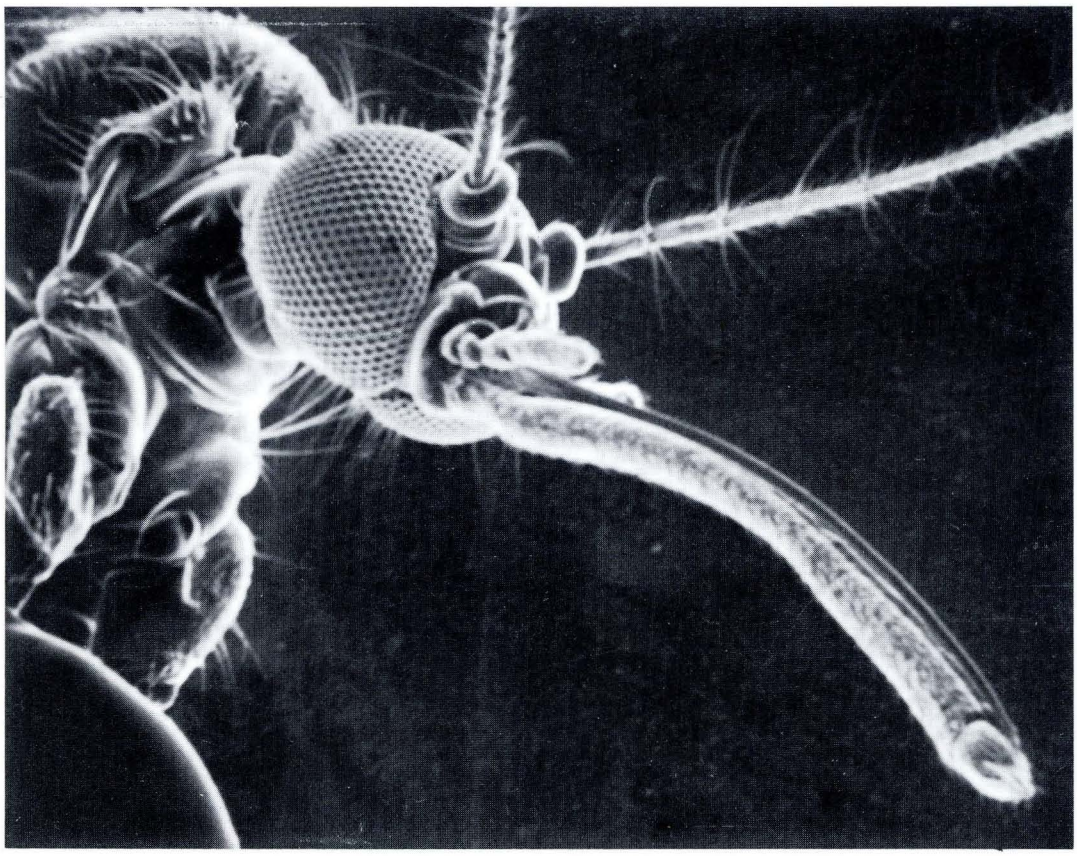
November, 1971

Vol. 20, No. 11

computers and automation



Mosquito
Proboscis

Marketing EDP Services: Legal Considerations — *W. A. Fenwick*
Information Retrieval in Law — *Lynn Schultz*
Computers Installed in American Railroads — *R. A. Petrash*
Issues Relating to National Defense — *Senator John C. Stennis*
The Assassination of President Kennedy: The Pattern of Coup d'Etat and Public Deception — *Edmund C. Berkeley*

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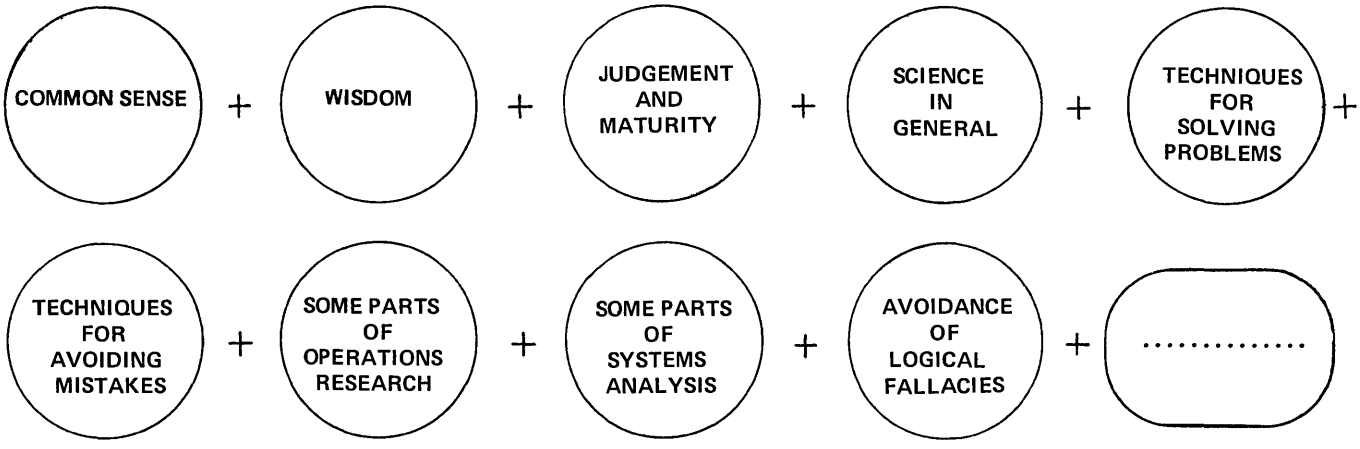

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The Most Important of All Branches of Knowledge

(Based on the editorial in the April 1971 issue of *Computers and Automation*)

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.

" Computers and Automation" for April 1971 contains an article, "Common Sense, Wisdom, General Science, and 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". For more details, see the announcement on page 2. (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

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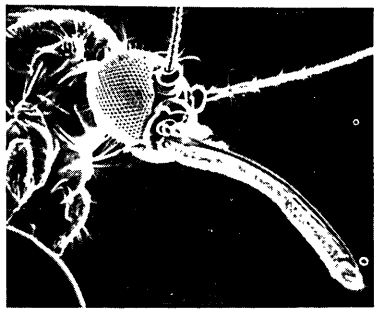

Front Cover Picture

The front cover shows a greatly magnified common mosquito, Culex. The mosquito's long, sharp proboscis is inserted through animal skin to enable the mosquito to suck blood. Biologists at the Argonne National Laboratory, Argonne, Ill., produced the photograph, using the scanning electron microscope, and unusual techniques.

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C.a

EDITORIAL

The RCA Computer Effort — Common Sense vs. Catastrophe

On Sept. 17, RCA announced that it was leaving the computer business.

The "Wall St. Journal" story in its Sept. 20 issue was entitled:

> RCA Quitting as Computer Maker; Write-off may Reach $250 Million; Substantial 1971 Loss Likely to Result; Specialized Systems and Service to Continue.

Part of the background is expressed in the following remarks drawn from various published reports:

> RCA, the 21st largest industrial concern in the U.S. in terms of 1970 sales, was the second huge corporation in the past year to give up on computers. Last year the General Electric Co., the 4th largest such company, sold the principal parts of its computer business to Honeywell Inc., the 49th largest. None of these companies has made an overall profit from computers in almost 15 years of trying.
>
> The profits have continued to go largely to IBM, the 5th largest industrial concern, although Sperry Rand Corp., Burroughs Corp., and Control Data Corp. have made some money too.
>
> Xerox has incurred unexpected losses since acquiring Scientific Data Systems, Inc., a computer maker in 1969; but it intends to add about 100 persons to its computer field sales staff by the end of the year.
>
> Ray W. MacDonald, president of Burroughs Corporation, said that their computer operations have been profitable since 1968, and they are not worried about the future.
>
> G. G. Probst, president of the Univac division of Sperry Rand Corp., remarked that the growth rates in the 1960's for the computer industry cannot be maintained in the 1970's, for the simple reason that to grow 20% a year on a large volume base is much more difficult than on a small base.

What makes the story of RCA even sadder is that RCA has had a number of significant achievements in the computer field:

1955 — BIZMAC, then the world's largest digital computer system, and the first computer made by RCA, was delivered to the supply organization of the U. S. Army in Detroit.

1958 — RCA introduced the first general-purpose digital computer that was fully transistorized, the RCA 501.

1960 — RCA introduced the first practical real-time computing system, the RCA 701, and other computers.

1964 — A new line of computers using monolithic integrated circuits, the Spectra 70 series, was introduced.

1969 — Additional large scale computing systems, with a factor of three gain in speed, and up to a million words in main memory, were introduced.

1970 and 1971 — Additional introductions of new, faster, and more capacious computer systems.

The Computer Division of RCA had until Sept. 17 about 10,000 employees in: Marlboro, Mass.; Cherry Hill, N.J.; West Palm Beach, Fla.; Lewiston, Me.; and a number of other locations. Now, some 8000 of them have been or will be laid off. Added to the catastrophic loss to RCA stockholders, in the range of $300 million, is the catastrophe of unemployment for 8000 RCA employees.

Why did this happen?

One explanation offered is: "It was a classic case of hubris coming to its appointed end", according to reporter John Rhea in the front page report in "Electronic News" of Sept. 27. This report was entitled "Computer Demise at RCA: Strategy Needed Debugging". "Hubris", according to Webster's "Third New International Dictionary", 1961, (published by G. & C. Merriam Co., Springfield, Mass., 1961, 2662 pp) comes straight from an ancient Greek word with the same spelling, and means "overweening pride or self-confidence; arrogance". The meaning is illustrated with an apt quotation:

> The very best critics of the past have made so many blunders . . . that our own critics of today should be careful to avoid hubris.

The "pride" consisted essentially of a bold policy declared and adopted by RCA in September, 1970, only a year ago, that RCA would set out to capture 10% of the computer market, would compete head-on with IBM, and would do so with an unlimited purse. The promise was made by chairman and then president Robert W. Sarnoff, an ex-IBM man. He gave the promise of vast financial support to L. E. Donegan, Jr., another ex-IBM man, new head of the computer division; this promise caused Donegan among other things to greatly increase his sales staff, including many ex-IBM-ers. Donegan relied on the promise he had been given.

The deficit for a year of the operations of the computer department under Donegan became on the order of $90 million, as compared with a deficit of $5 million estimated by James R. Bradburn, predecessor of Donegan as head of RCA computer operations.

The corporate management of RCA became uneasy. This uneasiness was implemented with the appointment on August 1 of a new RCA president, Anthony L. Conrad, an RCA veteran. He investigated and determined that the computer operations outlook was far gloomier than the computer division reports indicated. The promise of "vast support" became untenable, and was canceled on September 17 by corporate action.

The basic question, however, is this:

> To what extent should you (supposing you are a manager of any organization) believe a promise of vast support?

The proper evaluation of any promise always depends on a number of real factors. A manager can be faulted for injudiciously believing a promise. It is a principle of common sense for anyone to ask himself two questions in regard to any promise:

1. What is the reliability of this promise? (It can be shown that no promise has a reliability of 100%.)
2. What happens if this promise is not fulfilled? What shall I do then – what position do I then fall back to?

It was a failure of common sense for a manager in charge of computer operations at a large company not to be skeptical – to continue month after month to believe that the economic depression in the computer field and other factors would not alter the promise of support which he was relying on. If even six months ago the manager had started realigning his plans and commitments towards possible nonfulfilment of the promise, the RCA computer division might still be surviving today.

The problem of competing successfully and profitably in the field of computer main frames is not insoluble. This is proved by Burroughs Corp., Digital Equipment Corp., and a number of other companies. But the solution does have a large component of good management, and this includes a good quantity of common sense applied to distrusting unrealistic promises from rich sources of any kinds:

"Put not thy trust in princes."

Edmund C. Berkeley

Edmund C. Berkeley
Editor

c.a NUMBLES

Neil Macdonald
Assistant Editor
Computers and Automation

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

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

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

Andrew M. Langer
Newton High School
Newton, Mass.

NUMBLE 7111

```
            P R O V E R B S
are the  ×  E C H O E S
          E V H S R V B X S
          C E H V P O B V                    INF = OSH
       R E O B V H S C S
     E P X C R O R X V
     O O V P R X S H V
     C E H V P O B V
= R R C E S C S V B C O O X S      362742     132582
```

Solution to Numble 7110

In Numble 7110 in the October issue, the digits 0 through 9 are represented by letters as follows:

H = 0	A = 5
N = 1	D,W = 6
I = 2	R = 7
B,K = 3	S = 8
E = 4	T = 9

The message is: The thread breaks where it is thinnest.

Our thanks to the following individuals for submitting their solutions – **to Numble 719**: Penn Benner, Graham, N.C.; A. Sanford Brown, Dallas, Texas; T. P. Finn, Indianapolis, Ind.; James Godderz, Edison, N.J.; and Abraham Schwartz, Jamaica, N.Y.; – **to Numble 718**: Penn Benner, Graham, N.C.; R. J. Farrar, Barrington, Ill.; James Godderz, Edison, N.J.; and David P. Zerbe, Reading, Pa. – **to Numble 716**: M. S. Krishnamoorthy, Kanpur, India.

MARKETING EDP SERVICES — REVIEWING THE LEGAL CONSIDERATIONS

William A. Fenwick
Attorney
New York, N.Y.

"The users of data processing services are a lot like 'the old gray mare' in that they are not what they used to be. They are considerably more sophisticated now than they were five years ago. They are far more militant now than they have ever been; that militancy is going to increase and not decrease."

(Based on a talk to the American Bankers Association 1971 National Automation Conference)

What Kind of Services

A variety of subjects must be covered when banks first begin consideration of whether to provide EDP services to others. Among the most important is the definition of what the bank is going to provide. The simplest type of service (and the manner in which many banks first began the provision of EDP) is to rent time on the computer to others, letting the users provide everything but the computer. This situation came about primarily because the configurations required by the banks to do their own processing weren't economical if the configurations kept "bankers' hours".

At the other extreme, the most complex type of service is one which inludes the design, development and processing of special systems applications in an on-line timesharing environment. (I suspect few, if any, banks are in this deep.) Most banks are somewhere between these extremes.

Some of the considerations having legal significance in providing EDP services are: location and security of the computer operation; scope of the service to be provided; pricing of service; confidentiality of programs and data to be used; documentation of customers' needs; impact of special creditor statutes; and the contract under which service is to be provided.

William A. Fenwick practices law in New York City, and is admitted to practice before the courts of the State of N.Y., Eastern and Southern Districts of the Federal District Court, and the U.S. Supreme Court. He is a member of the N.Y. State Bar Association. He received a B.S. degree in Business Administration from Southern Illinois Univ., where he was also elected to Beta Gamma Sigma. He received his L.L.B. degree from Vanderbilt Univ., and was elected to the Order of the Coif.

Mr. Fenwick worked in systems for a few years and was primarily concerned with the design and execution of an operations scheduling and control system, systems controls, and systems trouble shooting.

Location and Security of the Computer Operation

Location and security of "your" (the bank's) computer installation is a problem even if you plan on offering the simplest service, that is, just providing the computer for users to operate. There must be some access to the computer room which doesn't breach sensible security precautions for the bank. I suspect few banks thought of this problem when they prepared their original computer room. From what I've seen of how the use of computers comes about, I'd be surprised if most people located them any differently than they had located their tab card machines. Unfortunately, most public relations men recognized that computers had a good deal of sex appeal; so some different arrangements were eventually made. For reasons which will be discussed later, and which have been the subject of articles in the press, their decision to put them on display wasn't good either.[1]

Now, however, accessibility to outside users should be a factor in planning your facilities, regardless of whether a full line of EDP services will be available or only the machines. Computer centers don't normally operate during hours convenient to humans. So unless you want to increase the already burdensome problem of physical security for the bank, you may want to locate the computer away from the banking facilities. The ease in using CRT's and similar remote terminals encourages such a separation.

Computer centers however do require security precau-

tions. In fact, they require a much tighter security than the bank. If thieves or vandals get at your bank buildings or the assets they contain, your insurance carrier and construction company will help you. If they get into your computer center, neither Zeus nor any one else can help you unless you have carefully planned your facilities.

Not only must you plan and provide physical security for your computer center, but you must provide reasonable backup. Such a backup must include a feasible way of creating all the important files required for the bank and its EDP customers. This includes a "security file" or "fire file" containing the master files, the programs and documentation necessary to process all the applications.

It disturbs me to find people with the foresight to have a "fire file" containing the appropriate data masters but who fail to realize the data masters in many cases aren't worth a damn if you don't have the program system and sufficient information to operate it.

Vulnerability of Computer Operation

Most organizations are becoming aware of the vulnerability of their computer operation, when it comes to vandalism. If they are banks, they should also be developing an awareness of the vulnerability of banks to embezzlement through the use of the banks' EDP.[2]

In the book "The Godfather" it was stated that a lawyer with his briefcase can steal more than a legion of thugs. Well, I'm happy to report my profession is no longer supreme in that regard. A sophisticated systems man (or boy) with a telephone or some punched cards so dwarfs lawyers in that respect that I expect to see a Cosa Nostra Programming and Systems Instruction Institute being formed any day now.

Accordingly, the systems security man for your EDP operation should probably be a devout paranoiac with an inferiority complex.

