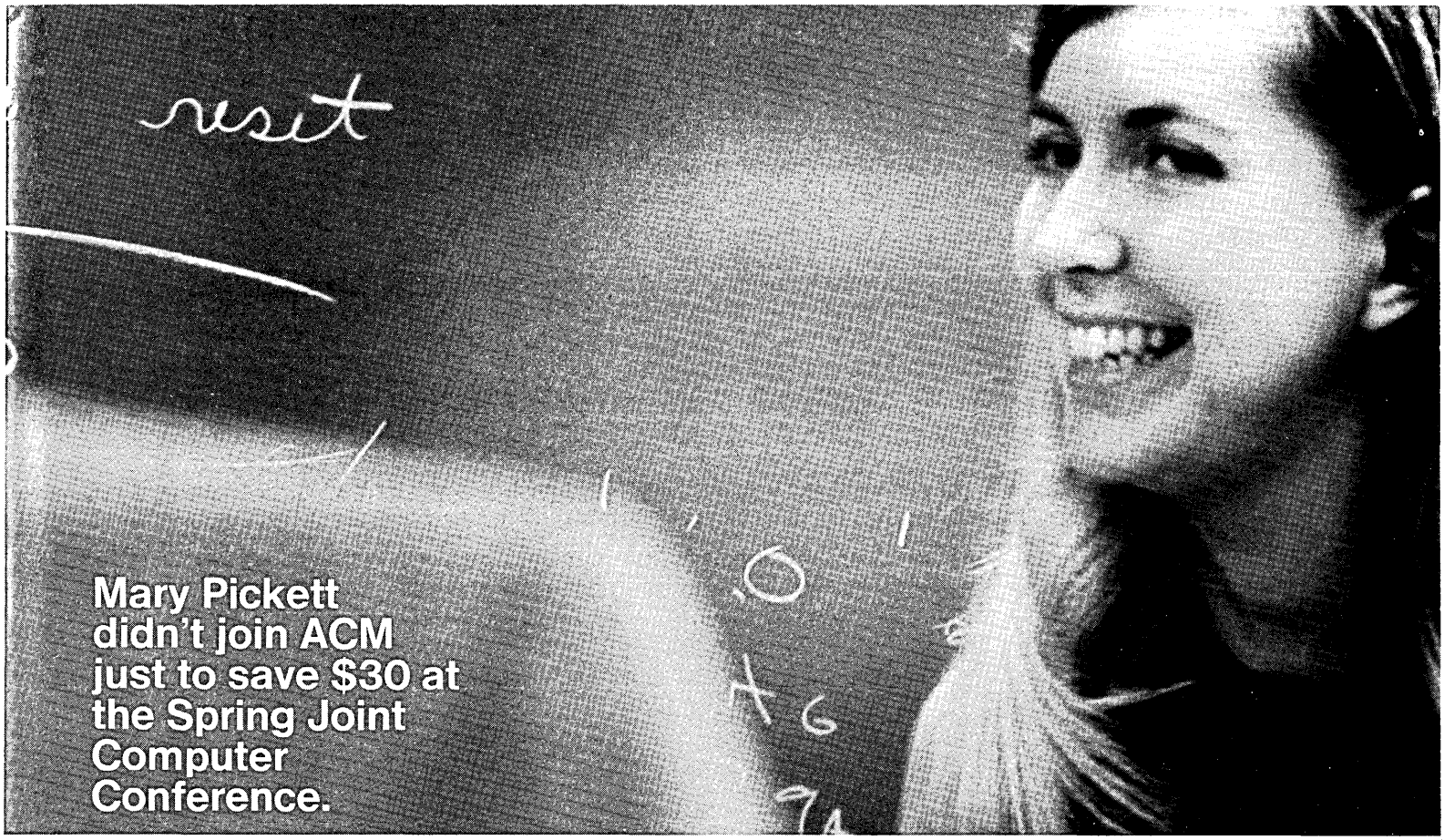
"Mine wasn't quite so simple", said Pete. "I got one value for the first square, then the original value for the next, and so on, so that I got a stream with those two values alternating."

What was the number Pete started with?

Solution to Problem 713: A Family Problem

If we are dealing with numbers from 1 to $2^n - 1$ inclusive, the value in position k will be $(k + 2^n - 2^r) / 2^{r+1}$, where r is the number of final zeros in k.

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.



But it helped.

Mary Pickett is an associate systems programmer with RCA Computer Systems in Cinnaminson, New Jersey. Not too far from Atlantic City, site of this year's Spring Joint Computer Conference. She joined ACM in 1969, while a student at Purdue. With RCA since last August, she's getting involved in our Delaware Valley Chapter and recently switched from student to regular membership.

She's looking forward to the Spring Joint. "It's a chance to attend good lectures, see the exhibits and renew a lot of friendships," says Mary. "And my ACM membership helps. I save $30 on admission, more than enough to cover my annual dues."

ACM membership is a lot more than conference discounts. It's technical publications, lectures, seminars and special interest groups. A chance to get involved. And the professional pride of belonging to the oldest and most respected association in the computer field.

If you're going to the Spring Joint and don't belong to ACM, join now and save $30 at Atlantic City. Send in the coupon today!

Association for Computing Machinery
1133 Avenue of the Americas
New York, New York 10036

I would like to consider joining ACM.
Please send more information.

Name _____

Position _____

Address _____

City _____ State _____ Zip _____

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ACROSS THE EDITOR'S DESK

APPLICATIONS

HAZARDS OF PROLONGED DRIVING REVEALED IN COMPUTER STUDY

A computerized study, recently concluded at Pennsylvania State University, suggests that something worse than slower physical reaction occurs when driver fatigue sets in. The study, conducted at Penn State University's transportation and traffic safety center (University Park, Pa.), tested the driver reaction time of volunteers during a two-year program which was financed by the university and the state's transportation and traffic safety center. According to Penn State's Dr. Richard Olsen, the results do not agree with popularly held opinions about the effects of prolonged periods behind the wheel.

There was no appreciable reduction in a subject's physical ability to respond to external factors after being behind the wheel continuously for up to nine hours. The reaction time throughout individual testing periods remained virtually unchanged. However, periodically, subjects entirely failed to respond to changing road conditions. Dr. Olsen said, "We concluded that the monotony of driving for a long period of time sometimes lulls people into something similar to a momentary hypnotic trance. Had this been a real situation, a driver might not have responded to an auto stopping in front of him, and an accident would have occurred."

To simulate driving conditions, the entire front half of an automobile was installed in the laboratory and linked to electronic monitoring devices. Lights flashed randomly on a semi-circular screen before the driver. Upon seeing the light, the driver was required to acknowledge its presence by depressing the accelerator pedal. The system continuously tested the driver's ability to respond, and recorded the events. A loud-speaker atop the laboratory auto simulated the constant noises of driving encountered on the road and the driver was required to "steer" — continuously keeping pace with a moving symbol.

Reaction time for all subjects was recorded and combined with the steering data and the heart rate which was measured by a device linked to the driver. This recorded data was then combined with the recorded time behind the wheel and processed on an IBM System/360 Model 67. The IBM computer produced charts and graphs showing average response times as well as noteworthy deviations and statistics. Although the results revealed unsuspected information on the side effects of driver fatigue, they did not dispel the potential hazards of driving without breaks or periods of rest.

PSYCHIATRISTS USE COMPUTER TO HELP DIAGNOSE MENTAL ILLNESSES

A new degree of accuracy in pinpointing mental illnesses, predicting how long patients will stay in hospitals and foreseeing behavior patterns, is being achieved by Missouri psychiatrists with the aid of an IBM System/360 Model 50 computer. The Missouri Division of Mental Health and the University of Missouri's Institute of Psychiatry (St. Louis, Mo.) administer the diagnostic program, one of a few of its kind in the world.