You must be aware of the problem of security both physically and electronically. You must protect against the guys on the outside as well as the guys on the inside. In addition, a 100% backup capability in data and programs is not a bad idea.

The legal significance of the location of your facilities is the tremendous liability to which you can be exposed in a multitude of actions (based on contract, tort, and statute) which can be brought if you fail to take adequate steps to protect your facilities. When you start providing EDP service for others, you may have no idea of the liability you are potentially assuming. A complete procedure utilizing your security package should be developed for all EDP services you market. It may imply that you will have to get more information about your customer's operation and it may imply spelling out the risk and how it is distributed in your contracts.[3] It may also imply that your insurance policy should be reviewed.

Deciding Scope of Service to be Offered

As stated earlier, the simplest type of service to provide is to make your computer available for use by other organizations. The users must provide all the programs, the necessary data, and the operator to run the machine. Your liability exposure to users of your service is probably less under these circumstances than they would be under any other arrangement.

However, your control over the use of your equipment, the security of your own programs, and – if you are using random-access devices which contain data in residence – the protection of your files is much less than would be the case if your personnel performed the processing. On the other hand, in all probability your liability would be restricted to damages caused by hardware failures (assuming none of the banks' software is utilized).

This option also poses the difficulty of having non-employees on the banks' premises. The ramifications such as insurance, bonding, and additional security obviously have to be considered.

The next logical expansion of the service to be offered would be the provision of the machine and an operator. The slight change in the scope of the service engendered by the provision of an operator has a substantial impact on your exposure to potential liability. It means that you must be concerned about processing controls to insure the accuracy of the processing. Hopefully, your customer will have developed controls within the system which can simply be exercised by your operator when he's processing the user's application. However, aside from any controls which are built into the system, you should provide the necessary operating control procedures to insure that the correct files are used in the processing, that the correct outputs are saved and properly identified, that your operator has sufficient operating information to properly process the application, and that sufficient information is given to your operating personnel in order that they can notify the customer immediately of any problems (should the application justify it). Delays may result in liability of unknown magnitude if you are aware of a dependency by the customer on a timely delivery.[4]

Adequate precautions must be taken to identify any data provided by the user which is considered confidential. Procedures must then be developed to insure that the data remains confidential. Since the bank's responsibility for erroneous processing is considerably enlarged, a procedure should be developed for isolating, in the shortest time possible, the cause of any erroneous processing. If the errors are caused by program failures or by erroneous input, it seems pretty obvious that the user would be responsible for any damage and for the cost of reprocessing. However, unless your system has a standard abort procedure, careful consideration should be given to developing procedures to be utilized by operators when processing errors become known. Most processing failures are the result of software problems (either in application programs or in supervisors), operator failures, or machine failures.

Under an arrangement whereby you are processing programs developed by others, there is an additional consideration which the banks must acknowledge. Customer programs may not be compatible with the bank's operating system. Therefore it may be necessary to have the user provide a duplicate of his operating system for loading when processing the user's application (because of the subtlety of some differences in operating systems, it may be that utilizing the users operating system is the safest procedure). Unless the user delivers a version of his operating system with every job he seeks to have processed, the bank's responsibility for maintaining updated operating systems is tremendously enlarged.

The next logical step in expanding the services that can be offered by the banks would increase the scope to providing the machines, the operators and the programs (either "canned" or special application programs). The

bank's responsibility under this option includes all of the areas encompassed in the previous options plus some additional items. Obviously, under this option the difficulty of determining the responsibility for erroneous processing is decreased; but it now is the bank's responsibility unless it's caused by erroneous input information supplied by the customer. Even in that case it may still be the bank's problem. Witness what happened to IBM in the *Clements Auto Company* case out in Minnesota.[5] In that case the chief failure was the inability to get the input correct. The input was prepared by Clements' employees. The court found IBM liable for almost half a million dollars in damages.

If you are providing this broad service, a number of important matters arise: your bank has now assumed the responsibility for maintaining and protecting all of the customer's files used in processing the customer's application. Adequate "fire file" precautions must be established. Also, sufficient retention cycles must be established to avoid disruptions in processing or the expensive re-creation of any files. Changes in the bank's operating system or any of its supporting software may well necessitate testing all customers' application programs. Unless the contract otherwise provides, the bank will assume responsibility for adequately testing any software it creates or modifies for a customer.

An extremely important property question is, Who owns the programs or the improvements of the programs? If the application is a generally accepted application such as payroll or accounts receivable, the problem is less difficult than it is where the bank is processing special cash flow or other unique applications for customers.

Scheduling

Another difficulty which you will probably incur is scheduling of your computer operation. There must be adequate provisions for scheduling customer applications and, of course, for juggling that scheduling when something goes wrong. There is also the problem of converting user files to accommodate the changes in the system and, of course, the initial creation of customer files when the banks first assume responsibility for processing. All of these areas are fraught with liability.

All of these problems and precautions are directed towards having your operation measure up to the legal standards which are likely to be applied. It is my opinion that anyone providing EDP services is going to be held to the standard of experts, while the customers will generally be treated as laymen.

There are sundry other items to be considered, such as the method of transporting the data, the preparation of the data for the system, the amount of editing to be provided, and the error resolution to be accomplished by the bank which enters into any customer applications.

Perhaps the best way to demonstrate the immensity of one of these items, the conversion task, would be to tell a story about the first systems man who ever faced a massive conversion problem. This fellow was born in the year zero under what some folks consider to be questionable circumstances. He was a very precocious youngster and set about his systems training rather early. When he finally got it all together and decided upon a design for his system, he was faced immediately with the task of converting the masses to his system. He got himself 12 programmers, 11 of whom were pretty good, some fish, and some stale bread, and went about his task with a good deal of zest. Everything went well for a while in the development of his new system until he got to the conversion part. At that point, he incurred a good deal of difficulty, which eventually led to his giving up the ghost and a great effort by his disciples to execute his design. Since then, there have been so many deviations, digressions, and revisions in his system that I suspect he might neither recognize nor claim credit for having initiated the whole thing. In any case his original system which received a very well-known name is now made up of an enormous variety of systems.

Pricing

In pricing the services you're going to offer, whatever your pricing structure, it must be based on the service provided and nothing else. It's quite clear that if you undertake to provide data processing services to your bank customers at prices different from those available to the public in general, you're in for problems. The antitrust laws prohibit tie-in arrangements.[6] More importantly, the Bank Holding Company Act Amendment of 1970[7] elaborates on the prohibition. There are also Robinson-Patman[8] considerations which must be given to any pricing structure. Under the combination of the antitrust laws and the Bank Holding Company Act, it's pretty clear that the spectrum of persons with standing to sue includes your customers, your competitors, and your competitors' customers. As most banks know, the specific regulations which will be applied under the Bank Holding Company Act amendments have not been definitively promulgated at present. Therefore, any attempt to elaborate on that subject at the present is premature.

Adequate Provision for Confidentiality

Whether you provide EDP services or not, you (the bank) must be concerned with the issue of privacy and confidentiality. Providing EDP services to others just enlarges your responsibility in that respect. It also increases the difficulty of control, in some instances, because your personnel may come to possess information about individuals and organizations which they would not have, but for the processing of EDP applications of your customer. You must, of course, be concerned about your customers' data and programs and their use by your personnel. Additionally, you must make provision for the confidentiality of your programs, if you consider them confidential. The issue of the ownership and use of customer application programs is also an integral part of the confidentiality which must exist. Add to this the history of mobility of EDP people, and you begin to perceive the magnitude of the problem. So far as employees are concerned, I suspect the best you can do is to make sure that your employment contracts with your employees sufficiently cover the confidentiality arrangements with which you must operate.

Documenting the Needs of Customers Adequately

It is necessary and desirable to adequately document the needs of your customers. That documentation ought to be provided to your operating personnel as well as be put into your "fire files". Unfortunately, there is a tendency to ignore the documentation problem by relying upon unrecorded information which is accumulated by your employees.

Impact of Special Credit Statutes and Regulations

As you may know, the public presently considers itself abused, and rightly so, as a result of the invoicing and dunning procedures which have been devised by many large organizations for use in their computer-based accounts-receivable systems.

The abuse has become so rampant that some states have proposed or enacted laws providing special responsibilities for organizations having credit relations with the public.[9] There is also a proposed FTC Trade Regulation Rule[10] which was released for comment in October of 1970, and a proposed federal law which has been introduced into the 92nd Congress as Senate Bill S.652. The thrust of the federal law and some of the state laws is to force an organization to respond to complaints by the public regarding the maintenance of customers' accounts.

The vehicle which is generally used and which is made a part of the federal bill is to require the creditor to respond to a debtor's complaint within a specified number of days and to make adjustments or to justify a refusal to make adjustments within the specified number of days. The penalties for not complying are set out in the statutes. They provide that the amount in dispute cannot be collected if the procedures prescribed by the act are not followed. They also provide for additional damage if the records are in fact in error. The creditor is liable for reasonable attorneys' fees if the debtor's action to collect the damage is successful.

In addition to the statutory regulations of the debtor-creditor relationship, you should also be familiar with the *Ford Motor Credit Company v. Swarens*[11] case which was decided by the Kentucky High Court in 1969. In that case, the Court granted punitive damages to a debtor who had been abused by computer failures. If you seek to provide EDP services you would not only be liable to the debtor in such a situation, but you would incur additional liability for the damage caused your customer as a result of your failures.

Contract Termination

A most important item related to the contract is the termination clause, and it should be contained in all of your contracts.

For example, a case is now pending in the Federal District Court in the Eastern District of New York. In this case a service bureau refused to turn over a customer's files to the customer, for a variety of reasons. Initially, the refusal took the form of a denial of breach of contract, with an offer to assist if the customer would sign a release. Upon receiving such a release the service bureau would then undertake, at the customer's expense, to reformat all the files and deliver them to the customer.

Subsequently, the data processing organization took the position that there had been no breach of contract, and therefore, they would not honor a termination notice given by the user. The basis for refusing to turn over the files was a claimed trade secret which would be revealed by the files.

Plaintiff made an application for a preliminary mandatory injunction requiring the turning over of the files in the form that they presently existed. There was a factual hearing on the subject of whether such turn-over would disclose a trade secret. The Court found that it would not, and is in the process of ordering all the files to be turned over.

I have greatly simplified what was in fact a very complex case. My purpose in so doing is to tell you that the cost to the customer to get back his files containing most of his business records has been pretty tremendous.

It is my belief that a termination clause of appropriate type would have avoided the loss for both parties. Such a clause in every contract for EDP services can avoid the economic loss to the disputing parties as well as the economic loss to society. In this regard, the provision of data processing services resembles somewhat a marriage contract. If either party becomes dissatisfied with the other, there should be the equivalent of a separation or divorce proceeding which can end the unhappy relationship.

Conclusion

The users of data processing services are a lot like "the old gray mare" in that they are not what they used to be. They are considerably more sophisticated now than they were five years ago. They are far more militant now than they have ever been; that militancy is going to increase and not decrease. They can no longer be expected to swallow the explanation that the computer goofed it up. The successes they have gained in the limited number of litigations so far have substantially increased their bargaining position in any disagreement. The success has spawned numerous other actions.[12]

It has always been thought by most lawyers and business organizations that the most expensive type of litigation from the standpoint of counsels' fees and disbursements is an antitrust case. After my involvement over the past four years in computer litigations and antitrust litigations, I am convinced that the cost of litigating computer cases will dwarf the cost of an antitrust case. What I am trying to say is that even if you are successful in your defense against an action, your loss is going to be tremendous. Therefore, it becomes very crucial that the negotiation and the eventual contract between your customer and you should be forthright and err on the side of *inclusion* – if there is to be error. It seems to me that you are going to have the obligation to make sure that your customers understand what they're getting into. If you utilize a sales force, you must impress upon the sales force the tremendous importance of not exaggerating the benefit or magnitude of the services you provide. □

Footnotes

1. "Sabotage, Accidents and Fraud Cause Woes for Computer Centers", *Wall Street Journal*, p. 1, col. 7, Apr. 1971
2. *Id.* and Gellman, "Using the Computer to Steal", *Computers and Automation*, p. 16, Apr. 1971
3. Boonin, "Who Should Pay for 'Risk of Revolution' in New Technologies?" *Case and Comment*, p. 38, Nov.-Dec. 1970
4. *Hadley v. Baxendale*, 9 Ex. 341, 156 Eng. Rep. 145 (1854)
5. *Clements Auto Company, dba Southern Minnesota Supply Co. v. The Service Bureau Corporation*, 298 Fed. Sup. 115 (D. Ct. Minn., 1969). Affirmed in part by the 8th Circuit Court of Appeals, Apr. 27, 1971.
6. Clayton Act Sec. 3, 15 U.S.C. Sec. 14 (1964). See also *Report of the Attorney General's National Committee to Study the Antitrust Laws 140* (1955).
7. Public Law 91-607 (1970)
8. Clayton Act Ch. 2
9. California Laws 1970, A.B. No. 433 (1970); State of N.Y. Senate Bill No. S.3888 (Assembly Bill No. A.5093). Introduced in 1971-72 Regular Session.
10. FTC Notice of Public Hearing, issued Oct. 8, 1970
11. Ky., 447 S.W.2d 53 (1969)
12. "Computer Companies are Hauled into Court by Flurry of Lawsuit", *Wall Street Journal* (Nov. 30, 1970), p. 1, col. 7. See also "Law Suits, Who're at Fault When the System Fails", *Business Automation*, p. 8 (Feb. 15, 1971). □

INFORMATION RETRIEVAL IN LAW

"With the computers now available it is possible to perform quickly, accurately, and economically the tedious and repetitious steps involved in retrieving from a general body of legal literature particular cases, statutes, or rulings relevant to the problem at hand."

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During the process of gathering information for this study, several attorneys were interviewed. One of them perhaps summed up the feelings of a number of his colleagues when he said, "Something must be done about the problems lawyers face in legal research". What this attorney was only vaguely aware of and what most attorneys are totally unaware of, is that for a considerable period of time, research and experimentation has been conducted in the field of information retrieval in law.

An essential but time consuming and frustrating part of every lawyer's practice is spent in legal research. Attorneys spend hours checking indexes and digests, and looking up and reading numerous cases. They then are faced with the fact that most of their work must be discarded as not in point and their finished product is not certain of being correct.

Basically, the chief problem of every lawyer is that he is faced with a morass of documents which threatens to eventually inundate him. The volume of jurisprudential material staggers the imagination. Tens of thousands of new cases and statutes are being added each year to this already formidable backlog of material. This amount of material, plus the limitations of the indexing systems currently available, are major reasons for the uncertainty as to what the law actually is on a given point.

A secondary, but also very severe problem faced by attorneys, is the cost of their law libraries. Most attorneys try to obtain from forty to sixty dollars per hour for their services and a substantial part of this is spent on keeping their libraries up-to-date.

It is for reasons such as these that the lawyer must have a better means of research. Committees of the American Bar Association have been devoting attention to the area of information retrieval in law since 1952. Since that date, a number of systems have been developed by Bar Associations, government agencies, and private individuals. This article will center, however, on the OBAR (Ohio Bar Automated Research) system developed by the Ohio State Bar Association in conjunction with Mead Data Central, Inc. It will be shown how this system operates, what results it has produced so far, and how it might be applied to the problems of lawyers in order to improve their own professional skill and performance, as well as benefiting their clients.

Until the emergence of third generation computers, computer technology was not sufficiently developed to meet the needs of the legal profession. With the computers now available it is possible to perform quickly, accurately, and economically the tedious and repetitious steps involved in retrieving from a general body of legal literature particular cases, statutes or rulings relevant to the problem at hand.

How OBAR Operates

In order to use the OBAR system, it is first necessary to begin the actual search by stating the question to be asked the computer as an actual question of law. The computer can search for key words or phrases if the question is arranged or stated in terms the computer can recognize. This process is referred to as "search framing". In order to frame a question for computer use, it is necessary to identify each major element of the question as well as all of the ways in which a court might discuss the particular question. "The ordinary search under the OBAR system will be a full text search of each case in the data base. This then is the first segment or command of the search frame."[1] The computer proceeds to search the data base for cases meeting the specifications of the command. After only a few seconds, the computer reports that it has located a certain number of cases with these phrases in them and asks if they should be printed. If the searcher wishes to have a smaller number of cases which deal more directly with his question, he signals the computer to modify the search. The modification request instructs the computer to locate among the cases with the key phrases in them those which also have additional key words in them which have been supplied by the searcher. Upon receiving the additional request, the computer proceeds again to search and within a few more seconds, reports that out of the original number of cases it has found, a certain smaller number also discuss the other key words. Once again, the computer requests instructions as to whether it should print these cases. The search may again be modified by the

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requirement that even more key words appear in the cases. When the searcher decides he wishes to see these cases printed, he responds to the computer by telling it to print them. The searcher then specifies the format in which the cases retrieved are to be printed and the output device which is to be used. In case format, the searcher can instruct the computer to print the full text of all cases received, case citations only, citation plus headnote and syllabus or citation plus a specific segment of the case (e.g., the dissent). "During extensive testing of the system, numerous searches have been timed. Total times have been observed from a minimum of twenty seconds to a maximum of three minutes."[2] The accuracy of the information retrieved was found to be of high quality.

Unique Features of OBAR

This system is characterized by important features which combine to distinguish it from other systems of computerized legal research. These features are: 1) The system operates by searching the full text of the legal material on a word-search basis, so there is no need for any indexing, digesting or any tampering with the original materials; 2) it is a full time-sharing system so that law firms who wish to do so may obtain their own consoles and contact the computer directly from their own offices; 3) the program permits the lawyer to conduct a continuing dialogue with the computer for a "rapid and accurate review of legal materials contained in the computer memory bank, entirely on the basis of his own judgement as to what materials he wants to see and how he wants them searched, with a high degree of accommodation to his own personal research preferences and habits."[3]

The fact that there is no indexing of the material in the computer's memory bank is advantageous because it means that no separate intelligence is placed in between the lawyer who is doing the research and the judge or legal scholar who wrote the material being researched.

Another important feature of the OBAR system is that the lawyer may use his own ingenuity in developing any question he wants to ask of the computer and isn't limited to any prepared groups of questions. "The computer is his mechanical servant, acting as an extremely rapid reader of a large volume of material and sorting out from it those documents which are relevant to the question he has asked."[4]

Advantages and Limitations of the Computer

When using conventional methods of research, a lawyer must, at some point, make a decision as to how far to go in his research. This decision is usually based, among other things, on the dollar value of the case. When a computer is used, these decisions are made unnecessary because of the rapid time in which a search can be conducted. This enables the lawyer to serve each client more fully, regardless of the dollar value of the case. It also enables him to serve more clients and to devote more of his research time to interpretation.

The computer will assume much of the drudgery for an attorney and save time for innovative activities. In this way, it can actually reward the innovative mind.

When the attorney has more productive time, he can probably handle more cases. The cost of legal services should go down in proportion to the savings in research expense, and, therefore, many persons not now willing or able to afford legal assistance will be brought into the market.

It should also be pointed out that the computer would in no way supplant the attorney. He will still have to isolate and define the problem of action to pursue. The better the attorney knows the laws of his state and the tendencies of the courts, the better he can use the system. Like the traditional manual research, the lawyer's analysis of the information which he has retrieved may induce him to redefine his problem, to do further research, or to take action based on conclusions drawn from the materials at hand. "In using the computer to retrieve desired cases, statutes, etc., only the drudgery of research will be delegated to the machine; the essential decisional part of the process will remain in the hands of the attorney".[5]

The computer, however, will not correct bad research habits. The lawyer must fully comprehend and come to grips with the legal problem he is faced with, before he ever goes to the computer. Also, the lawyer must be aware that the computer is not infallible and documents may be retrieved that turn out not to be relevant. However, relevance itself is subjective and to retrieve a document that is not relevant is not as bad as failure to pick up one that is relevant. Another hazard of the computer is that it can result in irresponsibility on the part of the lawyer and cause laziness in getting a job done.

Computers to Replace Law Libraries

In discussions of information retrieval in law, little has been written about the ability of the computer to substantially reduce the size of the law libraries. As was previously mentioned, a substantial part of a lawyer's fee may be spent in keeping his library up-to-date. Attorneys whom I have interviewed have stated that for a small firm, the law library

may represent an initial investment of approximately $3,000 with an annual upkeep of $2,000 for supplements to the lawbooks. For a very large firm, the initial investment may go as high as $50,000, plus $12,000 a year upkeep.

One of the most frequent complaints voiced by lawyers is that they are being victimized by lawbook publishers. There are quite a number of objectionable practices of the publishers, but one of the most egregious is the practice of sending unsolicited books to lawyers and law libraries, where they frequently do not get careful scrutiny and are imprinted with the firm or library stamp and placed on the shelf before their true nature is detected. Other unfair practices which are commonly used are: Putting new titles and new bindings on old books, including the same book in two different sets, using advertising circulars and letters that mislead, and failing to issue supplements for books that otherwise soon will become obsolete.

The reason that lawyers have been victims of the unfair practices of the producers of their most important working tools, is that the time of the modern lawyer is too valuable for him to devote much of it to the examination and selection of new books and the careful scrutiny of advertising circulars, invoices, and even the books that publishers send to him. Most often it is an inexperienced or uninterested person who is delegated these duties and that person is usually not qualified to detect the true nature of the publishers' practices.

"This kind of handling of book acquisitions by lawyers sometimes results in payment more than once for the same material and the purchase of more than one copy of the same or substantially the same item."[6] Also, sometimes when a lawyer pays from $15 to $25 for a particular lawbook, he is fortunate if he has the opportunity to use the book once in his entire career.

Some attorneys have been able to circumvent the considerable expense of maintaining a large library by using the facilities of county law libraries or law school libraries. However, even this results in a considerable amount of lost time when the necessary information is not at the lawyer's fingertips. Usually attorneys are willing to lend lawbooks to other attorneys but, as was pointed out previously, the lawbooks are the attorneys' working tools and this privilege of borrowing can be quickly abused.

As a result of the need to protect the lawbook consumers, Bar Associations have set up committees to screen books, supplementary material, etc., for the purpose of informing lawyers as to which material should be purchased and which should be rejected.

The computer has already helped to alleviate the law library problem. In the OBAR system, the computer's memory bank contains the full text of the constitution and the code of statutes, plus the reported decisions of all the courts. "In other words, the computer memory bank in Ohio contains a complete library of all Ohio primary research materials."[7] Soon the data base will be enlarged to include Federal materials such as the Internal Revenue Code and Regulations.

On the horizon are computers with infinitely more capability for the storage of data in less space and speeds of manipulation of this information which will stagger the imagination. The savings to attorneys could prove to be enormous not only because of research time saved, but also because the computer could substantially cut down the size of law libraries.

Future of OBAR

The question of cost will naturally be of the highest importance in the minds of potential users of computerized legal research. "The OBAR estimates that a lawyer with even limited expertise in search framing should be able to obtain results for about $20 per inquiry. As the lawyer becomes more skilled in search framing, he will be able to substantially reduce his charges for computer time."[8] In contrast, Texas attorneys who use the services of the Legal Research Board of the University of Texas Law School currently pay a $20 basic fee plus $2 per page for each inquiry, besides the fact that they must wait a month for their reply. Either one of these two methods is cheaper than maintaining a law library.

The future seems to offer unlimited potential for the use of computers in legal research. With its computerized legal information system on-line in Ohio, Mead Data Central has an agreement with the New York State Bar Association to move toward establishment of a New York system as its next step. It seems that the legal profession can best be served if the organized Bar retains substantial control over the development of information retrieval systems.

There are problems still to be solved, some of which are technical, but the greatest problems to be faced involve human beings. In my interviews with both lawyers and law students, there was much skepticism regarding the system, mostly centering around how questions could be properly framed. However, once these people can be convinced of the worth of the system, the rest should come more easily. "Training of lawyers in the Ohio firms which are now using the system has been accomplished in a matter of one or two days".[9]

The OBAR system is practical and it is the most advanced legal information retrieval system in the U.S. today. Its acceptance could be one of the most progressive steps ever taken by the legal profession. □

Footnotes

1. Frank J. Troy, "Ohio Bar Automated Research – A Practical System of Computerized Legal Research", *Jurimetrics Journal*, Vol. 10, (Dec., 1969) p. 62
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3. William G. Harrington, "Computers and Legal Research", *American Bar Association Journal*, Vol. 56, (Dec., 1970) p. 1146
4. *Ibid.*
5. W. Ronald Robins, "Automated Legal Information Retrieval", *Houston Law Review*, Vol. 5 (Mar., 1968) p. 691
6. Raymond M. Taylor, "Lawbook Consumers Need Protection", *Texas Bar Journal*, Vol. 32 (Nov., 1969) p. 783
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STEP MOTORS AND DIGITAL COMPUTERS

"The relatively low cost of new types of controls and the economy of the small motor design have worked a virtual revolution in the drive trains of modern equipment."

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SMALL motors can now produce accurately controlled motion economically, thanks to solid-state controls. The new controls and motors are used mostly for converting the logic commands to motion for numerically controlled tools, digital computers, and associated equipment, although applications for larger units, ranging from curtain rods to high-speed trains, are coming along rapidly.

The new types of electric motors are far from the original designs of the late-19th century. Then, motors were large machines designed to run continuously to replace the steam engine or the water wheel as a prime mover for the line shaft in a factory. The driven machinery was started, stopped, and controlled by clutches, brakes, and its own internal mechanism.

After World War II, there was a surge in the application of advanced technology, particularly servomechanisms, for industrial uses. Motor designs were tailored to specific applications, with advanced electrical controls to start, stop, and reverse the motors and to change their speed or move them a step at a time. Consequently, it has become economical to use small motors of many special sizes and types plus their electrical controls, rather than to duplicate the same capabilities by more conventional mechanical drives. Finally, computer control of machinery has required electrical drive circuits that can translate the logic commands from the computer into motion.

The "stepping" motor has been adopted primarily for driving computer-controlled equipment. Power is fed in pulses at any desired rate, rather than continuously at 60 cycles per second. The motor is so designed that each pulse of power causes the rotor to advance by a fixed number of degrees; for example, one pulse of power might move the rotor forward 1/200th of a revolution. The controls may be either transistors or silicon-controlled rectifiers. The relatively low cost (about $1 per watt) of these types of controls and the economy of the small motor design have worked a virtual revolution in the drive trains of modern equipment. The market for stepping motors is estimated to be about $20 million already, with rapid growth expected within the next five years.

If the object to be controlled is a rotating device, the motor may be connected to it directly or through a train of gears. If it is to be moved back and forth in a straight line, the motor may be connected directly to a lead screw, which by its rotation and screw action causes the device to be moved in a straight line. If, for example, the computer wants a shaft to rotate 45 degrees or 1/8 of a revolution, the electrical control system for a 200-step motor will emit 25 pulses into the stepping motor windings. Correspondingly, the stepping motor moves forward 25/200 of a revolution, and thus accomplishes the desired angular rotation. Modern solid-state control circuits can deliver as many as 10,000 separate pulses per second to a stepping motor that can respond within a fraction of a second.

Because such a motor is not tremendously powerful, when large amounts of rotating power are required, a hydraulic booster is added to the motor drive circuit. With such a hydraulic booster, very sizeable torque can be developed; 10-horsepower units are available, and 40-horsepower units are coming soon.

Stepping motors of this type have found wide application in numerically controlled machine tools. Here, the control information from a computer or a punched paper tape directs the electrical control circuit to emit a train of pulses of the desired duration to the desired

stepping motors. They, in turn, can rotate the lead screw of the machine tool table, causing the table to advance to the predetermined points in space. Control of the table within 0.0001 inch can be obtained easily. Furthermore, with the rapid pulsing capability of the solid-state control, such steps can be produced fast with the same motors that also produce the slow feed of the machine tool table during the work cycle. With the wide use of minicomputers that can not only perform the controlling functions, but also take care of record keeping, the use of stepping motors in manufacturing is expected to increase dramatically.

Numerically controlled machine tools are only a small fraction of the potential for direct digital controls, however. Other possibilities are manufacturing operations that now require hand labor. Many highly automated factories already use small motors and controls to make fine adjustments.

Still more recently, linear motion has been achieved with linear induction motors; instead of rotating an armature, the stator moves along an aluminum track, which is basically the armature, and remains in a fixed position. Applications include conveyors, materials handling systems, and sliding doors. A linear motor to move curtains without pulleys or other hardware can be hidden behind the traverse rods in a capsule one inch wide and six inches long. Other designs are being tested in systems for handling baggage. Huge linear motors are being developed to drive high-speed trains running along an aluminum reaction rail that carries no electrical current, but functions as the stationary part of the motor. By controlling the frequency of the power to the windings of that portion of the motor carried on the train, the speed can be controlled and both driving and braking actions can be achieved, all by the same techniques.

Another variety of machine control drive is the low-inertia DC motor. The demand for rapid starting and stopping, together with controlled rotation can be achieved by a DC motor of special design in which rotating parts have very low inertia and therefore can be started and stopped rapidly with a minimal amount of energy. Low inertia is achieved by designing the motor's rotating parts without large masses of iron, as in the conventional motors designed for continuous steady-state operation. A recent development is the brushless DC motor. Ordinarily, direct-current motors have a commutator to switch the current from one to another of the coils on the rotor. The commutator is a source of trouble because of the inevitable arcing caused by the making and breaking of the electrical circuits. Brushless motors have been developed where the brush function is replaced by transistors that switch the current in succession from one coil to another as the rotor turns. Not only does the structure last longer, but the absence of arcing eliminates electrical interference in surrounding circuits. Some of the newest of these small units cost about $10, compared with perhaps $50 for older types of low-inertia motors.

FORTRAN COMES TO WESTINGHOUSE-BETTIS, 1957

Herb Bright
Computation Planning, Inc.
5401 Westbard Ave.
Washington, D.C. 20016

It was late Friday afternoon, April 20, 1957. Ollie Swift, Lew Ondis, and I were standing in the hallway outside the 704 room, talking as usual, about when we'd finally get rid of the 650, when along came the mail carrier with a box of cards from IBM.

Curious, I opened the package and found that the deck was binary, and that it just about filled the (2000 card) box. There were no identifying marks and no instructions of any kind in or with the box or in other mail received that day.

Lew estimated that the size of the deck was about the right order of magnitude to be the "late 1956" FORTRAN compiler. It occurred to me that, if we could make it work, this fact would make interesting news at SHARE. (There was to be a SHARE Meeting the following Monday, to which I was going as the WB — Westinghouse-Bettis Laboratory — representative.) Our head CE came by and agreed to let us have some maintenance time on the 704 free, if we wanted to try to make FORTRAN go.

Jim Callaghan had written a small test program in FORTRAN, using a recent report by Ollie as a basis for

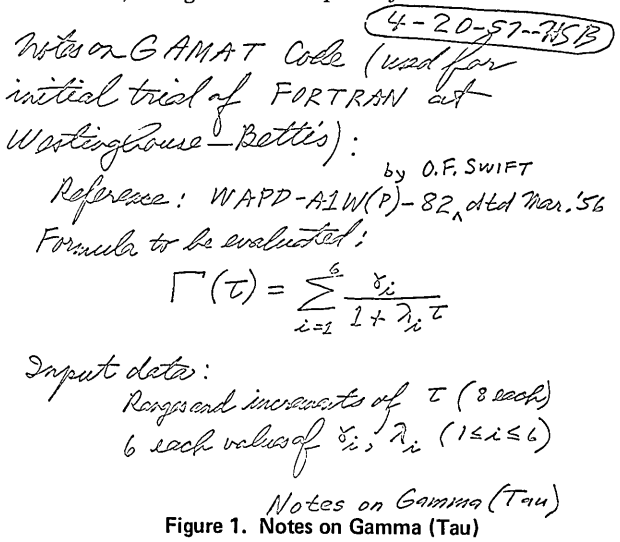


Figure 1. Notes on Gamma (Tau)

calculating "Gamma of Tau for the InHour Formula". (See Figure 1.) Lew commented that, if the FORTRAN group had its smarts, the compiler deck should be self-loading; why not try it and see? Ollie suggested a way to test the possibility: hang a full set of blank tapes (ten) and try to go in through the on-line reader. Of course, our 704 had the SHARE Standard Reader, Printer, and Punch Boards (remember?). IBM had started to use these and the SHARE Standard RPQ's. Incredible though it might seem today to those who were weaned on Systems, it just might be that we could fly the new compiler blind!

We mounted the blanks, saw that the on-line punch was stocked, loaded the first several inches of cards into the hopper, and pushed the commencer. The reader stuttered and a couple of tapes moved. We kept carding the hopper until all the cards had been put in. The DRUM WRITE light showed some action. After the last card had been fed, there was compute activity for several seconds, after which all of the tapes that had moved were rewound. The machine stopped, with the READY light on.

We then loaded Jim's FORTRAN source language deck, which didn't need input data other than that contained in the program, and again pushed READ CARDS. The deck chugged through. This time there was more tape motion, including a couple of tapes that hadn't moved before. The console lights came alive, and the on-line printer gave us four lines of output. (See Figure 2, which is a photograph of that output.) Below a heading, the printer had reproduced the source card containing Statement 25 followed by a startlingly explicit diagnostic, as follows:

```
05065 SOURCE PROGRAM ERROR.  THIS IS A
  TYPE -
GO TO ( ), I
- BUT THE RIGHT PARENTHESIS IS NOT
  FOLLOWED BY A COMMA
```

We looked. How true! We fixed Statement 25 and loaded Jim's source deck again.

This time the on-line punch muttered and its stacker grew a binary deck, which we placed in the on-line reader. Again, everything stopped with tapes rewound and READY on. Again, we pushed. Cards read. Rewound, stopped, READY on. Pushed.

We got a little whiff of computing followed by twenty-eight pages of output. (You ask: So what has changed?)