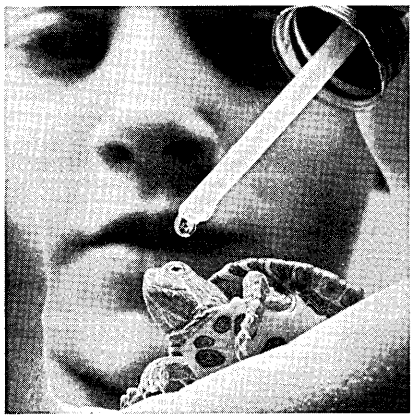
Physicians at five state hospitals interview patients and transmit preliminary figures via computer terminals to the Institute's computer. The Model 50 computer compares this with a vast file of psychiatric data and reports back: (1) three afflictions in the most probable order; (2) likelihood the individual will remain a patient more or less than 90 days; and (3) possible tendencies to commit suicide or assault or to run away.

The on-going program has compiled more than 100,000 case histories on which computer diagnosis relies. Dr. Ivan W. Sletten, chief of Clinical Services of the Institute said that the histories were collected through the Missouri Standard System of Psychiatry which, in 1966, introduced the necessary standard terms, forms and check lists. Now, when a physician submits preliminary findings, and his own diagnosis, he, in effect, gains access to the IBM system's extensive, standardized file of demographic, mental, behavioral and historical information--something he never could accumulate in his own mind.

The system recommends its diagnosis from eight illnesses — ranging from neurosis to schizophrenia — which affect 95% of mental patients. The program correctly suggests the possibility of long-term treatment 75% of the time. "Significantly, it has proven quite accurate in suggesting critical behavioral tendencies," Dr. Sletten said. "These factors are instrumental in the continuous process of observation, diagnosis, care and treatment."

PET SUPPLY FIRM USES COMPUTER TO MAINTAIN ITS INVENTORY

Hungry guppies, unwashed parakeets and turtles with eye irritations now have a computer looking out for their best interests. An IBM System/3 Model 10 is helping Peterson Pet Supply of Miami Springs, Florida maintain its inventory of such diverse pet supplies as guppy food, parakeet bathtubs and turtle eyedrops. As wholesalers the firm



must maintain an adequate supply of thousands of pet supply items and be able to get them to pet stores in a minimum amount of time. Peterson Pet Supplies now inventory over 5,000 different items, from ant farms through educational records for myna birds.

Since the firm services over 1,400 pet supply stores all over the Southeastern United States, the Carribean, South and Central America and the Bahamas, one of the biggest jobs the computer does is invoicing. Within the next few months the company plans to put an automatic inventory system on the computer, which compares sales and inventory records to automatically schedule inventory purchases long before items come in too short supply.

SMITHSONIAN SIE KEEPS SCIENTISTS UP-TO-DATE ON RESEARCH IN PROGRESS

At the Science Information Exchange (SIE) part of the Smithsonian Institution, Washington, D.C., an IBM System 360/Model 40 computer is helping insure that unwarranted duplication of scientific research

projects doesn't happen very often. It's also helping manage a significant part of the $4 billion the U.S. spends each year on basic research. "Two scientists can work on the same general problem," says Dr. David F. Hersey, deputy director of the SIE, "since they may come up with equally viable solutions. But in today's fast-paced world, a scientist has to know what others are doing so that he doesn't waste countless hours and valuable research funds."

The SIE helps overcome this communications gap by operating the world's largest clearinghouse of information on research in progress. This includes about 90% of federally-funded, non-classified research, as well as thousands of projects funded by private sources. The information addresses the "who", "what", "where", and "how", of a study, along with the agency or other group sponsoring the work.

Basic information comes from scientists working on projects. Descriptions they supply are carefully examined by scientists and engineers on the staff of SIE, analyzed and indexed. Terse summaries, limited to 200 words, are then stored in the electronic files of the SIE's computer. Requests for information are processed by SIE staff members with the same kind of hand-crafting that goes into the indexing. These requests come from people deeply involved in research as well as from people with general interest in a subject.

The information in the SIE system is unique since it covers the life of a project from the time it is first funded or undertaken to the time when literature resulting from it begins to appear. (Almost all other scientific information services base their information on published material.) When a researcher informs the SIE that his work is completed, the project is removed from the computer's files; they still are accessible, however, generally on microfilm, and can be retrieved when needed. This historical file, which contains information not always available in published reports, provides a record of on-going projects going back 20 years.

The SIE, which was founded in 1948, was established by a group of federal agencies, to track the work they were doing in medical research. The system was expanded gradually from a manual filing system containing 5,000 records, to today's system which uses the IBM computer to store about 100,000 projects a year.

WOODS HOLE COMPUTER SHOWS FISH POPULATION DWINDLING IN FAMED FISHING GROUNDS

The famed fishing grounds of the Grand Banks, Georges Bank, and other Northwest Atlantic areas, face depletion of fish which have populated them for ages. The numbers of haddock, herring, cod and some other species of fish are dwindling in the waters off Labrador, Greenland, and Newfoundland, according to the National Marine Fisheries Service's Biological Laboratory in Woods Hole, Mass. (The National Marine Fisheries Service is part of the National Ocean and Atmospheric Administration of the U.S. Department of Commerce.

As part of its studies, the lab compiles complete statistics on fishing in the Northwest Atlantic area from Nova Scotia to Cape Hatteras, using a UNIVAC 9200 computer from Sperry Rand's Univac Division. Its reports cover about 100 species of fish, showing where they are caught, what type of equipment was used, and other information. In 1969, about 1,058,000 metric tons of fish were caught in the area, according to the computer's statistics. Final totals for 1970 are expected to be over 1,000,000 tons.

The "fishing computer" at Woods Hole receives its data chiefly from forms filled out by dealers, interviews taken by port agents after a fishing vessel comes home, and from survey cruises by the two research vessels operated in the area by the Fisheries Service. This information is coded and entered on punched cards into the UNIVAC 9200's memory. The computer then prepares reports on landings by gear, species, and areas, or on the special scientific surveys. This information is published in the U.S. Fisheries Statistics Bulletin at the end of the year, as well as in the bulletins of the International Commission for the Northwest Atlantic Fisheries. The statistics deal mainly with high seas species -- fish caught ten miles or more off the U. S. coast.

The Biological Laboratory provides the International Commission, established under the Northwest Atlantic Fisheries Treaty in 1950, with results of its computer-based research. The commission uses this data in deciding how to maintain the fish population at levels producing maximum yields.

The UNIVAC 9200 also is used for

The UNIVAC 9200 also is used for

some special assignments, like receiving data on all landings and receipts at the Fulton Fish Market in New York, and producing receipt reports by state and type of fish.

EDUCATION NEWS

SERVICE BUREAU FOR THE BLIND GETS UNDER WAY WITH ITS ARTS-1 PROGRAM

Blind people in the Greater Boston area (Mass.) will have new opportunities offered them this spring, when the Service Bureau for the Blind starts its ARTS-1 program. ARTS (for Audio Response Time-shared System) provides vocational and educational aid through the use of time-shared computerized sensors and electro-mechanical devices. It is estimated that of the total blind population, approximately half who are employable would find their situation greatly improved by their having adequate sensory aids. Through the ARTS-1 program, the Service Bureau will be able to train, and later service, visually handicapped clients so that they could work competively in numerous employment categories.

The ARTS-1 program (applying the results of a wide variety of previous research in sensory aids, reading machine systems, and computer-generated speech and Braille production) enables a blind person working or studying at his office, home, or school, to telephone the Service Bureau computer using standard telephone equipment, and then interact with the computer — for a fee of approximately one dollar per hour — by means of a specially designed terminal in the form of a standard typewriter keyboard, stenotype keyboard, or Braille keyboard. The terminal costs approximately the same as a standard electric typewriter.

The data is transmitted in the form of Touch-Tone telephone signals to the computer (which performs computations or other functions). The user then receives a voice response in the form of recorded speech units giving letters, digits, or appropriate words. In addition, the terminal can be fitted with a small component which will provide a Braille printout of data from the computer, as a permanent record.

The prototype ARTS system was designed and developed at the Research Laboratory of Electronics, Massachusetts Institute of Technology (Cambridge) by Dr. Kenneth R. Ingham, a research associate who is blind. The Service Bureau, however, (which will offer the service to the blind) will be independently organized and supported under the auspices of the Protestant Guild for the Blind, in cooperation with the Research Laboratory of Electronics, M.I.T. Dr. Ingham will be the first director of the Service Bureau.

COLLEGE OF WILLIAM AND MARY INCREASES STUDENT SERVICES, FOR REGIONAL NETWORK

The College of William and Mary recently reported a 52% increase in volume with a 70% reduction in the cost of data processing services to students. Figures are for 1970 in the colleges computer network for education and research in southeastern Virginia. During 1970, eight schools joined the network bringing to 15 the number of institutions sharing the IBM System/360 Model 50 at William and Mary's computer center. The number of students using the network regularly more than doubled — from 921 a year earlier to 1,944. The cost per student job dropped to 50 cents from $1.65. To accommodate 1970 expansion, William and Mary doubled the capacity of the Model 50's main memory and increased the capacity of auxiliary disk storage.

Eighty-two per cent of the student jobs processed in 1970 by the IBM system supported classroom courses in computer sciences. When processing was measured in time, instead of jobs, the computer's work was about equally divided between computer science courses and graduate student research projects (which require more computer processing time). Computer-assisted research in 1970 ranged from developing programs for composing music automatically, to investigating human behavior and predicting water flow in Chesapeake Bay and its tributaries. An IBM time-sharing program called APL (A Programming Language) permits its users to share the central computer from their typewriter-like terminals.

The regional network is sponsored by the State of Virginia to give small schools and research centers the use of a large computer they cannot justify individually. Dr. Raymond W. Southworth, director of William and Mary's computer center, says the college "...is bringing more computer power and flexibility into the classrooms than the network locations could provide for themselves."

KODAK COURSE WILL TRAIN TOP SYSTEMS ANALYSTS IN COM

A select group of top systems analysts from across the country are being invited to take a new course in advanced microfilm information technology. The seminar, offered by Eastman Kodak Company, will be held at the company's Marketing Education Center in Rochester, New York, in June 1971. The course participants will be taught the newest in microfilm retrieval concepts, film technology as it relates to the EDP environment, coding methods, and the practical application of computer output microfilming (COM). While only 12 systems analysts will be enrolled in the June session, additional programs are being planned.

RESEARCH FRONTIER

SUB-NANOSECOND SWITCHING WITH SILICON-ON-SAPPHIRE DIGITAL CIRCUITS

RCA recently announced development of silicon-on-sapphire digital circuits that switch in less than a nanosecond. The new silicon-gate silicon-on-sapphire CMOS inverters operate at bipolar rates yet dissipate only nanowatts of standby power. Nanosecond switching delays can be obtained from the CMOS/SOS circuits even when operated at bipolar voltage levels, so that the buffering normally required between high-voltage MOS and low-voltage bipolar circuits can be eliminated. Therefore, the high speed CMOS/SOS circuits can be directly interfaced with high-speed bipolar circuits and operated from a single power supply.

Dr. William M. Webster, Vice President of RCA Laboratories, in Princeton, N. J., stated that this latest development enhances even more the prospect that SOS circuits will have important roles in the logic and memory portions of tomorrow's high-speed computers. He credited this latest SOS breakthrough to the development in RCA's Digital Systems Research Laboratory of a polycrystalline silicon-gate technology for fabricating short channel-length CMOS/SOS transistors. The work has been supported by the Air Force Avionics Laboratory, Wright-Patterson Air Force Base, Ohio. A technical paper describing the new SOS development was presented February 17 at the IEEE International Solid State Circuits Conference (held in Philadelphia) by Edward J. Boleky.

MISCELLANEOUS

434 OUT OF 1,114 PASS FIRST REGISTERED BUSINESS PROGRAMMER EXAMS

A total of 434 out of 1,114 applicants passed the first Registered Business Programmer Examination (RBPE) held last October by the Data Processing Management Association (DPMA), Park Ridge, Ill. The exam was authorized and administered by the DPMA Certification Council, which also is responsible for the Association's Certificate in Data Processing (CDP) program.

Despite some typographical errors and editing problems with the new exam, the Council has determined that these did not impair the reliability of the exam as a measure of business programmer knowledge, according to Herbert B. Safford, Certification Council chairman. The top-scoring candidate answered 126 out of 143 questions correctly, indicating the exam was difficult enough to insure that scores were not biased to the high side of the scoring curve.

Of greater significance, the exam appeared to differentiate successfully between experience levels. Individuals with three or more years of experience received scores at or above the cut-off established by the Council. Fewer than a dozen candidates with less than two years' experience received scores above the cut-off level. A more extensive report can be made on completion of a comprehensive evaluation now being prepared, Mr. Safford said.

The Council has established a subcommittee of five qualified programmers to act as advisors to the Council for all subsequent RBPE's. This subcommittee will work in cooperation with the Council to review and update the exam each year.

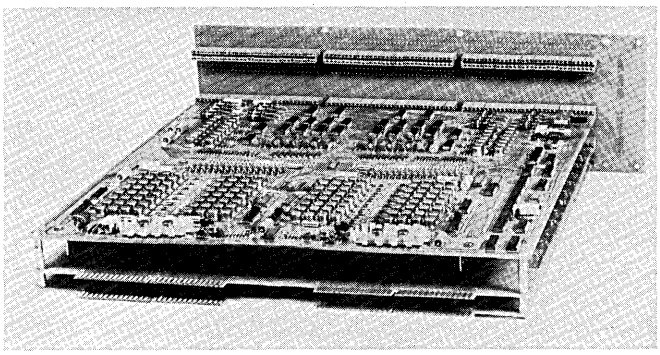
PATENT AWARDED INVENTION FOR REDUCING COMPUTER INTERRUPTIONS

An invention that helps prevent interruption of computer operations when an error occurs in one of the system's input-output channels has resulted in the issuance of a patent to IBM Poughkeepsie (N.Y.) engineers William E. Boehner and Bruce L. McGilvray. The patent has been assigned to IBM Corporation.

Normally, an error in one of the channels, used to control the exchange of information with input-output devices, halts the channel operation until the error can be corrected. The invention, used in IBM System/370 computers, enables the channel to indicate to the central processing unit status information about the particular input-output device in operation at the time of the channel error. With this information, an error recovery program can be initiated to help locate and correct the error in the channel data while the channel continues to control the flow of input-output data.

NEW PRODUCTS AND SERVICES

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
Digital		
Datacraft Model 6204/5	A 24 bit minicomputer which complements the larger Datacraft Models 6024/1 and 6024/3 / basic memory is 4K words (24 bits + Parity), expandable to 32K / cycle time is 1.2 usecs / software and peripheral compatibility with larger models	Datacraft Corporation P.O. Box 23550 Ft. Lauderdale, FL 33307 Attn: R. F. McCullough
Honeywell Series 6000 Family	Large-scale data processing systems consisting of six single-processor models — the 6030, 6040, 6050, 6060, 6070 and 6080 / program compatible with Series 600 / Models 6040, 6060 and 6080: specifically designed for business-oriented applications / Models 6030, 6050 and 6070: for a mixed scientific/engineering and business work load /	Honeywell Information Systems 60 Walnut St. Wellesley Hills, MA 02181 Attn: Inquiry Center
IBM System/370 Model 135	Lowest-cost System/370 offers expanded communications capabilities / designed for economical data base applications / main storage sizes (4) range from 96,000 to 240,000 bytes / main memory read cycle of 770 nsec and a write cycle of 935 nsec / scheduled deliveries, 5/72	IBM Corporation Data Processing Div. 1133 Westchester Ave. White Plains, NY 10604 Attn: R. F. Whalen
Micro 820 computer	For OEM or high-volume users in both systems and dedicated applications / system architecture is byte oriented / six operational registers; memory addressing to 32,768 bytes with a 1.1 usec memory cycle time	Micro Data Corporation 644 East Young St. Santa Ana, CA 92705 Attn: Robert Oakley
NAKED-MINI (trademark registration applied for)	New concept of minicomputers as components for OEM market / priced from $1700 in quantities of 200 / complete, tested minicomputer (in 15 x 15-inch module) stripped of its power supply, console and metal chassis / operationally identical to company's existing Models 116, 216, 108, 208 and 808	Computer Automation, Inc. 895 West 16th St. Newport Beach, CA 92660
Special Purpose Systems		
Electrocomp Model LIC Life Insurance and Investment Computer	Low-cost, miniature analog computer for life insurance and mutual fund salesmen / specifically designed to program life insurance and investment requirements of prospect in his own home / 10 lb. portable computer packaged in attache case operates from conventional 110 volt household, electrical outlet / on-the-spot financial analysis / easy to operate	Beckman Instruments, Inc. Cedar Grove Operations 89 Commerce Rd. Cedar Grove, NJ 07009 Attn: Pat Anderson
SYNCOMP MICRO/1	Designed by engineers for engineers / a turn-key computer system for on-site use; needs no special facilities or additional personnel / a "full service" processor of typical engineering problems / full library of related programs available	Synergistic Computer Systems, Inc. (Suites 11-31) 2736 W. Orangethorpe Ave. Fullerton, CA 92633 Attn: G. A. Doyle
Memories		
Ampex Model 1800 Series core memory	Modular core memories packing over 7,000 18-mil cores (or bits of data) in one square inch of board space / cycle times of 650 and 900 nsec in sizes from 8,192 words by 18 bits to 131,072 words by 36 bits / uses 3-wire, 3D design / to be shown at SJCC	Ampex Corporation 9937 West Jefferson Blvd. Culver City, CA 90230 Attn: Chris Hoppin



NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
(Memories, continued)		
CorPac 11, add on core memory system	Provides DEC PDP-11 users with up to 24K words of additional core memory in 10½" of rack space / available in 4K x 16 bit increments / plug-in interface module is physically and electrically compatible with all DEC PDP-11 peripherals	Information Control Corp. 9610 Bellanca Ave. Los Angeles, CA 90045 Attn: Trevor Hendershot
Fastrack II®	Disc memory system for OEM and end-user markets / fixed head-per-track design / average access time, 8.3 msec; serial data transfer rate, 4.5 million bits per second / data capacity expandable from 19 to 230-million bits	Systems Engineering Laboratories, Inc. 6901 W. Sunrise Blvd. Ft. Lauderdale, FL 33313 Attn: Ted Swift
501 H disc memory and controller system	For HP2114A computers / storage capacities from 512,000 bits to 3.0 megabits / operates over input bus / 8.5 msec average access time / withstands 10G shock, without isolators / complete with operating software	Dynacoustics, Inc. 1980 National Ave. Hayward, CA 94545 Attn: Dennis Setera
PDP-ROM memory system	A high speed random access storage device for PDP-8I and PDP-8L users / up to 32,768 additional words of storage / system includes all controls to interface with PDP-8's data break and a user software system	Memory Technology, Inc. 83 Boston Post Rd. Sudbury, MA 01776 Attn: Paul Rosenbaum
'PARROM' CCM-4096 memory	Partial Random Access MOS Read-Only Memory Subsystem / Bipolar speeds / high voltage 'P' channel / board density of 16K to 48K bits, operating with data rates of 8 to 10 MHz / uses include microprogrammed inplementation, controller design, emulators and logic control	On Line Computer Corp. 370 Ludlow St. Stamford, CT 06902 Attn: J. R. Douglas
SMS8228 Bipolar ROM	A 4,096-bit bipolar read-only memory integrated circuit / 1,024 x 4 organization / typical access time, 55 nsec / dissipates 125 microwatts per bit / custom versions available	Signetics Memory Systems, Inc. 740 Kifer Rd. Sunnyvale, CA 94086
Series 2200 Direct Access Storage Facility	Units compatible with IBM 2314 & 2319 system / consists of a Model 2218 dual drive unit, a Model 2212 single drive unit, a Model 2219, and a Bryant Model 2214 interface controller; each is plug compatible and directly interchangeable with IBM counterpart	Bryant Computer Products 850 Ladd Rd. Walled Lake, MI
Software		
ALICE	A proprietary logic simulation program / allows logic designers to check out circuits implemented in any form / performs simulations from a quick checkout to a detailed analysis of timing problems / developed by Applicon, Inc., Burlington, Mass.	Applied Logic Corp. One palmer Square Princeton, NJ 08540 Attn: Marketing Dept.
HOMEOWNERS RATING AND WRITING SYSTEM	For rating and writing homeowner insurance policies / specifically designed for medium-sized fire and casualty company to prepare annualized and 3-year policies on present computer system / needs no special equipment or skills / COBOL / DOS, OS or equivalent	Austin Systems Co. Inc. 87 Terrace Hall Ave. Burlington, MA 01803
NEATFLOW	For NCR Century Series computers / produces comprehensive flowcharts to standardize program and system documentation / assists program debugging and reduces documentation costs	The National Cash Register Co. Main & K Streets Dayton, OH 45409
1005 Eliminator	Executes computer programs written for the UNIVAC 1005 on third generation computer equipment with no modifications / can operate on any UNIVAC 9000 Series equipment or IBM System/360 / "dynamic translation" technique maintains accuracy of simulation with speeds comparable to a translated program	Data Usage Corp. 2460 Lemoine Ave. Fort Lee, NJ 07024
PROFILE	A matching, scoring, and retrieval system / useful in research applications requiring close analysis of different files / built-in report generator simplifies production of charts, lists, other output / IBM 360, 65K, OS, BAL	Cambridge Computer Associates, Inc. 220 Alewife Brook Pkwy. Cambridge, MA 02138 Attn: Len Spar
SPARSE	Sub-routines for inverting matrices to conserve core by not saving zero elements in the matrix / handles real, complex or double precision matrices / will work on non-symetric matrices / written in FORTRAN IV	Environmental Computing, Inc. 21 George St. Lowell, MA 01852 Attn: Marketing Manager
SUPER BASIC LANGUAGE	Allows UCS-VI time-sharing user to define his problem with simple English statements / includes extensive diagnostic messages and program de-bugging features / extensive character string manipulation capabilities	United Computing Systems 3130 Broadway Kansas City, MO 64111
TABS	A time accounting and billing system / designed to cope with problems of managing multi-programming environment / monitors all programs run under DOS S/360 / provides maximum information and control with minimum time and effort	Datachron Corporation 174 Fifth Ave. New York, NY 10010 Attn: Martin Zeitlin