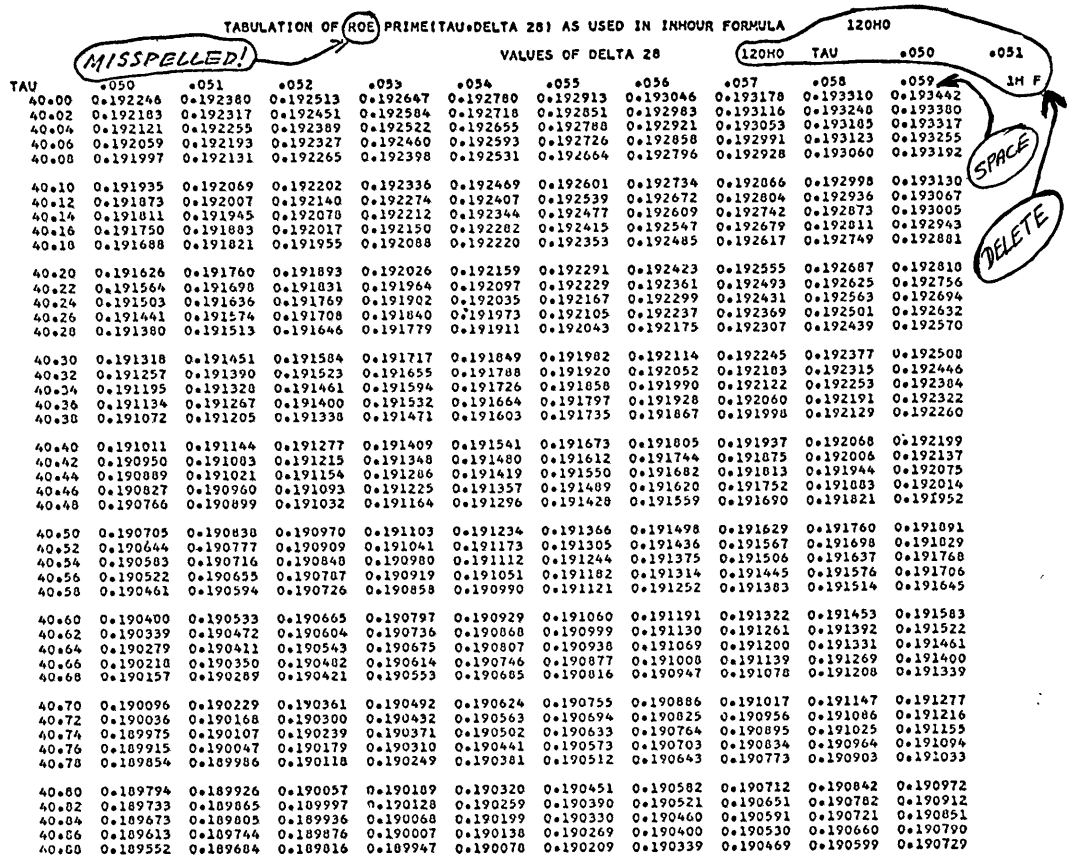
The first page of that output is reproduced here as Figure 3. You will note that it contains several FORMAT errors (no space below the column heads; the first column head displaced to the left; six items printed that should have been blind; and one word of the page heading (RHO) misspelled).

```
                    FORTRAN DIAGNOSTIC PROGRAM RESULTS

   25       GO TO (200,210,220,230,240,250,260,270,280,290,300,310,320,330)M
05065       SOURCE PROGRAM ERROR.  THIS IS A TYPE-GO TO ( ),I-BUT THE RIGHT PARENTHESIS IS NOT FOLLOWED BY A COMMA

                    END OF DIAGNOSTIC PROGRAM RESULTS
```

Figure 2. Gamma (Tau) Diagnostic Printout



TAU	•050	•051	•052	•053	•054	•055	•056	•057	•058	•059
40•00	0•192246	0•192380	0•192513	0•192647	0•192780	0•192913	0•193046	0•193178	0•193310	0•193442
40•02	0•192183	0•192317	0•192451	0•192584	0•192718	0•192851	0•192983	0•193116	0•193248	0•193380
40•04	0•192121	0•192255	0•192389	0•192522	0•192655	0•192788	0•192921	0•193053	0•193185	0•193317
40•06	0•192059	0•192193	0•192327	0•192460	0•192593	0•192726	0•192858	0•192991	0•193123	0•193255
40•08	0•191997	0•192131	0•192265	0•192398	0•192531	0•192664	0•192796	0•192928	0•193060	0•193192
40•10	0•191935	0•192069	0•192202	0•192336	0•192469	0•192601	0•192734	0•192866	0•192998	0•193130
40•12	0•191873	0•192007	0•192140	0•192274	0•192407	0•192539	0•192672	0•192804	0•192936	0•193067
40•14	0•191811	0•191945	0•192078	0•192212	0•192344	0•192477	0•192609	0•192742	0•192873	0•193005
40•16	0•191750	0•191883	0•192017	0•192150	0•192282	0•192415	0•192547	0•192679	0•192811	0•192943
40•18	0•191688	0•191821	0•191955	0•192088	0•192220	0•192353	0•192485	0•192617	0•192749	0•192881
40•20	0•191626	0•191760	0•191893	0•192026	0•192159	0•192291	0•192423	0•192555	0•192687	0•192818
40•22	0•191564	0•191698	0•191831	0•191964	0•192097	0•192229	0•192361	0•192493	0•192625	0•192756
40•24	0•191503	0•191636	0•191769	0•191902	0•192035	0•192167	0•192299	0•192431	0•192563	0•192694
40•26	0•191441	0•191574	0•191708	0•191840	0•191973	0•192105	0•192237	0•192369	0•192501	0•192632
40•28	0•191380	0•191513	0•191646	0•191779	0•191911	0•192043	0•192175	0•192307	0•192439	0•192570
40•30	0•191318	0•191451	0•191584	0•191717	0•191849	0•191982	0•192114	0•192245	0•192377	0•192508
40•32	0•191257	0•191390	0•191523	0•191655	0•191788	0•191920	0•192052	0•192183	0•192315	0•192446
40•34	0•191195	0•191328	0•191461	0•191594	0•191726	0•191858	0•191990	0•192122	0•192253	0•192384
40•36	0•191134	0•191267	0•191400	0•191532	0•191664	0•191797	0•191928	0•192060	0•192191	0•192322
40•38	0•191072	0•191205	0•191338	0•191471	0•191603	0•191735	0•191867	0•191998	0•192129	0•192260
40•40	0•191011	0•191144	0•191277	0•191409	0•191541	0•191673	0•191805	0•191937	0•192068	0•192199
40•42	0•190950	0•191083	0•191215	0•191348	0•191480	0•191612	0•191744	0•191875	0•192006	0•192137
40•44	0•190889	0•191021	0•191154	0•191286	0•191419	0•191550	0•191682	0•191813	0•191944	0•192075
40•46	0•190827	0•190960	0•191093	0•191225	0•191357	0•191489	0•191620	0•191752	0•191883	0•192014
40•48	0•190766	0•190899	0•191032	0•191164	0•191296	0•191428	0•191559	0•191690	0•191821	0•191952
40•50	0•190705	0•190838	0•190970	0•191103	0•191234	0•191366	0•191498	0•191629	0•191760	0•191891
40•52	0•190644	0•190777	0•190909	0•191041	0•191173	0•191305	0•191436	0•191567	0•191698	0•191829
40•54	0•190583	0•190716	0•190848	0•190980	0•191112	0•191244	0•191375	0•191506	0•191637	0•191768
40•56	0•190522	0•190655	0•190787	0•190919	0•191051	0•191182	0•191314	0•191445	0•191576	0•191706
40•58	0•190461	0•190594	0•190726	0•190858	0•190990	0•191121	0•191252	0•191383	0•191514	0•191645
40•60	0•190400	0•190533	0•190665	0•190797	0•190929	0•191060	0•191191	0•191322	0•191453	0•191583
40•62	0•190339	0•190472	0•190604	0•190736	0•190868	0•190999	0•191130	0•191261	0•191392	0•191522
40•64	0•190279	0•190411	0•190543	0•190675	0•190807	0•190938	0•191069	0•191200	0•191331	0•191461
40•66	0•190218	0•190350	0•190482	0•190614	0•190746	0•190877	0•191008	0•191139	0•191269	0•191400
40•68	0•190157	0•190289	0•190421	0•190553	0•190685	0•190816	0•190947	0•191078	0•191208	0•191339
40•70	0•190096	0•190229	0•190361	0•190492	0•190624	0•190755	0•190886	0•191017	0•191147	0•191277
40•72	0•190036	0•190168	0•190300	0•190432	0•190563	0•190694	0•190825	0•190956	0•191086	0•191216
40•74	0•189975	0•190107	0•190239	0•190371	0•190502	0•190633	0•190764	0•190895	0•191025	0•191155
40•76	0•189915	0•190047	0•190179	0•190310	0•190441	0•190573	0•190703	0•190834	0•190964	0•191094
40•78	0•189854	0•189986	0•190118	0•190249	0•190381	0•190512	0•190643	0•190773	0•190903	0•191033
40•80	0•189794	0•189926	0•190057	0•190189	0•190320	0•190451	0•190582	0•190712	0•190842	0•190972
40•82	0•189733	0•189865	0•189997	0•190128	0•190259	0•190390	0•190521	0•190651	0•190782	0•190912
40•84	0•189673	0•189805	0•189936	0•190068	0•190199	0•190330	0•190460	0•190591	0•190721	0•190851
40•86	0•189613	0•189744	0•189876	0•190007	0•190138	0•190269	0•190400	0•190530	0•190660	0•190790
40•88	0•189552	0•189684	0•189816	0•189947	0•190078	0•190209	0•190339	0•190469	0•190599	0•190729

Figure 3. Gamma (Tau) Output — Page 1 of 28

But the numbers were right. The numbers were right!

WB had become a FORTRAN user.

Postlude: Thanks to the hard-working Bettis photographer, who rose to the challenge and made projection slides for me over that weekend, I was able to share the above experience with SHARE. It created quite a stir. No one arose to claim precedence.

I'm sure that other SHARE installations, including especially UA (United Aircraft Research) and RL (University of California Radiation Laboratory), which had participated in the creation of the first distributable FORTRAN compiler, must have had successful FORTRAN experiences on site before WB, which was merely a user ... but it's hard for me to imagine that any of those sophisticates experienced the combination of innocence, ignorance, and exhilarating success that we felt that Friday in 1957. A couple of hundred compiler fixes down the road, it was hard to believe it had happened.

So, to John Backus and the rest of the thirteen Merry Men* of FORTRAN, thirteen years later: Thanks! Your first FORTRAN Compiler loaded, compiled, diagnosed; its object code loaded, executed (correctly!), and printed out (complete with our FORMAT errors).

Computing would never be the same.

---

*R. J. Beeber, S. Best, R. Goldberg, H. L. Herrick, R. A. Hughes, L. B. Mitchell, R. A. Nelson, R. Nutt, D. Sayre, P. B. Sheridan, H. Stern, I. Ziller

Page 1

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PS Form 3526 July 1971

COMPUTERS INSTALLED IN AMERICAN RAILROADS

R. A. Petrash, Exec. Director
Data Systems Division
Association of American Railroads
Washington, D.C. 20036

The number of computers installed through June 1, 1971 in the railway industry has increased from 243 to 250 and the changes in the manufacturers' percentage of total rental over the four years is as follows:

	Computers Installed				
	Year				% of Increase or decrease in Rental Value
	1968	1969	1970	1971	1970 vs. 1971
IBM	87.8	84.8	78.4	84.0	- 6.6
Univac	5.0	5.3	10.4	3.7	- 8.5
Honeywell	1.1	1.2	1.2	.5	- 14.8
GE	1.1	3.0	5.0	3.5	+ 8.4
Collins	0.5	0.6	0.8	1.6	+ 200.0
RCA	3.9	4.9	3.3	6.5	+ 103.4
NCR	.0	.0	.0	0.2	+ 800.1
	Net change in Rental Value				- 1.5

Following is a summary of computers installed in the railway industry through June 1, 1971 (Exhibit A). Also, a statement comparing the total average monthly rental of the systems on June 1, 1971, as compared to January 31, 1970 (Exhibit B).

Exhibit A, Part 1

Summary of Computers Installed in the Railway Industry, Manufactured by IBM (includes computers installed through June 1, 1971)

Railroad	IBM Computer(s)	Total
Alaska Railroad	1400	1
Aliquippa & Southern	360/20	1
Alton & Southern	2-1400	2
Association of American Railroads	360/50	1
Atchison, Topeka & Santa Fe	2-360/20; 3-360/25; 1-360/40; 1-360/50; 2-360/65	9
Belt Railway of Chicago	360/30	1
Bessemer & Lake Erie	2-360/40	2
Burlington Northern	3-360/20; 1-360/40; 2-360/50; 2-360/65; 1-System 3	9
Canadian National	4-360/30; 1-360/50; 1-360/65; 1-7000; 10-1400	17

Exhibit A, Part 1 *(continued)*

Railroad	IBM Computer(s)	Total
Canadian Pacific	2-360/40; 1-360/65; 1-7000; 5-1400	9
Central of New Jersey	2-1400	2
Chesapeake & Ohio — Baltimore & Ohio	1-360/20; 1-360/30; 1-1130	3
Chicago, Milwaukee, St. Paul & Pacific	1-360/20; 1-360/30; 1-360/40; 1-360/50	4
Chicago & North Western	1-360/20; 1-360/30	2
Chicago, Rock Island & Pacific	3-360/40	3
Clinchfield	360/25	1
Colorado & Southern	360/30	1
Delaware & Hudson	360/30	1
Detroit, Toledo & Ironton	360/40	1
Duluth, Missabe & Iron Range	1400	1
Elgin, Joliet & Eastern	2-360/40	2
Erie-Lackawanna	2-360/40	2
Florida East Coast	2-360/20	2
Georgia Railroad	360/20	1
Grand Trunk Western	360/40	1
Green Bay & Western	360/20	1
Gulf, Mobile & Ohio	360/40	1
Houston Belt & Terminal	360/30	1
Illinois Central	1-360/20; 1-360/30; 1-360/50; 1-360/65	4
Illinois Terminal	1400	1
Indiana Harbor Belt	360/30	1
Kansas City Southern	2-360/40	2
Kentucky & Indiana Terminal	360/20	1
Lake Superior & Ishpeming	360/30	1
Lehigh Valley	360/30	1
Long Island	360/40	1
Louisville & Nashville	1-360/30; 2-360/50	3
Missouri-Kansas-Texas	360/30	1
Missouri Pacific	3-360/50	3
Monon	360/25	1
Monongahela Connecting	360/20	1
Norfolk & Western	3-360/25; 1-360/40; 2-360/65; 1-1400	7
Ontario Northland	360/20	1
Patapsco & Back River	360/20	1
Penn Central	1-360/20; 5-360/30; 8-360/40; 2-360/50; 1-360/65; 1-7000; 2-1400; 1-1130	21

Exhibit A, Part 1, *(continued)*

Railroad	IBM Computer(s)	Total
Philadelphia, Bethlehem & New England	360/20	1
Pittsburgh & Lake Erie	360/30	1
Rate Associations	1-360/25; 1-360/30; 1-360/40	3
Reading	1-360/30; 1-360/40	2
Richmond, Fredericksburg & Potomac	360/20	1
St. Louis — San Francisco	2-360/50	2
St. Louis Southwestern	360/25	1
Seaboard Coast Line	1-360/20; 3-360/40; 1-360/65; 1-1800	6
Soo Line	2-360/40	2
South Buffalo	360/20	1
Southern	2-360/30; 2-360/50; 2-360/65	6
Southern Pacific	5-360/20; 2-360/30; 2-360/40; 1-360/50; 2-360/65; 1-7000; 1-1400; 1-1800; 2-1130	17
Terminal Railroad of St. Louis	360/30	1
Texas Mexican	360/20	1
Toledo, Peoria & Western	1400	1
Union Pacific	3-360/30; 1-360/50; 2-360/65; 1-1800; 1-1130	8
Vermont	360/20	1
Western Maryland	360/20	1
	Total:	189

Exhibit A, Part 2

Summary of Computers Installed in the Railway Industry, Manufactured by Other Than IBM
(includes computers installed through June 1, 1971)

Railroad	Computer(s)	Total
Alton & Southern	GE 4000	1
Atlanta & St. Andrews Bay	NCR Cent. 100	1
Boston & Maine	Univac: 1-9300, 1-1000	2
Burlington Northern	Univac: 1-III, 1-9200, 2-418, 2-1000; Honeywell: 1-516; GE: 1-4020	8
Canadian National	Collins: 4-8000	4
Chesapeake & Ohio — Baltimore & Ohio	Univac: 3-III, 2-1000; RCA: 5-3301; Other: 1	11
Chicago & North Western	RCA: 4-70/45	4
Denver & Rio Grande Western	GE: 1-425, 1-405, 2-DN30	4
Detroit & Toledo Shore Line	Univac 9300	1
Kansas City Southern	Univac: 6-9200	6
Maine Central	Honeywell H200	1
Minneapolis, Northfield & Southern	Univac 9200II	1
Norfolk Southern	Honeywell 120	1
Norfolk & Portsmouth Belt Line	NCR Cent. 100	1

Exhibit A, Part 2 *(continued)*

Railroad	IBM Computer(s)	Total
Penn Central	Univac: 1-9300; GE: 4-4020; Collins: 2-8000	7
Peoria & Pekin Union	Honeywell 115-2	1
Richmond, Fredericksburg & Potomac	NCR Cent. 100	1
Southern Pacific	Honeywell: 1-116; Other: 2	3
Western Pacific	GE: 1-425, 2-DN30	3
	Total:	61

Exhibit B

Estimated Monthly Rental by Manufacturer

Mfr. & Model	Average Monthly Rental (000) 1/31/70	6/1/71	% Total	Increase or Decrease $ (000)	%
IBM					
360/20	85.2	83.7			
360/25	43.2	51.0			
360/30	426.3	339.9			
360/40	939.0	733.4			
360/50	600.0	582.0			
360/65	840.0	972.4			
1400	142.6	146.5			
7000	225.0	165.0			
Other	16.2	23.8			
Subtotal:	3317.5	3097.7	84.0	-219.8	-6.6
Univac					
III, 90 & Step 2	92.0	84.0			
418	22.0	22.0			
1000	20.5	9.5			
9000	15.8	22.0			
Subtotal:	150.3	137.5	3.7	-12.8	-8.5
Honeywell					
All	21.0	17.9			
Subtotal:	21.0	17.9	.5	-3.1	-14.8
GE					
All	118.5	128.5			
Subtotal:	118.5	128.5	3.5	10.0	+8.4
Collins					
All	20.0	60.0			
Subtotal:	20.0	60.0	1.6	40.0	+200.0
NCR					
All	0	8.1			
Subtotal:	0	8.1	.2	8.1	∞
RCA					
All	118.0	240.0			
Subtotal:	118.0	240.0	6.5	122.0	+103.4
Other					
All	10.0	N/A			
Subtotal:	10.0	—	—	—	—
Grand Total:	3755.3	3689.7	100.0	-55.6	-1.5

ISSUES RELATING TO THE NATIONAL DEFENCE OF THE UNITED STATES

"I think the extent to which the Vietnam war problem was a civil war was not fully recognized in the beginning."