NAME/MODEL NO.	DESCRIPTION	FOR MORE INFORMATION
Peripheral Equipment		
CRT Display Terminal, Model 7700	Available in two versions: 1,000 characters (40 characters per line, 25 lines); 2,000 characters (80 characters per line, 25 lines / both completely self-contained, equipped with keyboard, control logic, character generator, refresh memory and interface	Lear Siegler, Inc., Electronic Instrumentation Division 714 No. Brookhurst St. Anaheim, CA 92803 Attn: Lee R. Couts
Cassette Recorder, Mobark Model 400 T	For applications in both in-house and remote time-sharing installations / EIA interfaced; plug-to-plug compatible with many soft and hard copy terminals / control panel allows user selection of 110, 150 or 300 baud speeds; on-line or off-line operation; et al / stop/starts on character in read mode without loss of that character	Mobark Instruments Corp. 1038 W. Evelyn Ave. Sunnyvale, CA 94086 Attn: W. D. McMan
Magnetic Tape Controller, Model SDI-3010	Used with synchronous recorders to produce off-line data recording / standard speed, 25 ips; available ranges from 10 to 45 ips / character densities from 200, 556, and 800 bpi in 7-track; 800 and 1600 in 9-track / features error-checking capability	Systems Development Inc. 9982 Monroe (Suite 403) Dallas, TX 75220 Attn: J. B. West
Magnetic Tape I/O System, Model 5091-P/8e	For use with PDP-8/e minicomputer / consists of a controller, up to 4 tape drives, interconnecting cables and software routines / available tape speeds range from 12.5 ips to 75 ips / IBM-compatible tape format	Datum Inc. 170 E. Liberty Ave. Anaheim, CA 92801
Magnetic Tape Transports, Mod 310 and Mod 311	For use with minicomputers, key-to-tape, data conversion systems / series provided in 9- and 7-track configurations / IBM-compatible tape format / Mod 310 speeds from 12.5 ips to 37.5; Mod 311, 6.5 to 12.5 ips	UniComp, Inc. 18219 Parthenia St. Northridge, CA 91324
Matrix 1300 printer, Matrix 1100 plotter, and Matrix 1100A printer/plotter	Designed to interface with mini-, midi-computers and CRT terminals for hard copy output / all use 11" wide paper, operate silently, are compact / Matrix 1300 is 132 column, operates at 300 lpm (660 characters per second); Matrix 1100 uses electrostatic writing, plots standard page in under 13 seconds; Matrix 1100A combines features of both / to be shown at SJCC	Versatec, Inc. 10100 Bubb Rd. Cupertino, CA 95014 Attn: G. A. Marken
SYSTEM 2400	A modular peripheral processor / performs all necessary peripheral data manipulations without main frame involvement / includes 4K byte processor (expands to 32K bytes); one to four fully buffered I/O channels, each accommodating up to 16 peripheral controllers sends or receives data at 9600 bps / MDL (Mohawk Data Language) simplifies programming requirements	Mohawk Data Sciences Corp. Palisade St. Herkimer, NY 13350 Attn: A. W. Hoge
TEMPO 270T Terminal Control Processor	Programmable front-end communications subsystem for use in medium-to-large scale IBM 360/370 teleprocessing systems / designed as a turnkey package (software, hardware, system integration included / no 360/370 software changes are necessary	Tempo Computers, Inc. 4005 W. Artesia Ave. Fullerton, CA 92633 Attn: Nan Corby
VW01 writing tablet input device	For digitizing any kind of graphic data for display devices offered with DEC's PDP-8, PDP-12 and PDP-15 computers / tablet activated with stylus or ball point pen pen with a spark gap; tablet paper serves as permanent record	Digital Equipment Corp. 146 Main St. Maynard, MA 01754 Attn: Dennis C. Goss
Comm-pute	A library of communication system information and and design programs offered through time-sharing / a no-minimum, cost-as-used offering	Berglund Associates, Inc. 1060 N. Kings Hgy.(Suite 212) Cherry Hill, NJ 08034 Attn: A. R. DeVere
Computer Analyzed Electrocardiograms	For real-time analysis of medical data as aid to physician in making diagnoses / dual configuration of SDX Sigma 5 computers / multiple telephone lines connect via remote coupled ECG units in hospitals, clinics, offices, etc., nationwide / analysis returned within 10 minutes after taking ECG	Telemed Corp. 9950 W. Lawrence Ave. Schiller Park, IL 60176
TARPS® (Transportation Auditing and Reporting System)	For solving major freight administration problems for shippers; also provides management information reports / derived from continuously up-dated and maintained freight rate data base; supported by computer/freight systems engineers/ three plans available	Numerax, Inc. 467 Sylvan Ave. Englewood Cliffs, NJ 07632

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Data Products Division, Lockheed Electronics Co., Los Angeles, Calif.	Western Electric Co., Greensboro, N.C.	Provision of 63 data storage systems over a 2-year period; built to military specifications; fastest operating ferrite core memories available	$7.5 million
Burroughs Corp., Detroit, Mich.	Reynolds & Reynolds Co., Dayton, Ohio	Five B4504 computer systems to be used in data processing services, including accounting, parts inventory control, etc.	$7.3 million
Sanders Associates, Inc., Nashua, N.H.	Avis Rent A Car System, Garden City, N.Y.	Hard copy terminals, cathode ray tube displays & SANDAC communications processors for rental agent counters & administrative offices	$7+ million
Univac Division of Sperry Rand, Blue Bell, Pa.	Naval Air Systems Command, Washington, D.C.	Lot IV production of UNIVAC 1830A avionics computers for the Navy's P-3C Orion, a land-based anti-submarine patrol aircraft	$3.9 million
Data Facilities Management, Inc., Stamford, Conn.	Vermont National Bank, Brattleboro, Vt.	A management contract for VNB System/360 Computer Center & supply of all systems design, programming & computer services for the bank's customers	$2 million
Elektron GmbH, a subsidiary of Conrac Corporation, Weikersheim, Germany	Olympic Construction Corp., Munich, Germany	Three computer-controlled information displays, 2 at the main Olympic stadium in Munich & a mobile unit for the rowing area & canoe races in Augsburg	$1.5 million
Interdata Inc., Oceanport, N.J.	Royal Canadian Mounted Police, Ottawa, Ontario Canada	A computer-based data communications system to form the base for a Law Enforcement Information Network	$1,250,000
Data Disc, Inc., Palo Alto, Calif.	Westinghouse Electric Corp., Orlando, Fla.	Providing a complete Disc Memory System including a standard 7200 Series Disc Memory unit & power supply, & a special disc controller/interface	$1+ million
Datacraft, Ft. Lauderdale, Fla.	Singer Micrographic Systems, Link Div., The Singer Co., Sunnyvale, Calif.	A minimum 25 computer systems over next 3 years on OEM basis; initial use as controller for MS 6000 line of computer output micro film "COM" plotter printers	$1+ million
Computer Identics Corp., Westwood, Mass.	Research & Engineering Dept., U.S. Postal Service, Oakland, Calif.	Development of a real-time computerized postal vehicle control system for predicting & handling truckload mail	$899,674
Ann Arbor Computer, affiliate of Jervis B. Webb Co., Detroit, Mich.	Speaker Sortation Systems Div., A-T-O Inc., Milwaukee, Wisc.	A computer system to operate automatic sortation devices for the N.Y. Metropolitan Bulk & Foreign Mail Facility	$750,000 (approximate)
Decision Data Corp., Warminster, Pa.	Unidata, Ltd., England	A combination of 96 column card peripherals for system I/O & data recorders used in card punching, verification & auxiliary punched card operations	$650,000+
Athena Systems, Inc., Bedford, Mass.	American Regitel Corp., San Carlos, Calif.	Five thousand automatic credit card readers to be incorporated into electronic cash registers, providing automatic point of sale billing & data	$500,000
Information Storage Systems, Inc., Cupertino, Calif.	Trans-A-File Systems Co., Cupertino, Calif.	Initial order (with potential value of over $4 million) for disk memory systems for use in the Trans-A-File document storage and retrieval system	$430,000
Datacraft, Ft. Lauderdale, Fla.	Computer Technology, Inc., Dallas, Tex.	Two 6024/1 computers to be used as the digital controller portions of 2 systems to train U.S.Navy pilots for night landings on aircraft carriers	$340,000
Systems Application Center of TRW Inc., Redondo Beach, Calif.	Federal Reserve, Washington, D.C.	A computer model to simulate nation's payment mechanisms; to identify future potential of the existing check collection network & evaluate alternatives	$214,750
A. B. Dick Co., Chicago, Ill.	National Cash Register Co., Dayton, Ohio	A subcontract award to develop a non-impact, non-contact bar code printer to increase mail handling efficiency	$50,000
Mainstem, Inc., subsidiary of Cummins Engine Co., Princeton, N.J.	United Airlines, Chicago, Ill.	A maintenance cost control system for ground support equipment; to record & analyze maintenance data on each item of equipment & overall costs	—
Collins Radio Co., Dallas, Tex.	American Airlines, Tulsa, Okla.	A processing system, valued at approximately $1.6 million, to link passenger reservations with ticket agent stations	—
Computek, Inc., Cambridge, Mass.	Center for Computer Based Behavioral Studies at UCLA, Los Angeles, Calif.	A contract for 24 Model 400 terminals to provide total interface for a large dual-processor time sharing system	—
Optimum Systems Inc., Palo Alto, Calif.	The City of Sunnyvale, Sunnyvale, Calif.	Computer services; includes rental of terminals, other electronic equipment, cost of leased lines linking city to OSI, and all data processing and systems work	—
Proprietary Software Systems Inc., W. Los Angeles, Calif.	Western Tele-Communications, Inc., Denver, Colo.	A mini-computer to monitor, analyze & log faults of a microwave relay network	—