"The Reserves are now costing 2½ billion dollars a year, and their whole purpose is to augment the active forces when the need arises. The failure to call the Reserves undermines their entire purpose and negates their statutory mission."

"In the final analysis the name of the game is a division of the money."

"I believe that the military should be lean and competent."

Senator John C. Stennis
Chairman, Armed Forces Committee
United States Senate
Washington, D. C.

(Based on a talk to a seminar on national defense, Jackson Chamber of Commerce, Jackson, Mississippi, January 11, 1971.)

This seminar offers the opportunity for me to discuss a number of issues concerning our national defense. I am of the firm belief that these major policies should be discussed and openly debated before the people throughout this country and this is one example of the opportunity.

Perhaps I can best contribute to this discussion by discussing a number of issues on the basis of the problems of the past and the lessons for the future.

Vietnam War

I do not intend to devote all of my remarks to the Vietnam war but this remains a most important and divisive issue within the nation and deserves some comment. Over 15,000 Mississippians have served in Vietnam and on a population basis, we have lost more young men than most of the other states.

The war has borne down heavily on our young men. In contrast to past wars there have been few parades, few flags flying, and few citizen receptions for those returning. I realize that many of our young people do not believe that they have served in a just cause.

The point I cannot too strongly emphasize is that those who have served in Vietnam should not feel that their service has been in vain. I am immensely proud of all who have responded to the President as Commander-in-Chief through a basic sense of duty which has always characterized the youth of this country.

I strongly favor winding down the war as quickly as possible and I therefore fully support President Nixon's present policies and I fully support also the Nixon Doctrine of greater self-help on the part of the free nations of Asia.

Lessons for the Future: Necessity for Declaration of War in the Future

I do not intend to engage in the matter of "placing the blame" for the Vietnam war. Instead, I ask the question: What lessons have we learned in charting the future course of this country?

The first lesson is that in the future there must be a declaration of war by the Congress with respect to these engagements unless, of course, there is some major Pearl Harbor-type attack on the country. The Vietnam war is now the longest war in our history. The first combat units were committed on March 5, 1965, with the landing of the Marine Units at Danang.

Until this day there has never been a direct vote in the Congress on declaring war and mobilizing the country with regard to this Vietnam conflict. Only by a decisive vote in the Congress which represents the people can there be a real test of the sentiment of the country for supporting any war and mobilizing all our resources.

I readily recall the gradual escalation under which the highest officials of our country testified that with an additional 50 or 100 thousand troops and passage of another year, the Vietnam problem would be solved. This process was repeated year after year and, as we know, the problem is not yet solved although a solution is in sight.

Let me emphasize that I believe that Congress should exercise its Constitutional role in a more vigorous fashion. I totally reject the concept advocated from time to time that the President has certain inherent powers as Commander-in-Chief which enable him to extensively commit major forces to combat without Congressional consent.

As one Senator, I am striving to help perfect a more realistic method that Congress shall use in providing explicit authority for the President to repel an attack, but requiring Congressional authorization before hostilities can be extended for an appreciable time. This is an area that must have clarification.

Reassessment of Worldwide Commitments

This Asian war as well as other factors necessitate a reassessment of our worldwide commitments. First of all, the Vietnam war teaches us that the limitations of our manpower and resources will not permit us to aid every Asian nation any time it is confronted with a Communist threat both from within and without. Moreover, we must make certain that a preponderant proportion of the people in a country must be willing to adhere to the principles of free-

dom and be united in their willingness to defend their freedoms to the death if necessary. I think that the extent to which the Vietnam war problem was a civil war was not fully recognized in the beginning.

Turning now to our overall worldwide commitments, as you know, we have arrangements with 43 countries with whom we have entered some sort of treaty arrangement since the end of World War II. I am a firm believer in NATO and do not intend to advocate any abrupt or substantial withdrawal of our troops. At the same time our European North Atlantic Treaty Organization partners should furnish a greater proportion of the manpower and other support in order to permit some reduction in U.S. troops in Europe. Europe is no longer an impoverished continent as it was when the treaty was signed. Their strong economies justify their bearing a greater proportion of the load. We must force them to realize we are dead serious on this point.

I might observe that the cost to us of NATO in terms of our total forces committed in Europe is about $14 billion per year. This figure might be contrasted with the $8 billion which we spend on our strategic forces which include the Polaris missile and the Strategic Air Command.

Failure to Call the Reserves

Another lesson for the future with respect to the Vietnam war was from our failure to call reserves to active duty in any substantial numbers. Secretary Laird's recent statement on this matter should make clear that the reserves will be called in the future. The Reserves are now costing about two and a half billion dollars per year and their whole purpose is to augment the active forces when the need arises. The failure to call the Reserves undermines their entire purpose and negates their statutory mission.

Let me emphasize that I strongly support the Reserves and to me they offer the only hope of reducing the size of the active establishment and thereby reducing substantially our Defense costs. While my support is total, I must also make clear that their mission must be clearcut, they must be fully trained, and adequately equipped in order to be truly "ready," and they must be used when the need arises.

Two Main Future Problems of the Department of Defense

In the decade ahead the problems of defense will fall into two categories: First, the problems associated with weapons, and second, the matter of personnel. My discussion is on the premise of my firm belief in quality and not quantity in both weapons and personnel.

Weapons

We may look forward to fewer and better defense weapons. The enormous increase in cost alone will dictate this result. At the same time our weapons must always be superior to any potential enemy. This principle must be maintained whatever the cost. Second best equipment usually means we will be second best in any way. Let me give you some examples of the vast increase in cost which results from both inflation and weapons complexity. In World War II a typical fighter cost $69 thousand; in the Korean War $980 thousand; in 1960 $1.7 million for the F-4C, and in 1970, the F-14 about $11.5 million.

As another example, the F-4, still a work-horse, is a 1960 aircraft. The F-4C model in 1960, as I have indicated, cost $1.7 million. The F-4E model, an improved version, during the current fiscal year will cost about $3.6 million.

Overall defense programs between fiscal year 1964 and fiscal year 1971 have increased in cost by about 33%.

As a part of this problem every effort must be made to get along with fewer types of weapons; some hard choices will be in order as these matters reach the point of decision.

Personnel

One of the most vital problems confronting defense will be to hold in control the cost of personnel. Since we are facing an era of a realistic budget ceiling, we must meet the defense mission with fewer people or suffer for lack of enough of the best weapons.

Let me illustrate. In fiscal year 1964 the Defense payroll and related costs were $22.1 billion. The cost of the same number of people today because of pay raises and other increases would be $32.3 billion. Without adding a man, this is an increase of $10.2 billion and the problem will get worse.

The only way I know is to place increased reliance on the Reserves and reduce the numbers in the active services accordingly, along with a reassessment of our worldwide missions and responsibilities.

Necessity for Extending the Draft

I anticipate that one of the hardest fought battles in this new session will be the extension of the Selective Service induction authority. Without the draft a significant element of our combat forces will become ineffective in a short period of time. Let us look at what happened in 1948 when peacetime conditions prevailed to a far greater extent than at present. We had no Selective Service Act. President Truman was forced to come to the Congress and ask for a new Selective Service law because a total armed force of 1.4 million could not be maintained on a volunteer basis. Not only could the numbers not be met, but the effectiveness of the services was completely open to question.

The combat elements of the Army had ceased to become effective fighting units. Their eleven divisions on paper averaged only about one-third strength; that is, about 6,500 men each. Many of the rifle companies were on a caretaker basis, with only 15 to 20 men out of the total 100 authorized.

Since 1948 the Selective Service System has been the driving force for meeting our military manpower requirements. Without dwelling on infinite detail, the draft calls have averaged from 60,000 to 500,000 per year over the last 20 years. Moreover, well over 50% of those who have volunteered have been "draft motivated" as this term is used.

Volunteer Army

Let me say a word on the current discussion of reaching a zero draft call and having an all-volunteer armed force. I do not oppose this effort in principle. It is a flight from reality and will be impossible to achieve. Here are some facts which

we must acknowledge in doing away with the draft.

In the current fiscal year for the entire Department of Defense only about one-third of the new enlisted men will be true volunteers. The inductees will total 150,000 with 440,000 who are technically volunteers, but at least half of this latter number entered only because of the draft according to very competent surveys of the men themselves.

Gentlemen, let me observe at this time that since Labor Day I have personally conferred with over 1,000 GI's and Junior Commissioned Officers, Lieutenants and Captains at various bases in the nation. I have talked with them alone in small groups and am certain I received their independent views. To them, trying to maintain a combat Army without the draft was a pure joke, and they frankly said so. Let me add that this was true whether the men had been inducted or "volunteered" ahead of the draft. The fact is that without the draft we cannot anticipate men in any sizable numbers entering the Armed Forces under today's conditions.

Another fact is that so long as the Vietnam war is on our hands there is no hope of having a volunteer Army. In Vietnam today, out of 100 riflemen in a company, that is, the men who actually carry the M-16 rifles and slug it out in the mud, only about 15 are true volunteers. The rest are either inductees or draft motivated enlistees.

We have today what I consider a rather questionable enlistment system in the Army under which men who go in for 3 years may select their specialty and practically all of these select some occupation other than the combat arms. I am told that only about 2% of the men who enlist select the specialty of a rifleman in the infantry.

Budget Trends and Realities

In the final analysis the name of the game is a division of the money. In a real sense this must be the case since the budget is the manner in which we divide the Federal resources. We often forget the enormous growth in Federal spending, which was $2 billion in 1917; $14 billion in 1941; $100 billion in 1962, and in 1970 was $200 billion for the first time. Almost $18 billion ($17.8 billion) amounting to almost 10% of the Federal budget goes to pay interest on the Federal debt. There are many liabilities that do not appear in the budget, such as an accrued but unpaid sum of $68 billion for the Civil Service Retirement Fund, plus an additional accrued liability of the Military Retirement System of $104.4 billion. These are all future debts which will become due.

I cite these figures merely to show the squeeze which will be on the budget from all fronts and of course, as you know, we have tremendous demands from some elements of our civilian economy for increased Federal appropriations. I cite this general problem in order to indicate issues which the Congress will be attempting to resolve.

Closing Remarks

This speech represents my personal and also my official views based on years of work and experience on the Senate Armed Services Committee. It is in this vein that I can make the greatest contribution to this Seminar as I do not speak for any policy or policies.

In concluding, I emphasize that I have great respect for the American military uniform and for the man or woman who wears it, if worthy and dedicated. I stand for, and shall work for, the best weapons that technology can build, and that money can buy. I believe in, and shall work for, high quality personnel for all the military services, motivated and well trained, well equipped and well supplied, as well as well cared for. I believe that the military should be lean and competent. He must be well paid and well disciplined. We must never make the mistake of believing that we can have effective military units without stern discipline.

As a parting word, I can assure you that I will never consciously make any contribution to our nation becoming the second best military power. To the contrary, my efforts will be to make it the best, with security and freedom for all in the decades ahead. □

KEEP PITCHING

David Sklar
Morristown, N.J.

Subject: "Lying by the United States Government: An Acceptable Level?" in the May, 1971 issue of C & A, p. 36

For several months now, I have made repeated mental notes to write and tell you how much I think of your publication but, until today, there has never been enough time to do it. The happy coincidence of an uncrowded day and my reading your article referred to above are responsible for this letter.

Let me say, first, that the continued existence, apparently profitable, of your publication testifies to the belief I have fondly harbored for years that not all Systems & Data Processing types modelled themselves after their bosses in their thinking and outlook on life. The value judgments reflected in C & A are a far cry from those generally held by the upwardly mobile, middle and upper echelons of business, commerce and industry.

The second thing I want to say is that it undoubtedly has taken lots of guts on your part to hang in there and keep pitching a point of view that obviously goes against the grain of so many of your potential customers. I admire and respect you for this. In the controversy that has raged over the years as to whether we were computer professionals first and citizens of a participatory democracy second or vice versa, it is perfectly clear where E. C. Berkeley stands.

Keep pitching — for every one of us who writes you there must be a thousand who never find the time — and there just might be a few others who are not so firmly locked in step that they could not be influenced by what you have to say.

THE ASSASSINATION OF PRESIDENT KENNEDY: THE PATTERN OF COUP D'ETAT AND PUBLIC DECEPTION

Edmund C. Berkeley
Editor, Computers and Automation

"We must begin to recognize history as it is happening to us. We can no longer toy with illusions. Our war adventures in Asia are not related to national security in any rational sense. ... A coup d'etat took place in the United States on November 22, 1963, when President John F. Kennedy was assassinated."

In May 1970, Computers and Automation published a 32-page article "The Assassination of President Kennedy: the Application of Computers to the Photographic Evidence" by Richard E. Sprague. The author made the following important statements (among others) which bear on the subject of this article:

(Beginning of Quotation)

Who Assassinated President Kennedy?

On November 22, 1963, in Dallas, Texas, President John F. Kennedy, while riding in an open limousine through Dealey Plaza and waving to the surrounding crowds, was shot to death. Lee Harvey Oswald, an ex-Marine, and former visitor to the Soviet Union, was arrested that afternoon in a movie theatre in another section of Dallas; that night he was charged with shooting President Kennedy from the sixth floor easternmost window of the Texas School Book Depository Building overlooking Dealey Plaza. This act Oswald denied steadily through two days of questioning (no record of questions and answers was ever preserved). Two days later while Oswald was being transferred from one jail to another, he was shot by Jack Ruby, a Dallas night-club owner, in the basement of the Dallas police station, while millions of Americans watched on television. The commission of investigation, appointed by President Lyndon B. Johnson, and headed by Chief Justice Earl Warren of the U. S. Supreme Court, published its report in September 1964, and concluded that Oswald was the sole assassin and that there was no conspiracy.

In view of the authority of the Warren Commission, that conclusion was accepted by many Americans for a long time. But the conclusion cannot be considered true by any person who carefully considers the crucial evidence — such as the physics of the shooting, the timing of a number of events, and other important and undeniable facts. In other words, Oswald was not the sole assassin, and there was a conspiracy.

This article will develop that thesis, prove it to be true on the basis of substantial, conclusive evidence, and in particular some analysis of the photographic evidence.

There was in fact a conspiracy. Oswald played a role in the conspiracy, although there is conclusive evidence that on November 22, 1963, he did no shooting at President Kennedy, and that, just as he claimed when he was in the Dallas jail, he was a "patsy." At least three gunmen (and probably four) — none of whom were in the sixth floor easternmost window of the Texas School Book Depository building where the Warren Commission placed Oswald — fired a total of six shots at President Kennedy.

One of these shots missed entirely; one hit Governor John B. Connally, Jr., of Texas, riding with Kennedy; and four hit President Kennedy, one in his throat, one in his back, and two in his head. (The bulk of the undeniable evidence for these statements about the shots consists of: (a) the physics of the motions of Kennedy and Connally shown in some 60 frames of the famous film by Abraham Zapruder; (b) the locations of the injuries in Kennedy and in Connally; and (c) more than 100 pictures, consisting of more than 30 still photographs and more than 70 frames of movies.)

More than 50 persons were involved in the conspiracy at the time of firing the shots. These persons included members of the Dallas police force (but not all of the Dallas police — and that accounts for some strange events), elements of the Central Intelligence Agency, some anti-Castro Cuban exiles, some adventurers from New Orleans, and some other groups. After the assassination, some very highly placed persons in the United States government became accessories to the crime. In other words, they participated in assiduous concealment of important facts, in shielding the perpetrators of the crime, and in spreading a thick layer of rewritten history (in the manner of George Orwell's famous novel "1984") over the whole crime.