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B3500 system	Bank of Idaho, Boise, Id.	Processing demand deposits, payroll, general ledger and check credit; projections of future applications include remote processing of installment loans & a total information system
Control Data 3170 system	Interdata South Africa, Johannesburg, South Africa	Providing data processing services to a variety of industries, including remotely located businessmen as well as local clients
Control Data 3200 system	U.S. Dept. of the Interior, Bureau of Mines, Mining Research Center, Spokane, Wash.	Analyzing soil and analyzing data collected from ventilation tunnels, materials removal tunnels and strain guages; calculating stress/strains that can be applied and on-line detection of shifts
Digital Equipment PDP-10	University of Glasgow Glasgow, Scotland	Time-sharing services & real-time access for experiments; will aid nuclear structure physics work in the Department of Natural Philosophy
IBM System/3 Model 6	Liebovich Bros., Inc., Rockford, Ill.	Handling order entry, invoicing, & other business applications as an aid to customer service
IBM System/3 Model 10	A. Caratan & Son, Delano, Calif.	Inventory of grapes in cold storage with a daily report to aid consumer demand and sales analysis
	Clarksburg Drug Co., Clarksburg, W. Va.	Helping control the distribution of drugs to customers in W.Va., Md., & Pa.; monitoring inventory, billing, purchase orders & sales analysis
	Deaconess Hospital, Oklahoma City, Okla.	Automatic billing, including laboratory fees, x-ray, & pharmacy plus hospital census information
	Hooley Super Markets, Inc., Stillwater, Minn.	Providing sales & inventory analysis for Hooley Wholesale Meat Co., and a Bonanza store (a warehouse-membership retail grocery outlet) in Fridley, Minn.
IBM System/370 Model 145	Mammoth Mart, Inc., Bridgewater, Mass.	Use as an integral part of planning, expansion & control in the 51 unit chain of self-service discount department stores & juvenile outlets
IBM System/1130	Northern Improvement Co., Fargo, N.D.	Weekly accounting reports & projections plus providing depreciation figures on heavy construction equipment & analyzing performance data
NCR Century 100 system	Bates, Betts, Felton, Carter, Atlanta, Ga.	Processing water bills for the City of Atlanta, miscellaneous work for the county, as well as payroll & accounting for building industry clients
	Dairy Farmers' Co-operative, Ltd., Sydney, Australia	Processing sales data & keeping track of nearly 70 million gallons of milk handled annually at the company's 25 milk-receiving centers
	Lawrence Pharmaceuticals, Jacksonville, Fla.	Maintaining inventory, billing & accounts receivable, payroll preparation & detailed analyses by individual drug store
	Sies Electric Supply Co., Chattanooga, Tenn.	Inventory control, invoicing & processing payroll records in the company, which supplies tramsmission equipment & supplies for the electrical industry
NCR Century 200 system	Carlton Industries, Richmond, Va.	Controlling inventory & handling billing operations for the company, a warehousing & wholesale supply firm for the appliance industry
	First Huntington National Bank, Huntington, W. Va.	Replacement of a smaller computer; to handle demand deposit accounting, processing stockholder records & handling loan scheduling, check reconciliation & payroll
	Florida Administrators, Miami, Fla.	Data administration & processing financial records for clients in the building industry
	University of Hartford, Hartford, Conn.	Maintenance of all student records including grades, attendance & billing
UNIVAC 418-III system	State Police Academy, Hershey, Pa.	An advanced real-time computer system to give immediate information on stolen vehicles, stolen cars & wanted persons (system valued at $5 million)
UNIVAC 1106 system	Direct Access Computer Corp., Troy, Mich.	Facilitating the company's time sharing services to major Detroit companies (system valued at $1.7 million)
UNIVAC 1108 system	Osaka Gas Company, Ltd., Osaka, Japan	Primary applications of customer billing & information for Japan's 2nd largest gas company (system valued at approximately $2.5 million)
UNIVAC 9200 system	Haydon Brand Company, Detroit, Mich.	Work scheduling, cost accounting, payroll, accounts receivable & service bureau work
	Hills Business University, Oklahoma City, Okla.	Initial use as "hands-on" computer training to students; secondary application for business use in handling accounting procedures
UNIVAC 9300 system	Fred Sanders Co., Highland Park, Mich.	Route accounting, production control, distribution, general accounting, materials & supply forecasting, & payroll procedures
UNIVAC 9400 system	Helena Rubinstein, Inc., Greenvale, N.Y.	Order processing, billing & pre-billing, accounts receivable & marketing statistics
XDX Sigma 7	University of Wyoming, Laramie, Wyo.	Use by students enrolled in computer science courses in expanding campus-wide computer training & data processing activities; future uses include the school's administrative tasks

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 MARCH 15, 1971

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Part II. Manufacturers Outside United States							
A/S Norsk Data Elektronikk	NORD-1	8/68	2.0	0	43	43	15
Oslo, Norway	NORD-2B	8/69	4.0 (S)	0	4	4	10
(A) (Feb. 1971)	NORD-5	-	-	0	0	0	1
A/S Regnecentralen	GIER	12/60	2.3-7.5	0	40	40	0
Copenhagen, Denmark	RC 4000	6/67	3.0-20.0	0	14	14	3
(A) (Feb. 1971)							
Elbit Computers Ltd.	Elbit-100	10/67	4.9 (S)	-	-	225	50
Haifa, Israel							
(A) (Feb. 1971)							
GEC-AEI Automation Ltd.	Series 90-2/10/20						
New Parks, Leicester, England	25/30/40/300	1/66	-	-	-	13	X
(R)	S-Two	3/68	-	-	-	1	X
(Jan. 1969)	130	12/64	-	-	-	2	X
	330	3/64	-	-	-	9	X
	959	-/65	-	-	-	1	X
	1010	12/61	-	-	-	8	X
	1040	7/63	-	-	-	1	X
	CON/PAC 4020	-	-	-	-	0	X
	CON/PAC 4040	5/66	-	-	-	9	-
	CON/PAC 4060	12/66	-	-	-	5	-
International Computers, Ltd. (ICL)	Atlas 1 & 2	1/62	65.0	0	6	6	X
London, England	Deuce	4/55	-	0	7	7	X
(A)	KDF 6 - 10	9/61	10-36	0	58	58	X
(Sept. 1970)	KDN 2	4/63	-	0	1	1	X
	Leo 1, 2, 3	-/53	10-24	0	59	59	X
	Mercury	-/57	-	0	13	13	X
	Orion 1 & 2	1/63	20.0	0	17	17	X
	Pegasus	4/55	-	0	30	30	X
	Sirius	-/61	-	0	22	22	X
	503	-/64	-	0	16	16	X
	803 A, B, C	12/60	-	0	83	83	X
	1100/1	-/60	5.0	0	22	22	X
	1200/1/2	-/55	3.9	0	68	68	X
	1300/1/2	-/62	4.0	0	196	196	X
	1500	7/62	6.0	0	110	110	X
	2400	12/61	23.0	0	4	4	X
	1900-1909	12/64	3-54	0	1690	1690	C
	Elliott 4120/4130	10/65	2.4-11.4	0	160	160	C
	System 4-30 to 4-75	10/67	5.2-54	0	138	138	C
							Total: 525
Japanese Mfrs.	(Mfrs. of various models include: Nippon Electric Co., Fujitsu,						
(N) (Sept. 1970)	Hitachi, Ltd., Toshiba, Oki Electric Industry Co., and Mitsubishi Electric Corp.)					Total: 4150 E	Total: 800 E
Marconi Co., Ltd.	Myriad I	3/66	£36.0-£66.0 (S)	0	37	37	9
Chelmsford, Essex, England	Myriad II	10/67	£22.0-£42.5 (S)	0	17	17	12
(A) (Jan. 1970)							
Redifon Limited	R2000	7/70	-	0	6	-	6
Crawley, Sussex, England							
(A) (Feb. 1971)							
Saab-Scania Aktiebolag	D21	12/62	7.0	0	38	38	-
Linkoping, Sweden	D22	11/68	15.0	0	24	25	4
(A) (Feb. 1971)	D220	4/69	10.0	0	10	10	
Selenia S.p.A.	GP-16	7/69	13.7 (S)	-	39	39	21
Roma, Italy (A) (Jan. 1971)	BP-16R	6/70	10.6 (S)	-	1	1	1
Siemens	301	11/68	0.75	-	-	73	C
Munich, Germany	302	9/67	1.3	-	-	27	C
(A)	303	4/65	2.0	-	-	70	C
(Feb. 1971)	304	5/68	2.8	-	-	59	C
	305	11/67	4.5	-	-	84	C
	306	-	6.5	-	-	-	C
	2002	6/59	13.5	-	-	40	C
	3003	12/63	13.0	-	-	31	C
	4004/15/16	10/65	5.0	-	-	101	C
	4004/25/26	1/66	8.3	-	-	52	C

Please turn to page 55

computers and automation

815 WASHINGTON STREET
NEWTONVILLE, MASSACHUSETTS 02160
617-332-5453

ENTRY FORM FOR THE 1971 COMPUTER DIRECTORY AND BUYERS' GUIDE

(may be copied on any piece of paper)

Complete both sides of this form. PLEASE TYPE OR PRINT.