Of course, asserting these statements makes them neither true nor believable. Without very strong evidence, it would be evil to make such statements. As to believability, prior to District Attorney Jim Garrison's trial of Clay Shaw in New Orleans in Feb. and March, 1969, public opinion polls in the United States showed that over 75 percent of the people in the United States believed that there was a conspiracy. The press, radio, and TV almost everywhere in the United States reported Garrison's investigation and the New Orleans trial in a very distorted way. Furthermore, Garrison did not prove to the satisfaction of the New Orleans jury that Clay Shaw was involved in the conspiracy, even though he proved that Shaw knew and met Oswald. The news media of the United States (except for two newspapers in New Orleans) reported the trial in such a way as to show that no conspiracy existed. The media largely succeeded in changing U.S. public opinion, if we judge from the falling off of the poll percentages.

But the United States' media have been proved wrong many times before, and they will be proved wrong again in this case....

But the evidence cited or referred to in this article, and the existing photographic evidence and its analysis, a little of which is published here, establishes the fact of conspiracy. This evidence along with other evidence should and can initialize a major change in the beliefs of the people of the United States. As for beliefs of the people of Europe, it has long been and still is accepted there that President John F. Kennedy was assassinated by a conspiracy....

(End of Quotation)

Now, a year and a half later, we have found no substantial information or evidence which implies that we should publish a correction of any of the above statements, — except that other competent investigators of the assassination do prefer the more conservative statement "at least four shots" to the statement "six shots".

Since that article was published, a number of significant, eye-opening events have taken place. We shall refer specifically to five.

1. The Pentagon Papers

Item One is the publication of "The Pentagon Papers", through the actions of: Daniel Ellsberg (a research associate of Mass. Inst. of Techn.); The New York Times (which initiated the newspaper publication); the U.S. Supreme Court (which approved it); and other persons and organizations.

According to Senator Mike Gravel of Alaska, speaking in the United States Senate:

> The Pentagon Papers reveal the inner working of a government bureaucracy — out of control — created to defend this country but now managing an international empire by garrisoning American troops around the world....The papers show that American policy toward Southeast Asia has been characterized by a deception — a deception of the American people and of their representatives in the Congress which has continued for 20 years and which continues today through the present Administration.

The repercussions of this historic action, the publication of the Pentagon Papers, will continue for many years — but they prove conclusively a long continuing policy of deceiving the American people by the actions and statements of the American government.

It is worth noting that Senator Wm. J. Fulbright, the distinguished and often brave Senator heading the Senate Foreign Relations Committee, had the papers in his possession towards the end of 1969 — but did not have what it takes to release them to the press.

2. "Heritage of Stone"

Item 2 in our collection of significant events was the publication of a book by District Attorney Jim Garrison of New Orleans, La., "Heritage of Stone". It was published by G. P. Putnam's Sons, New York, and reviewed in the March, 1971, issue of "Computers and Automation" (p. 45). In this book Garrison says:

"All superstates engaged in efforts to gain power must maintain extensive intelligence efforts at home. They must seek to maintain control of individuals and ideas lest their international war adventures lose the support of the populace at home. ... The issue is power, immense power ...

"After the United States ascended to the position of the most powerful military nation in history, in the midst of its accumulation of the most effective death machinery of all time, there occurred the accident of the election of a President who regarded the entire human race with compassion. By the time this happened, the cold war had become our major industry, and the Central Intelligence Agency had become the clandestine arm of our military-industrial complex, and, in the process, the most effective assassination machine in the world."

Diligent vs. Careless Investigation

"When an assassination of a national leader is not supported by elements of the government, it is predictable that the government investigation will be effective and relentless. ... All information contributing to the discovery of the whole truth will be welcome ... When the criminals are caught, the machinery of justice will be firm and uncompromising.

"... However it is another matter when an assassination is supported by powerful forces within the government. The ... protective guard of the President suddenly will have become curiously impotent, for its operation will be known intimately by the assassins. The assassination apparatus will be extraordinarily effective. Federal investigative agents ... will move like sleepwalkers. High officials reviewing the affair will diligently examine many irrelevant items" — such as Lee Oswald's record of a smallpox vaccination in 1951 — "but will casually overlook the most pertinent evidence relevant to the assassination."

The Cover Story

"In a country with advanced technology for news distribution, the removal of a nation's leader will never be attempted unless those sponsoring the murder feel assured that they will have an effective degree of control over the dissemination of the news. Government control must be at a high enough level to guarantee the subsequent distribution of official news releases encouraging the belief, that however tragic the accident, it was essentially meaningless and all is well. ... Creation of a believable cover for an assassination is routine for an intelligence agency of a major government. The cover story which is initially distributed by the press release creates a degree of acceptance virtually impossible to dislodge. This is the case especially when the official fiction is supported by the pre-arranged activities of a decoy pointing in the direction of a false sponsor of the assassination. The actual events of the assassination become irrelevant. All that remains relevant is the cover story issued to the press and the power to control the investigation and conceal the evidence."

Understanding of the Forces

"We must begin to recognize history as it is happening to us. We can no longer toy with illusions. Our war adventures in Asia are not related to national security in any rational sense. ... To

understand the forces involved [in the murder of Jack Kennedy] and their motivation is to understand all of the once-mysterious assassinations of the 1960's, which in each instance achieved the elimination of a public figure who opposed our massive military expedition into Asia."

The Link of Assassination to War

"A new political instrument has been created. It provides for the permanent removal of men whose philosophies do not coincide with that of the dominant power structure of the United States. ...Justice is not so blind that it pursues the most powerful forces in the country. Nor is the press so committed to truth that it wants the burden of knowledge of what is happening. ...Sooner or later the relationship of assassination at home and war abroad must come to be understood. ...I have written this book so that the truth about the murder of John Kennedy finally may be brought out for every American to see. ...I have sought to show what has been done to our country by men who believe in solving problems by the use of force. ...I wrote [this book] in the hope that it might illuminate the peril which surrounds us. Welcome to the fight."

3. The Members of the Coup d'Etat Still Have Power

A third significant (though small) piece of evidence showing the extent to which the interests of the members of the coup d'etat still reach, is the contrast between two versions of the review of Garrison's book published in The New York Times in Dec., 1970.

One was printed in the early edition of The New York Times for Dec. 1, 1970; the second version was printed in later editions for Dec. 1, 1970. (See the article "The Central Intelligence Agency and The New York Times" by Samuel F. Thurston in the July 1971 issue of "Computers and Automation," p. 51.)

The first version is entitled "Who Killed John F. Kennedy?" and includes a number of sentences challenging the Warren Commission Report, including "Something stinks about this whole affair." The second version is entitled "The Shaw-Garrison Affair"; and that sentence and the others challenging the Warren report have all been deleted!

4. The Atmosphere 1960-63 in Regard to Assassination

Item Four in our survey is some information that, for want of a better name, we may call "the atmosphere in regard to assassination" in the first few years of President Kennedy's term of office as president, when he (and the CIA) smarted from the ignominious collapse of the Bay of Pigs invasion of Cuba mounted by the CIA in April 1961.

In I. F. Stone's Biweekly for Sept. 21, 1970, occurs the sentence:

> We now learn from the private papers in the John F. Kennedy library that he and former Senator Smathers of Florida on many occasions discussed the feasibility of arranging the assassination of Fidel Castro. The craziest of our mixed-up kids are no crazier than the end-justifies-the-means morality of American imperialism.

I wrote to Mr. Stone for additional information — but he was unable to give me a published reference. Apparently, this evidence is on a tape recording played to reporters that has not been transcribed on to paper.

The "discussions" apparently proceeded further than just discussions. A report by columnist Jack Anderson entitled "CIA Tried Six Times to Assassinate Castro" was published in the Boston Evening Globe of January 18, 1971 (and in a number of other papers including one in Japan):

(Beginning of Quotation)

Locked in the darkest recesses of the Central Intelligence Agency is the story of six assassination attempts against Cuba's Fidel Castro.

For 10 years, only a few key people have known the terrible secret. They have sworn never to talk. Yet we have learned the details from sources whose credentials are beyond question.

The plot to knock off Castro began as part of the Bay of Pigs operation. The intent was to eliminate the Cuban dictator before the motley invaders landed on the island. Their arrival was expected to touch off a general uprising, which the Communist militia would have had more trouble putting down without the charismatic Castro to lead them.

After the first attempt failed, five more assassination teams were sent to Cuba. The last team reportedly made it to a rooftop within shooting distance of Castro before members were apprehended. This happened around the last of February or first of March 1963 ...

To set up the Castro assassination, the CIA enlisted Robert Maheu, a former FBI agent with shadowy contacts, who had handled other undercover assignments for the CIA out of his Washington public relations office. He later moved to Las Vegas to head up billionaire Howard Hughes' Nevada operations.

Maheu recruited John Roselli, a ruggedly handsome gambler with contacts in both the American and Cuban underworlds, to arrange the assassination. The dapper, hawk-faced Roselli, formerly married to movie actress June Lang, was a power in the movie industry until his conviction with racketeer Willie Bioff in a million-dollar Hollywood labor shake-down.

The CIA assigned two of its most trusted operatives, William Harvey and James "Big Jim" O'Connell, to the hush-hush murder mission. Using phony names, they accompanied Roselli on trips to Miami to line up the assassination teams. ...

For the first try, the CIA furnished Roselli with special poison capsules to slip into Castro's food. The poison was supposed to take three days to act. By the time Castro died, his system would throw off all traces of the poison, so he would appear to be the victim of a natural if mysterious ailment.

Roselli arranged with a Cuban, related to one of Castro's chefs, to plant the deadly pellets in the dictator's food. On March 13, 1961, Roselli delivered the capsules to his contact at Miami Beach's glamorous Fontainebleau Hotel.

A couple weeks later, just about the right time for the plot to have been carried out, a report out of Havana said Castro was ill. But he recovered before the Bay of Pigs invasion on April 17, 1961.

(Please turn to page 29)

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Berkeley — *Continued from page 26*

The Cuban who had sneaked the poison into Havana was never seen again. The CIA, unsure whether the plotters had failed or the poison simply hadn't been strong enough, decided to try again with a more powerful dose. Roselli arranged for triple-strength capsules to be slipped into Castro's food several weeks after the Bay of Pigs. But once again, the plot failed and the conspirators disappeared.

Four more attempts were made on Castro's life, using Cuban assassination teams equipped with high-powered rifles, explosives and two-way radios. At intervals in the dark of night, Roselli personally delivered the teams in twin powerboats to the Cuban shores.

Once, a Cuban patrol boat sank Roselli's boat with a lucky shot but the occupants were quickly fished out of the murky water by the other boat. The assassination teams never got a shot at Castro, although the last group reached a rooftop within range. ...

Roselli, Harvey, O'Connell and company had taken precautions, however, to make sure not even the Cuban recruits knew the CIA was behind the plot. Roselli posed as a representative of big oil interests which sought revenge against Castro expropriating their holdings in Cuba. ...

(End of Quotation)

5. The Zapruder Movie

Item Five in our collection of significant events is the change in the last year and a half in the status of the Zapruder movie, which basically has, in this period, escaped from suppression.

The background story of the Zapruder movie is given again here (excerpted from the article by Richard E. Sprague in "Computers and Automation" for May 1970).

(Beginning of Quotation)

Of all the photographs taken in Dealey Plaza on November 22, 1963, when President Kennedy was assassinated, the color movie sequence of some 480 frames taken by Abraham Zapruder is the most important. It shows from the right hand side of the motorcade the entire sequence of events, from President Kennedy rounding the curve from Houston St. into Elm St., through all the shooting, until the big presidential limousine left with the dead president going under the triple overpass off to Parkland Hospital. This film almost by itself, with careful, scientific analysis, establishes the times of five of the shots.

The Warren Commission received the original of the Zapruder film to look at, on loan from Life magazine, which bought it from Zapruder.

From that time on, the film was never publicly shown, but remained in the locked files of Life. But a direct copy of the original was subpoenaed and shown NINE times by Asst. District Attorney Alvin Oser in New Orleans in February 1969, at the trial of Clay Shaw. The judge, the jury, the newspaper reporters, and the spectators in the court room all became convinced that Oser and Garrison had demonstrated a conspiracy to kill President Kennedy.

When one sees and studies in detail the Zapruder film in its clear version and examines the other photographs showing the effects of the shots, one becomes convinced of two statements:

1. There were six shots, of which five hit persons in the Kennedy car; of these five the first went through the throat of President Kennedy; the second struck Kennedy in the back; the third struck Governor Connally in the right shoulder; the fourth and fifth struck President Kennedy nearly simultaneously in the head and blew out his brains. The remaining shot missed and struck a curbstone on Main St.

2. The last of the five shots (coming from the grassy knoll area), and one of the two fatal shots, struck Kennedy from the front and to the right, hurling his head to the left and backwards with great force, in accordance with the laws of physics. (For a scientific analysis, see Six Seconds in Dallas, by J. W. Thompson).

Either one of these statements renders impossible the Warren Commission Report's conclusion, that only three shots were fired, the second one missing entirely and striking the curb of Main St.

Obviously, if there was a conspiracy, it becomes vitally necessary to prevent the American people from seeing the Zapruder film, clear and complete, and especially in motion. For over six years, except in New Orleans, this has been achieved. However, currently, bootleg copies of the Zapruder film are on sale here and there in the United States at prices ranging from $10 to $50, available for private and illegal showings, since Life magazine owns the original and has never given permission for copies of the film to be sold. Many of these bootleg copies, because of lack of clarity, do not demonstrate the first statement; but they do demonstrate convincingly the second statement, the backward thrust of President Kennedy's head at the time of the fatal shot.

Life magazine would be able to earn millions of dollars from showing the Zapruder film. In three days of showing the Zapruder film, uncut, clear, and not tampered with, on national television, every person in the United States who watched television could see for himself that more than three shots were fired (which makes the Warren Commission conclusions nonsense) and could see that the fatal shot thrust Kennedy's head backwards with great force (proving that he was hit from the front, and not the back, which also makes the Warren Commission conclusions nonsense).

(End of Quotation)

In the year and a half since May 1970, bootleg copies of the Zapruder film have been shown many, many times — at press conferences, lectures, and other occasions. Life magazine has apparently found itself unable to stop the showings; and has chosen to do nothing, make no stir — express no protest — thus acting once more in the true interest of the members of the coup d'etat.

Deductions and Predictions

The evidence cited above and a good deal more appears to be conclusive that:

- A coup d'etat took place in the United States on November 22, 1963, when President John F. Kennedy was assassinated as a result of a conspiracy;

- Among those who planned that action were many members of the Central Intelligence Agency,

the Federal Bureau of Investigation, and the Pentagon;

- Among those who assiduously covered up that conspiracy and the fact of the coup d'etat were:

  — Lyndon B. Johnson, successor president,

  — Allen W. Dulles, former head of the CIA member of the Warren Commission; and

  — J. Edgar Hoover, head of the FBI

The foregoing deductions, like any good theory, enable some predictions to be made:

1. As more and more of the true story of what really happened in the United States government in the 1960's becomes available, the members of the coup d'etat will be identified, and responsibility for the assassination of President Kennedy will be found to lie in a group including Lyndon B. Johnson, Allen W. Dulles, and J. Edgar Hoover.

2. So long as the members of the coup d'etat and their successors remain in control of the Executive Branch of the United States government, the only persons who will be permitted to continue in the office of President of the United States will be persons who are acceptable to the CIA, the FBI, and the Pentagon. Other persons will be eliminated. (Note: Senator Robert Kennedy was not acceptable. Senator Edward Kennedy is not acceptable. Senator George McGovern is not acceptable.)

The basic reason for this present condition in the United States is two-fold.

First, there is an enormous amount of money at stake for the military-industrial complex in the United States. The CIA acts as if it were the intelligent, conscious, organized branch of the military-industrial complex. The military-industrial complex of the United States is receiving over 70 billion dollars of the United States budget per year; and it (or they) will not surrender these billions lightly or willingly.

Second, there exists among these people a mindset of emotionally held beliefs, which justifies any deception, any immoral behavior whatever, and which is expressed in the phrase "the interests of national security" of the United States; but the effective meaning is their own security.

The phrase "national security" nowadays in the United States replaces the dead slogans of "patriotism" or "my country, right or wrong". And the failure of the war in Vietnam and the domestic revulsion to it are causing a great deal of trouble to this group.

Of course, the true security of the nation of the United States does not include or require the expenditure of $10 to $30 billion a year for war in South East Asia, and the incessant bombing and napalming of the population there, etc., etc., etc.

Only thorough perversion of the thinking of millions of people in the United States, accomplished by essentially controlled mass media, enables this fiction of the "interests of national security" to continue to be believed.

Epilogue — Some Questions and Answers

Question 1: If your deductions are correct, how do you account for the continuance of a democratic form of government in the United States, presidential elections, the U.S. Congress, the U.S. Supreme Court, etc.?

Answer: Essentially, because these democratic forms of government do not make any real difference to the Establishment that is in control of the presidency of the United States. It is the presidency that continues the war in South East Asia, that claims and usurps the power to carry on that war irrespective of the cancellation of the Tonkin Bay Resolution by the U. S. Senate, that operates the Central Intelligence Agency and hides its budget among the budgets of other departments of the U.S. Government, that spends $395 million a year (according to Defense Secretary Laird testifying in Congress) fighting an undeclared, unauthorized, and illegal war in Laos, that subverts the votes of Congressional senators and representatives with offers like leaving Naval bases open in their constituencies, etc.

And the democratic forms most usefully divert an enormous amount of energy and effort of the people of the U.S. away from the true objective, the real requirement.

Question 2: Why is it appropriate for a professional magazine devoted to the field of computers and data processing, to deal with such a subject as this?

Answer: There are several reasons:

(1) When "the house is on fire", the computer professionals working in the laboratory wing had better help put out the fire, even while they try to go on with "business as usual" in computers.

(2) Most of the press of the United States, and nearly all of radio and TV, engage in very complete coverage of very unimportant subjects (such as sports and consumer goods) and very biased coverage of very important subjects (such as international affairs). Therefore, at least some of the press like C&A should try to cover important subjects with a contrasting bias.

(3) Computer professionals are in our opinion professional information engineers. As professional engineers, they have a responsibility for the truth, in the information they do engineering with. This implies not only truth in data processing (accuracy, completeness, correctness), but also truth in input data, and truth in output data. Otherwise, "garbage in, garbage out".

Question 3: Do you consider that your deductions and your predictions may be wrong?

Answer: Of course. I wish they were wrong, and I hope they will be proved as wrong as bad dreams. It would be far more comfortable for me to believe that no coup d'etat took place, that President Kennedy was not eliminated by a conspiracy, that Senator Kennedy was not shot by a second gunman instead of Sirhan, and that the federal government of the United States is what it claims to be, free, democratic, the servant of the people.

Unfortunately, such a comfortable view does not explain many events that have undeniably happened.

(Please turn to page 48)

The New Popularity of the Dvorak Simplified Keyboard

"Those who type all day on the Dvorak Simplified Keyboard can't get over how much easier the new keyboard is. It's simply the difference between their finger tips traveling one mile on the DSK, for a normal 8-hour day, versus 12 to 20 miles on the standard keyboard for the same amount of work."

Bob McCauley and Bob Parkinson
Motivational Communications Corp.
134 Pleasant Lake Rd.
St. Paul, MN 55110

In the recent months, the Dvorak Simplified Keyboard (DSK) has reached a new plateau of popularity. This is not the first time that this efficient keyboard arrangement has come to the forefront as a newsmaker. In the 1930s-1940s, the DSK was enjoying what seemed to be travel down a road to total acceptance. It seemed like a mass conversion was near. Then the war came, and it was put aside for more important issues at hand.

After the war, Dr. August Dvorak, the inventor, continued his pursuit by gathering a remnant of followers and went on to a new wave of popularity. The promotion reached a climax when the General Services Administration (GSA) set up tests to determine, once and for all, which keyboard to use. The tests set up were controlled and objective, but like many government endeavors, were underbudgeted.

Because of budget restrictions, participants had to "compress" their training schedules in order to finish the tests within the time frame set up by the GSA. Instead of typing 2 hours per day, they doubled up with 4-hour sessions in order to get through sooner. While this contradicted many principles of training involved in learning neuromuscular skills, it was the GSA's money and their tests.

The results of the tests were favorable for the DSK. Those converting to the DSK reached their old speeds in less than a month and went on to score impressive gains. The control group, involving standard typists taking additional training, also scored gains, and to such a degree that statistical analysis indicated that it would not be vastly profitable to mass convert.

Dr. Dvorak believed that the tests were not fair. He pointed out that the 4-hour sessions heavily favored those who continued with the standard keyboard. Had the test duration involved a longer period with shorter sessions, he believed, the results would have been quite different.

But, Dr. Dvorak's protests were ignored. Even though he had proven time and time again that conversion was, in fact, profitable; still, his keyboard had failed the "big test."

Whether the tests were fair or not fair will probably never be determined — and this may not be important. If "cold-turkey" conversion on a mass scale had been forced on a large number of unwilling typists, chaos and mutiny might have resulted, and this could have closed the door on the Dvorak keyboard forever. The "rather-fight-than-switch" attitude typical of many employees would have appeared. Those who converted from the tests enjoyed a hidden benefit. Typing on the DSK is many times easier and less tiring than on the conventional keyboard arrangement. This is a common reaction from typists who convert. Those who type all day on the DSK can't get over how much easier the new keyboard is. It's simply the difference between their finger tips traveling one mile on the DSK, for a normal 8-hour day, versus 12 to 20 miles on the standard keyboard for the same amount of work.

Also not noticed in the GSA tests was the group that was left out. The opening paragraphs of the GSA report on their tests stated that it was not their prerogative nor intent to examine the effects of the DSK with people who had no previous typing experience. Only those who had previously typed were tested. The reason for this omission was that the GSA had no say over the keyboard to be learned by a new trainee. They only hired typists with previous skills.

In the summer of 1969, in a new, educationally oriented company, we were looking for a new product which would help students "learn to learn." Investigation of the DSK left two impressions with those involved in this research effort. First, it was noted that the DSK might provide a significant learning tool for students. Second, it might provide a convenient input device for those many computer programmers who waste valuable time each day using the hunt-and-peck system on keypunches. Many of these programmers do not have the time to learn the touch system on the standard keyboard because of the long training period involved. Previous experiments made by the University of Chicago, the U.S. Navy Department, and the Tacoma (Washington) Schools indicated that the DSK could be learned, even by very young children, in one quarter to one half the time required on the Standard keyboard. It was our thinking that previous presentations of the DSK had been aimed at the wrong population segment.

The standard keyboard clearly is difficult to learn. Most of the typing is performed off the home row, which requires much finger travel. On the DSK, over 70 per cent of normal typing is done on the home row (finger-rest) without having to reach. The standard requires very complicated movement and awkward stroking. One only has to go through the motions of typing "continue" or "minimum" to see how fingers often have to hurdle back and forth between the bottom to top alphabetic rows on the standard. The DSK is almost devoid of such awkward strokes or hurdles. The standard requires many complete words to be typed with one hand alone while the other hand is idle. On the DSK, hand alternation is maximized. This allows one hand to move for position while the other is typing. On the standard, the left hand does most of the work. On the DSK, the work is distributed to the fingers and hands according to dexterity.

The result is simple ... the DSK is easier to learn and easier to use. Many people, either because of lack of time or dexterity, cannot learn to type over 30 words per minute on the standard. It is not

unreasonable to expect 40 words per minute on the DSK after only 6 weeks.

Before starting a full-fledged promotion of the DSK, we did some experimentation on our own. A 12-year-old grade school student began typing on the DSK and was typing 40 words per minute in 7 weeks. Six to nine year-old students learned the DSK in 2-3 weeks and were typing over 40 words per minute in a short period of time.

We became convinced of the DSK utility with children; so the question of the programmer was investigated. Experiments indicated that adults could learn to touch type on the alphabetic rows of the DSK in less that 2 hours. This is because most typing for normal English or computer-oriented text is done on the home row.

As the results of these experiments were publicized, large numbers of people began to respond with very interesting comments. Many of these were part of the old Dvorak remnant, who up to that time felt they were the only people in the world who were still using the DSK. Their main message was that they were glad to see "like-kinds", but their letters contained some additional facts. One, from Barbara Blackburn of Kansas City, Missouri indicated that she has been using the DSK over 30 years and now types upwards of 150 words per minute. Her production is nearly three times that of most other secretaries. Also, her error rate is very low and she does not find herself exhausted at the end of an 8-hour day as when she typed 55 words per minute on the standard.

Howard Hudson, a court reporter in Phoenix, stated that he had used the DSK over 30 years and could type over 150 words per minute. Investigation has suggested that he may be the fastest typist on the planet Earth at this time.

Many other similar reports verified the authenticity of the DSK claims, subjected to testing over many decades.

But all these reports and experimental results indicated nothing new. Even after the GSA tests of 1956, it was widely accepted that the DSK was, in fact, superior in all aspects to the standard ... and that it possesses both social and economic benefits to society.

So, this is the base on which we have justified a wide educational program on the DSK. The goal is simple ... to introduce the DSK into the non-commercial student market and into the data processing industry as a data entry device. Additional utilization by other industry segments will come as a matter of course and in their own time.

By the end of the summer of 1971, several thousand students will be using the DSK. These students represent a segment of the population that normally would not type ... because of lack of time to learn the standard. Armed with the results of these students, the data processing and printing industries will be invaded with the DSK. These students will offer to these industries skills matching those of persons with many years of experience on the standard keyboard. The cost-effectiveness will be too significant to ignore.

Why will these industries provide suitable invasion grounds for the DSK? The data processing industry has no choice. From articles in the current literature and experience in our own shops, we are all aware of the real problems that everyone is facing in trying to keep up with the number-crunching power of our computers. Cost-effective measures are already being taken by shipping data to Hong Kong, Ireland, Manila, etc. to be prepared and flown back to the U.S. The same 30-50% reductions in cost of preparation will be available in-house with the DSK.

The printing industry is already involved in a conversion effort from a 5-row Mergenthaler keyboard to the 4-row standard keyboard in the hot-type to cold-type changeover. A conversion to the DSK presents no significant additional problem. The printers are reasoning that if they are going to have to convert, it might as well be to an efficient keyboard.

In the middle 1970's we expect the DSK will move into the commercial typing industry. The move will not be compelled; it will be on a natural evolutionary basis. The merging of the typing industry with the data processing preparation industry (partly due to optical scanning, etc.) will aid in this transition.

In the meantime, we would like to propose that those who might be affected by this changeover form a user-oriented group to study probable and possible consequences. The purpose of this group would be to objectively analyze the pros and cons of new keyboard arrangements. The DSK, Maltron and Minimotion arrangements and other factors will be studied.

ENGINEERING OF THE TYPING KEYBOARD FROM THE HUMAN FACTORS VIEWPOINT

A.S. Dunn
Canadian Government Specifications Board
88 Metcalfe St.
Ottawa 4, Canada

In regard to the Dvorak Typewriter Keyboard, much has been said about the increased speed of typing that is possible with this keyboard and the ease with which it is possible to learn to touch-type on it.

From what I can see to-day in the use of keyboard both mechanical and electronic, there are relatively few keyboards that seriously require the use of high-speed keying. The high-speed keying promoted during the so-called "world championships" might have had some significance in 1945, but I believe the significance and importance is much less to-day.

From the human engineering and human factors point of view it would appear to me that the Dvorak or a similarly designed keyboard might well be more profitably pursued from the point of:

1. Ease of learning
2. Less chance of errors
3. Lower fatigue rating of those using the keyboard

You pointed out, and quite rightly so, that with modern electronic keyboards it is not hard to place the keys wherever we want so that, I believe, the chances of keyboards with better human factors are probably much better than ever before.

I believe that international action to standardize the QWERTY keyboard may well run into considerable difficulty in the years ahead, despite its world acceptance.

It is my belief that "Computers and Automation" instead of sponsoring keyboard typing speed contests might well support more effective studies into the human factors of keyboards, bearing in mind the work carried out by Dvorak, Malt and others.

Being deeply involved in the development of the bilingual (French-English) keyboard for use in Canada, I should, for one, welcome well reasearched and factually supported information in the field of keyboard design.

The North American continent for the past 200 years has been renowned for its initiative and technological ability. It seems that we have come to a pretty sorry state if we continue to live with our existing keyboard.

INCREASED AUTOMATION FOR GROCERIES

Gilbert R. Parker
McKinsey & Company, Inc.
245 Park Avenue
New York, NY 10017

A committee representing grocery manufacturers, wholesalers, and retailers has recently concluded that it is feasible to develop a standard system for identifying the many thousands of grocery items produced and sold in the United States.

The automation of grocery store checkout procedures could enable the grocery industry to improve its operating efficiency and could create new business opportunities for companies in the computer, electronics, machinery, and information service fields.

Most of the automated checkout systems now being developed, use a product code for each grocery item, represented by a machine-readable symbol applied to the package by the grocery manufacturer. The symbol is electronically read by a scanning device or manually entered through a keyboard at the checkstand. This product data is then fed to a computer to access current price information for totaling the customer's bill, and to record the details of the transaction.

The committee has agreed that a 10-digit numerical code is the most practical for the grocery industry, given the economic tradeoffs of using shorter and longer codes as well as other types of codes. Furthermore, the committee expects to recommend a standard symbol to represent the code, but only after store tests of alternative symbol markings and checkout devices are completed in 1972.

The committee is now establishing guidelines for companies to follow in developing and testing automated checkout equipment, computer hardware, and display and communications devices. Within the guidelines, store testing of competing systems will begin in Switzerland in August and is expected to continue in the United States during this year and next.

For retailers, the benefits of electronic checkout would be increased checker productivity and lower store operating costs. For distributors, data collection at the point of sale would improve inventory control, stock replenishment, and merchandising decisions. And for consumers, the benefits would be faster checkout, greater ring-up accuracy, and fewer out-of-stock items.

AUCTIONING A COMPUTER

(Based on a report by R.A. Rosenblatt in the Los Angeles Times, April 30, 1971)

A poker-faced Glendale businessman bought a complete computer system at auction on April 29, beating a determined Texan in a spirited battle of bids.

F.P. Fisher paid $282,000 for an IBM 360/30 system, which probably cost about $585,000 when it was new.

The equipment was sold after being repossessed by International Business Machines Corp. IBM had leased its equipment to Computer Applications Inc., a New York-based firm which went bankrupt. The company operated installations here and in New York, each equipped with the IBM 360/30 system.

The New York model was put on the block earlier this year: it brought $260,000, supposedly a record for that piece of equipment in the brand new field of computer auctions.

A similar price was predicted for Thursday's auction here, but nobody anticipated the checkbook contest between Fisher of Glendale and Harry E. Blair, head of Computer Installation Corp. in Houston.

Bidders came from as far as Chicago to the warehouse on Bandini Blvd, which housed the equipment shrouded in clear plastic covers.

Auctioneer Wally Sackin opened the bidding at $100,000. The price jumped quickly to $200,000, then began creeping upward in increments of $5,000, then $2,000. One by one, the crowd of 15 bidders fell silent; at $265,000 only Fisher and Blair were left.

They worked the bidding slowly upward.

After Fisher had bid $282,000, auctioneer Sackin looked at Blair and asked, "Would you make it 5 (meaning $285,000)?" Blair stared straight ahead. Sackin then asked if all bids were in, declared "fair warning" and announced Fisher the winner. The Glendale executive didn't smile or say a word, as the crowd began drifting away.

Fisher said later that the computer will be used in expanding his business, Computer Microfilms Systems, Inc. He made a down payment of $30,000. Bank financing will provide the rest.

One onlooker said the computer would have been a bargain at $260,000, the price paid in New York. "At $282,000, it's not so cheap — I guess that's why the winner didn't look happy about it."

The man who appraised the computer before it was put up for auction, Mel Kleinman, branch manager of Time Brokers Inc., said that, at $282,000, "IBM is getting a very good price."

DVORAK SIMPLIFIED KEYBOARD – EXPERIMENTAL INTRODUCTION IN A LARGE OFFICE

1. From Belmont W. Adams
RFD 1, 4 Park Ave.
Scarborough, Maine 04074

You published an interesting page of comment in February, about the Dvorak Simplified Typing Keyboard. You invited interested persons to write you. I am very much interested.

After careful planning, I intend to try to introduce the DSK in the office where I work — an insurance office employing 1000 persons. I know how difficult and unsuccessful previous attempts have been; but conditions may be more favorable now; some success seems possible.

You suggested that you might try to sponsor some typing competitions. If you have done so, I should like to know the outcome, whether any DSK operators appeared, etc.

If you can send me any suggestions, it will be appreciated. I recently obtained a copy of Dr. Dvorak's book "Typewriting Behavior", and have written several other places for material.

2. From the Editor

Yours is really the first response I have found out about, of some one intending to introduce the DSK to an office employing 1000 persons or more. I shall be glad to know of your progress, and to publish results in C&A.

One suggestion: copy the "Hawthorne effect" technique — try it out first with those who want to try it!

SECOND GENERATION COMPUTER USERS CLUB

Roger L. Hackman,
John R. Graham, and
Jack H. Stokes, Directors
1901 W. Harrison – P.O. Box 1534
Harlington, Tex. 78550

To Managers of Data Processing:

Please take one minute of your time to familiarize yourself with our users club.

Perhaps you are currently a second generation computer user or have recently stepped up to a more sophisticated system under emulation. If so, we have a service that will prove useful and profitable for your company.

During the past twelve years, millions of dollars and man hours have been spent in the analysis and programming of applications for our second generation hardware. Many companies are still operating profitably and economically with these old, but proved, methods.

Most clubs, chapters, etc., in today's market are totally committed to third generation software and hardware while the economics of using "old" but proved methods are seldom given a chance. Manufacturers themselves, in order to market their equipment, have neglected the users of second generation equipment.

Second generation computer users club believes our computer to be a sound and economical approach in handling the normal everyday business applications. Second generation computer users club is dedicated to organization, assembling, and advising club members of the following:

1. Installations that have similar system for back-up.
2. Programmed applications that are for sale, lease or trade.
3. Installations that offer programming support for your equipment.
4. Names of E.D.P. executives.
5. Languages used in installations.
6. Installation experts.

Second generation computer users club is presently planning a publication including a directory to be realsed in the fall. This publication will be dedicated to users of second generation hardware and software.

The principal purpose of this directory will be to advise second generation computer users of the source and availability of application programs that are for lease or sale or trade. In addition there will be sections devoted to: Installations that have similar systems for back-up, installations that offer programming support for your equipment, and names of E.D.P. executives.