I. Roster of Organizations in the Computing and Data Processing Field (Alphabetical and Geographical Listings)

1. Your organization's name_____

2. Phone (with area code)_____ 3. Street address_____

4. City_____ State_____ Zip Code_____

5. Organization headquarters (if address is different from above): Street address_____

City_____ State_____ Zip Code_____

6. President or Executive Head_____

Advertising Manager_____

7. What does your organization do?

( ) A. Manufacture and sell data processing equipment (please specify)

_____

_____

_____

_____

( ) B. Provide computing and data processing services (please list specific services offered and equipment used, if any)

_____

_____

_____

_____

( ) C. Other (please describe)

_____

_____

_____

8. Approximate number of your employees_____ 9. Year your organization was established_____

10. This form submitted by: Name_____ Title_____

II. Special Geographic Roster

1.	Do you sell (to the public) computing and data processing services?	(Sv)	( ) Yes	( ) No
2.	Do you sell (to the public) commercial time-shared computing services?	(Ti)	( ) Yes	( ) No
3.	Do you sell (to the public) courses, seminars, or instruction in computing, programming, or systems?	(In)	( ) Yes	( ) No
4.	Do you sell (to the public) consulting services in the computer field?	(Co)	( ) Yes	( ) No
5.	Do you offer (to the public) on a lease basis computing and data processing equipment, manufactured by companies other than your own?	(Le)	( ) Yes	( ) No
6.	Do you sell (to the public) software or computer programs?	(Sf)	( ) Yes	( ) No

PLEASE ALSO CHECK OFF THE PRODUCTS AND SERVICES YOU OFFER FOR SALE ON THE REVERSE SIDE OF THIS FORM →

Please send your filled-in form to COMPUTERS AND AUTOMATION DIRECTORY, 815 Washington St., Newtonville, MA. 02160

to arrive on or before APRIL 30, 1971!

III. Buyers' Guide to Products and Services in Computing and Data Processing

The purpose of the Buyers' Guide is to give information about every supplier of products or services in the computer field from whom we have received information this year. There may be some overlapping in the list of headings below. Please check the products and/or services which your organization offers next to each heading that applies. If your product or service is applicable to the computer field, yet does not fall into any of the listed headings, please write in the space provided at the end.

1. PRODUCTS

A

- A1 ☐ Air Conditioning Devices and/or Systems for DP rooms
- A2 ☐ Audio Response Devices

B

- B1 ☐ Binders (Computer Output)
- B2 ☐ Binding Equipment

C

- C1 ☐ Calculators (Electronic)
- C2 ☐ Cameras (Data Processing)

Cards:

- C3 ☐ Magnetic
- C4 ☐ Punch
- C5 ☐ Circuits (Computer Types)
- C6 ☐ Communication Systems (Computer Types)

Computers:

- C7 ☐ Analog
- C8 ☐ Digital
- C9 ☐ Hybrid
- C10 ☐ Special Purpose
- C11 ☐ Computer Components (see also specific types)

Controls:

- C14 ☐ Automatic
- C15 ☐ Sorting and Counting

Converters:

- C16 ☐ Analog to Digital
- C17 ☐ Card to Magnetic Tape
- C18 ☐ Card to Paper Tape
- C19 ☐ Code
- C20 ☐ Digital to Analog
- C21 ☐ Magnetic Tape to Card
- C22 ☐ Magnetic Tape to Magnetic Tape
- C23 ☐ Magnetic Tape to Microfilm
- C24 ☐ Magnetic Tape to Paper Tape
- C25 ☐ Optical to Card
- C26 ☐ Optical to Magnetic Tape
- C27 ☐ Optical to Paper Tape
- C28 ☐ Paper Tape to Card
- C29 ☐ Paper Tape to Magnetic Tape
- C30 ☐ Other

Counters:

- C31 ☐ Electronic
- C32 ☐ Mechanical

D

- D1 ☐ Data Collection and Recording Equipment
- D3 ☐ Data Processing Accessories (see also specific types)
- D4 ☐ Data Reduction Equipment

Data Terminals:

- D5 ☐ Acoustic - coupled
- D6 ☐ Display
- D7 ☐ Receiving
- D8 ☐ Transceiving
- D9 ☐ Transmitting
- D10 ☐ Delay Lines (Computer Types)
- D11 ☐ Disc Packs

F

- F1 ☐ Facsimile Equipment
- F2 ☐ Filing Equipment and Systems
- F4 ☐ Floors (Computer Rooms)
- F5 ☐ Forms, Continuous
- F6 ☐ Forms Handling Equipment

G

Generators, Function:

- G1 ☐ Electronic
- G2 ☐ Other

H

Heads, Magnetic:

- H1 ☐ Reading
- H2 ☐ Recording

I

- I1 ☐ Information Retrieval Systems
- I2 ☐ Input/Output Devices (see also specific types)
- I3 ☐ Integrators
- I4 ☐ Interface Equipment
- I5 ☐ Inventory Systems

K

- K1 ☐ Keyboards
- K3 ☐ Key-to-Tape Equipment

M

- M1 ☐ Magnetic Ink Character Recognition (MICR) Equipment
- M4 ☐ Mark Sensing Equipment

Memory Systems, Magnetic:

- M5 ☐ Core
- M6 ☐ Disc
- M7 ☐ Drum
- M8 ☐ Thin-Film
- M9 ☐ Multiplexers

Multipliers:

- M10 ☐ Electronic
- M11 ☐ Servo

O

- O1 ☐ Office Machines
- O4 ☐ Optical Scanning Systems

P

- P1 ☐ Patch Cords
- P2 ☐ Plotters
- P3 ☐ Plugboards
- P4 ☐ Power Equipment and Supplies

Printers:

- P5 ☐ High Speed
- P6 ☐ Keyboards
- P7 ☐ Other
- P10 ☐ Punch Cards
- P11 ☐ Punch Card Accessories
- P12 ☐ Punch Card Machines

R

Readers:

- R1 ☐ Character
- R2 ☐ Film
- R3 ☐ Magnetic Card
- R4 ☐ Magnetic Ink
- R5 ☐ Magnetic Tape
- R6 ☐ Optical Character
- R7 ☐ Paper Tape
- R8 ☐ Photoelectric
- R9 ☐ Punch Card

Recorders:

- R10 ☐ Magnetic Tape
- R11 ☐ Paper Tape
- R12 ☐ Other
- R13 ☐ Recording Papers
- R14 ☐ Registers, Shift
- R15 ☐ Resolvers
- R16 ☐ Ribbons, Data Processing
- R17 ☐ Robots

S

- S1 ☐ Servomechanisms
- S3 ☐ Simulators
- S4 ☐ Software Packages

Storage Equipment:

- S5 ☐ Cabinets, containers
- S6 ☐ Safes, vaults
- S7 ☐ Systems
- S8 ☐ Switches
- S9 ☐ Synchros

T

Tape:

- T1 ☐ Magnetic
- T2 ☐ Paper
- T3 ☐ Plastic

Tape Accessories:

- T4 ☐ Cleaners
- T5 ☐ Punches
- T6 ☐ Reels
- T7 ☐ Other
- T8 ☐ Tape Handlers
- T10 ☐ Teaching Devices
- T11 ☐ Telemetering Systems

Test Equipment:

- T12 ☐ Computer
- T13 ☐ Other
- T15 ☐ Timing Devices
- T17 ☐ Translating Equipment
- T19 ☐ Typewriters, Computer Related

U

- U1 ☐ Used Data Processing Equipment and Supplies

V

- V1 ☐ Visual Input/Output Devices

2. SERVICES

C

- C12 ☐ Computing and Data Processing Services
- C13 ☐ Consulting Services
- C33 ☐ Courses by Mail (Computer Field)

Courses, Seminars, or Instruction — Commercial:

- C34 ☐ Computing
- C35 ☐ Programming
- C36 ☐ Systems
- C37 ☐ Other (Computer Field)

D

- D2 ☐ Data Conversion Services

E

- E1 ☐ Economic and Market Research/Analysis
- E2 ☐ Employment Agencies, and Services

F

- F3 ☐ Financial Services

K

- K2 ☐ Keypunch Services

L

- L1 ☐ Leasing Services

M

- M2 ☐ Magnetic Ink Imprinting
- M3 ☐ Mailing Services (Computerized)

O

- O2 ☐ Operations Research
- O3 ☐ Optical Scanning Services

P

- P8 ☐ Programming Services
- P9 ☐ Publications

S

- S2 ☐ Simulation
- S10 ☐ Systems Analysis/Design/Engineering

T

- T9 ☐ Tape Recertification
- T14 ☐ Time Brokers (Computer)
- T16 ☐ Time-Shared Computing Services
- T18 ☐ Typesetting Services (Computerized)

Products or Services not included in any of the above headings may be listed in the space provided below.

Census --*Continued from page 52*

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Siemens (Cont'd.)	4004/35	2/67	11.8	-	-	172	C
	4004/45	7/66	22.5	-	-	222	C
	4004/46	4/69	34.0	-	-	9	C
	4004/55	12/66	31.3	-	-	20	C
	404/3	-	1.1	-	-	-	C
	404/6	12/69	2.5	-	-	6	C
						Total:	291
USSR	BESM 4	-	-	-	-	C	C
(N)	BESM 6	-	-	-	-	C	C
(May 1969)	MINSK 2	-	-	-	-	C	C
	MINSK 22	-	-	-	-	C	C
	MIR	-	-	-	-	C	C
	NAIR 1	-	-	-	-	C	C
	ONEGA 1	-	-	-	-	C	C
	ONEGA 2	-	-	-	-	C	C
	URAL 11/14/16	-	-	-	-	C	C
	and others	-	-	-	-	C	C
						Total: 6000 E	Total: 2000 E

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

CLASSIFIED ADVERTISEMENTS

EAI TR-48-1 ANALOG COMPUTER

For sale or trade,
(time share terminals, for example)
as is, where is, slightly used.
Complete with prepatch panel and components.

J. A. Ulrich
Pitney-Bowes, Inc.
Stamford, Conn. 06904

Purchasing Department
(203) 327-3000
Ext. 1203

---

360 LEASES - LONG OR SHORT TERM
WE ALSO BUY AND SELL

- 360's - 7074's - 1401's -
Complete Systems or Components

SUMMIT COMPUTER CORPORATION
785 Springfield Avenue
Summit, New Jersey 07901
(201) 273-6900

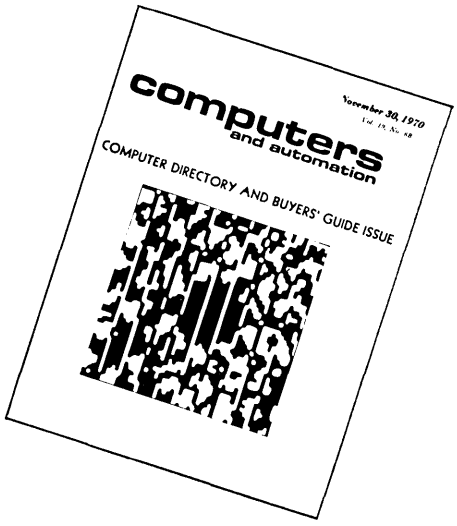
To use economical C&A Classified Ads, send copy to:
Computers and Automation (Tel: 617 332-5453)
815 Washington St., Newtonville, MA 02160
Rates for Classified Ads: 90¢ per word — minimum, 20 words.
First line all capitals — no extra charge. Ads must be prepaid.

16th Annual

COMPUTER DIRECTORY AND BUYERS' GUIDE

Issue of Computers and Automation

Softbound edition, 220 pages, IN STOCK



OVER 20 KINDS OF REFERENCE INFORMATION including:

Roster of Organizations in the Computer Field

Buyers' Guide to Products and Services

Over 2000 Applications of Computers .....

$12.00 to subscribers

$14.50 to nonsubscribers

Returnable in 7 days for full refund if not satisfactory (if in salable condition)

COMPUTERS AND AUTOMATION, 815 Washington St., Newtonville, MA 02160

Announcement

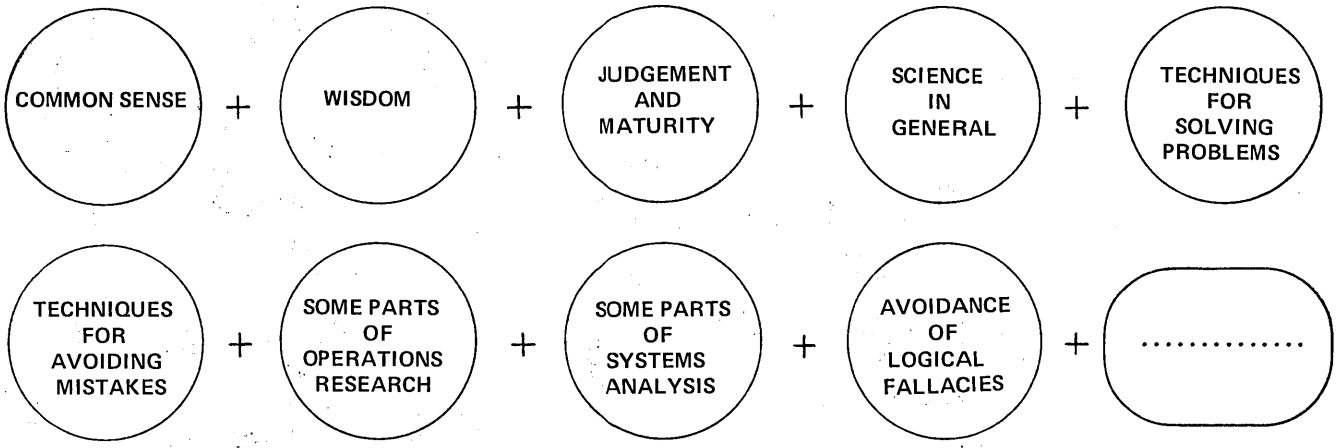
computers and automation 815 Washington St., Newtonville, Mass. 02160 invites your subscription to:

The C&A Notebook on

COMMON SENSE, ELEMENTARY AND ADVANCED

devoted to research, development, exposition, and illustration of the most important (or one of the most important) of all branches of knowledge, i.e., the subject of —

WHAT IS GENERALLY TRUE AND IMPORTANT =



Purposes:

- to help you (and us and anybody) avoid pitfalls
- to prevent mistakes before they happen
- to display new paths around old obstacles
- to apply in practical situations the observations and wisdom of great scientists and wise men
- to point out new solutions to old problems
- to stimulate one's resourcefulness
- to increase one's accomplishments
- to improve one's capacities

Editor: Edmund C. Berkeley

For additional information see the editorial on page 6 and the article on page 27.

- - - - - - - - - - - - - - - - - -(may be copied on any piece of paper)- - - - - - - - - - - - - - - - - - - -

To: Computers and Automation
815 Washington St., Newtonville, Mass. 02160

( ) Yes, please enter my subscription to "The C&A Notebook on Common Sense, Elementary and Advanced

( ) Please enroll me ( ) as a READER, subscription $12 a year (24 issues)
( ) as a PARTICIPATOR, subscription $6 a year (24 issues)

( ) In order to be a participator, I AGREE to send to the C&A Notebook reasonable contributions to this project of at least 400 words per month — of notes, comments, ideas, concepts, principles, examples, anecdotes, proverbs, etc. (Note: Only 10 days grace period!) Please send me a description of "reasonable contributions".

( ) Please send me as free premiums for subscribing:

( ) Right Answers — a Short Guide to Obtaining Them
( ) The Empty Column
( ) The Barrels and the Elephant
( ) Strategy in Chess
( ) The Argument of the Beard
( ) The Golden Trumpets of Yap Yap

( ) I enclose $_____ ( ) Please bill me.

Name_____ Title_____

Organization_____

Address (including zip)_____

Signature_____ Purchase Order No._____