For you to participate in our club, which is the only one totally committed to second generation hardware and software, fill in a questionnaire we will send you on request and return with your check for $30.00, which will entitle you to a copy of the directory.

If you would like your programs listed for sale or lease in our special section at $5.00 per listing, please mark the appropriate box in the questionnaire and we will mail you the necessary forms.

Let's use computers for profit, not to build empires.

OPPORTUNITIES IN THE COMPUTER FIELD

Askew H. Clark, President
San Antonio Architectural & Engineering Society
P.O. Box 12173
San Antonio, Tex. 78212

I have noticed your offer to acquaint people with opportunities in the computer field. You have my permission to suggest that they also contact me. There are many fine opportunities that I know of.

That is a fine journal that you publish. Congratulations on the appraisal of the Pentagon's honesty!

[See "Computers and Automation", May 1971 issue, p. 36: "Lying by the United States Government: An Acceptable Level?" by Edmund C. Berkeley.]

COMPUTER-ASSISTED ANALYSIS AND DOCUMENTATION OF COMPUTER PROGRAMS

● ARE YOU INTERESTED IN THIS KIND OF PROBLEM?

Problem: You have a piece of software, a working binary program (WBP) in machine language — with operating instructions, and it is useful in your installation -- but you have no idea how it works in detail and you have no idea how to modify it to suit new conditions or requirements. (The programmers who wrote it went away two years ago to their next job -- or they never worked for you at all -- or ...)

But YOU have the problem of understanding and modifying that program, salvaging what you can of it; YOU have the problem of making its subroutines useful in other programs by calling them when you want them; etc.

Theory: Use a computer to assist you in your detective work analyzing that program (the WBP) and producing documentation for it. Desired Goal: Complete understanding.

Idea 1: Use a computer program (SIMULATOR ANALYZER) which will simulate your computer, and operate the given program (WBP) on examples, step by step, from one point to another point, showing you intermediate results, telling you where control goes.

Idea 2: Use a computer program (RELOCATOR) which will shift the WBP into another area of core, and thereby reveal which machine words can be moved unchanged, and which machine words have to have the shift difference added or subtracted from them.

Idea 3: Use a computer program (SUBROUTINE EXAMINER) which will show how each subroutine in the WBP operates on each kind of information that comes into it.

Idea 4: Apply techniques of CRYPTANALYSIS to discovering what systems of character representation are being used in the computer program.

Etc., Etc., Etc.

● IF THIS KIND OF PROBLEM IS INTERESTING TO YOU, WHY NOT TAKE A LOOK AT THE FOLLOWING BOOKS?

Research in Computer-Assisted Documentation of Computer Programs

by Edmund C. Berkeley
principal investigator, author

- Vol. 1, published by Information International, Boston, Mass., softbound, April, 1969, 128 pp, $3.00

- Vol. 2, published by Berkeley Enterprises Inc., Newtonville, Mass. 02160, softbound, Nov. 1971, 112 pp, $3.00

Technical (but understandable) reports produced — and research done — under contracts with the Office of Naval Research (N00014-68-C-0268, N00014-C-70-C-0225)

Volume 1, CONTENTS:

- The Subject and Purpose of this Research
- The Documentation of Computer Programs
- Some Estimates of Loss Due to Inaccessibility of Computer Programs
- The Concept of the Simulator Analyzer
- Model 1 and Model 10 of the Simulator Analyzer
- Cryptanalysis of a Portion of a Computer Program with Unknown Documentation

Volume 2, CONTENTS:

- Simulator Analyzer Model 13
- "Comments" in Computer Programs: Principles for Abbreviating, and Suggested Abbreviations
- Successful Relocation of the Working Binary Program for "Old 16K DDT" (Dynamic Debugging Program) Without Knowing the Symbolic Program from Which it was Assembled

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To: Berkeley Enterprises Inc., 815 Washington St., Newtonville, MA 02160

( ) Please send me both volumes of "Research in Computer-Assisted Documentation", for $6.00.

( ) I already have Volume 1; please send me Volume 2 only, for $3.00.

( ) I enclose $_____ in full payment. ( ) Please bill me. ( ) Please bill my organization.

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Address_____

City_____ State_____ Zip_____

Signature_____ Purchase Order No._____

WHAT IS THE COMPUTER DOING FOR ORDINARY HUMAN BEINGS?

Willie Graffals
The Farmers and Merchants Bank
Stuttgart, Ark.

Over a period of months, I have read various articles and letters to the editor concerning bad public reaction to computers. This has been interesting because the causes, effects and solutions to computer-related problems are often put forth as technical-oriented rather than human-oriented. It is this concern over the technical and scientific aspects of our automated environment, above and outweighing the human aspect, that is largely responsible, I think, for the lack of full acceptance of computers by the general public.

We have often attempted to adapt society to the computer rather than adapt the computer to society. We are constantly failing to accept or realize that regardless of who we are, where we are, or what we do, we are members of the human race. We are not the products of engineering and scientific achievements. Science itself tells us that this unique being called man is not only unpredictable but also very individualistic. Individualistic in physical appearance, in vocal response, in thinking patterns and emotional reactions. Yet we daily attempt to rob man and use as an excuse — "The Progress of Civilization". Is it any wonder that society groans?

Our egos are showing. Worse yet, our ignorance. We have constructed a powerful scientific and technical tool and placed it in the hands of immature, inexperienced and at times incompetent beings — in record time — and expected to revolutionize all of creation. Immature, inexperienced and incompetent not so much in technical knowhow but in common ordinary human sense. Even now the "experts" are blaming input, output, controls and other processing techniques that are commonly mishandled. True that the methods are not free of blame, but the primary culprit is the initial approach which has often left out the human factor, because it was more expedient and "less costly" to do so.

Our knowledge is vast, our potential is great, our achievements are questionable. We still suffer greatly from intellectual bigotry. We want not to be concerned with simple accounting or billing problems, because it is more stimulating to work mathematical computations and hypothetical games. We thrive in a sea of self-esteem that seems to forget that those who are struggling for survival in this complex society, of which we are a part, care little about scientific progress or intellectual prowess. Right now they may be asking — "What is the computer doing for me? I know what it is doing to me, but what is it doing for me?"

Are we prepared to answer that question in a language they can understand?

LEGAL DECISIONS BY COMPUTERIZED SYSTEMS

1. From William Propp
514 Rob Roy
Lakeland, Fla. 33803

In your November 30, 1970 directory issue, you listed a number of applications of computers. In particular under Law, you mentioned "Judicial decisions: simulation of." This upcoming year the high school debate topic is, "Resolved: That the Jury System be significantly changed." My question is, "Could a computer be fed information about a trial and then, from a logical point of view, state whether or not the defendant is guilty?" The judge would decide the legal technicalities.

2. From the Editor

Yes, a computer could be fed information about a trial, and then could, from a logical point of view, state whether the defendant is guilty or not.

However, the interpretation of the law and the expression of the case in unambiguous terms that the computer could accept, would be extremely difficult. In fact it would be subject to so much differing interpretation by different people that a practical acceptable result would be very hard to achieve.

We hope these remarks will be of some help to you.

"SERIOUS THREATS TO PRIVACY"

From: Sam J. Ervin, Jr., Chairman
Subcommittee on Constitutional Rights
Committee on the Judiciary
U. S. Senate

To: Honorable Cornelius E. Gallagher
U. S. Congress
Washington, D. C.

I was sorry to learn that your special Subcommittee on Privacy had been abolished. You and your colleagues did a magnificent job in bringing to the attention of Congress and the public the consequences of a national data bank and the serious threats to privacy from some current attitudes and practices of government and private organizations.

There is a real need in the Congress for a committee which can devote its full attention to a study of privacy as a human value necessary to our society. In particular, I see a need for a continuing study of those elements of the new technology, the machines, devices, instruments, methods, and attitudes which bring many benefits to society but which also may sometimes be used to violate privacy and threaten the liberty of individuals.

Therefore, I wish you all success in your efforts to win the establishment of a Select Committee on Privacy, Human Values, and Democratic Institutions.

COMPUTER BOOKS AND LITERATURE FOR NORTH VIETNAM

Joe Hanlon
Cambridge, Mass.

Books on computers and literature on computers are sorely needed in the Democratic Republic of Vietnam (North Vietnam).

Richard Levins, a University of Chicago biology professor who recently visited North Vietnam, is asking for help from U.S. computer people to send books and literature to the Vietnamese.

They particularly need material on numerical methods and integrated circuits; Levins hopes to send coherent units, for example on Monte Carlo methods. Contact Levins for more information.

Much to our surprise, the U.S. Commerce Department reports that the project is probably legal.

PROBABILITY AND STATISTICS KIT K22

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- ***Are stars in the sky distributed randomly? What about towns on a map?***

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With this kit—by means of more than 60 intriguing, easy-to-perform experiments and exercises—you can see for yourself, at first hand, the scientific basis for predicting events . . . drawing statistical conclusions . . . making informed estimates in many chance situations . . . analyzing the patterns of chance happenings. You acquire a firm knowledge of many of the key ideas of probability and statistics THROUGH YOUR OWN EXPERIMENTS.

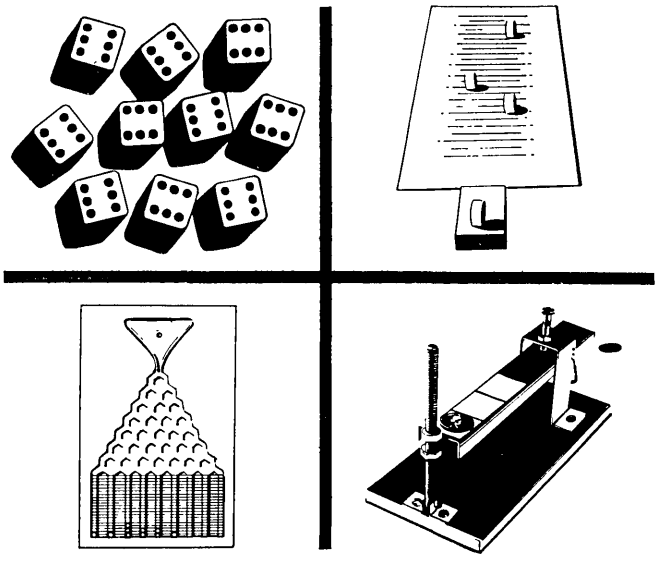
SOME OF THE CONTENT OF THE EXPERIMENTS: If you flip a coin 50 times, what will happen? If you roll 2 dice, what will happen? If you roll 30 dice and do that 40 times, what will happen? How often will you get 5 sixes when you roll 30 dice? How often will you get 10 sixes when you roll 30 dice? How will raindrops be distributed? How do you use the frequency of letters to solve a cryptogram? If you have 20 black beads and 10 white beads in a sampling box, what are you likely to get in ten samples? If you have 20 black beads and 10 white beads in one sampling box and 25 black beads and 5 white beads in another sampling box, are you likely to be able to tell the boxes apart if you sample twenty times? How random is random? Can a person name 100 digits randomly out of his head? How do you measure departure from randomness?

STATISTICAL DISTRIBUTIONS DISCUSSED IN THE KIT AND EXPERIMENTS: Uniform Distribution in one and two dimensions; Binomial Distribution; Normal Distribution; Chi-Squared Distribution; Poisson Distribution; Multinomial Distribution.

From the Instruction Book's preface by Dr. Frederick Mosteller, Professor of Mathematical Statistics, Department of Statistics, Harvard University, Cambridge, Mass.:
. . . Some may feel that this sort of material is only for the youth who is quick at science and mathematics, and certainly such a youngster will profit mightily. But it is not so well known that children, retarded in the mathematical areas, brighten up when presented mathematical tasks derived from experiments they have executed themselves . . .

In all the talk about science and mathematics, let's not forget that experimentation with mathematical ideas is fun. And hours and hours of such instructive fun are in the Berkeley book and lab. How do I know? In preparing this introduction, I have been greatly hampered by my not-very-studious 14-year old who busily instructs me in the use of all these materials.

Now if you'll excuse me, I have a new theory I'd like to try on the coin-flipping machine. Have fun!



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- Full descriptions of 27 Main Experiments and briefer descriptions of over 36 subsidiary experiments
- Book *"Probability and Statistics: An Introduction Through Experiments"* by Edmund C. Berkeley—140 pages—with a preface by Dr. Frederick Mosteller; includes a chapter by Martin Gardner

WHO IS EDMUND C. BERKELEY? Designer of *Brainiacs;* editor and publisher of the magazine *Computers and Automation;* author of *Giant Brains or Machines That Think* (Wiley), *Computers: Their Operation and Applications* (Reinhold), *Symbolic Logic and Intelligent Machines* (Reinhold); author of 9 other books; mathematician and actuary—*Fellow of the Society of Actuaries.*

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My name and address are attached.

IRRESPONSIBLE AND UN-AMERICAN

1. From James H. Clardy
P.O. Box 2909 MS/2000
Austin, Tex.

I did not renew my subscription because I don't agree with the type magazine you are now publishing.

I cannot support an irresponsible, un-American editorial policy such as you now exhibit.

2. From the Editor

Thank you for your note. We appreciate your frank comments, and regret that you are not renewing your subscription to "Computers and Automation".

We do not believe that it is "irresponsible" to draw attention to the lack of credibility of the U.S. Government.

We do not believe it is "un-American" to show how a judge in New York state is failing to adhere to the Constitution of the United States.

TOO MUCH NARROW SELF-INTEREST

Dick Eichhorn
16663 Meadowbrook Lane
Wayzata, Minn. 55391

I strongly disagree with those asking Computers and Automation to be relevant by publishing only technical topics, which relate to the world of computers.

Sensitive people today have seen too much complacency, narrow self-interest, irrational hatred and fear in our society. As a result, issues are being raised and many societal changes are taking place. When we recognize that corporate structures can only be justified by the contributions they make to the vitality and success of our society, then we will also recognize that everyone of us in business must demonstrate, in whatever way we can, our ability to be both economically and socially productive.

Thus, I salute you for taking a courageous stand in your fine and relevant magazine. Keep up the good work.

POORLY DISGUISED SENSATIONAL TABLOID

R. Hugh van Brimer
Central Research Labs.
The Mead Corp.
Chillicothe, Ohio 45601

Would you please cancel my subscription to Computers & Automation?

I was under the mistaken impression that yours was a trade magazine serving the technical industry, not a poorly disguised tabloid specializing in sensationalism and unsupported pseudo-political hypotheses.

Initially, the article carried in your magazine concerning the possibility of a conspiracy in the assassination of John F. Kennedy seemed to have some credence. But when it was followed by articles suggesting duplicity in the death of every nationally known figure from Robert Kennedy to Walter Reuther you and your contributing authors are losing credibility on all points.

I can get all of the biased opinions I need on national events from the news media without having to receive it from a thinly veiled "technical publication".

NOT JUST TRUISMS, BUT THOUGHT-PROVOKING

George M. Thomson
53 Okanagan Dr.
Ottawa, Ont., Canada

It would be appreciated if you would send me a copy of the articles concerning the assassination of President John F. Kennedy which appeared in the May 1970 issue, and, any charts which have become available since that time.

Would you also include other articles which may be available, in particular, the assassination of Senator Robert F. Kennedy? It would be convenient if you would bill me accordingly, at the above address.

Your magazine, in my opinion, is one of the most thought-provoking publications available today.

You publish many interesting articles on computers and data processing which stimulate the thinking because they are not just truisms of the state of the art.

Of course, your articles concerning assassination stand alone.

Keep up this important work.

SUPERB SERIES OF ARTICLES ON THE ASSASSINATIONS

Dan Ritey
2848 California St.
San Francisco, Calif. 94115

I must congratulate you on your superb series on the assassinations of President Kennedy, Senator Kennedy, and Dr. King. I have been an "assassinations investigator" for years and I find your information not only accurate, but totally absorbing. I think it is a major public service and I wish it were read by more people.

I have been a subscriber since last year, and have collected every one of the articles. However, I have not received the April, 1971, and May, 1971, issues of C&A; and I certainly do not want to miss any installment. Could you send me the two missing magazines for my collection? If there is any problem with payment, please advise, though I have received the June, 1971, and July, 1971 issues; so I do not understand why the April and May, 1971, issues are missing.

Again, your series is excellent. I hope to get the missing parts as soon as possible, and please keep the new issues coming!

MAIN ROSTER OF ORGANIZATIONS IN COMPUTERS AND DATA PROCESSING -- SUPPLEMENT 1

(Information as of October, 1971)

For the last cumulative "Main Roster of Organizations in Computers and Data Processing", see the June 30, 1971, issue of "Computers and Automation," the 1971 Computer Directory and Buyers' Guide issue, starting on page 59.

The purpose of this Main Roster is to provide names, addresses, and some details about organizations in the computer field that make or develop computing or data processing machinery or supply significant components used in the computer industry or provide specialized services in the computer field.

This supplement is based on information kindly sent to us. We appreciate the correcting and updating provided to us which we are here able to publish.

The following is the key to the abbreviations:

Key to Abbreviations

Sv - computing and data processing services
Ti - commercial time-shared computing services
In - courses, training, seminars, or instruction in computing, programming, or systems
Co - consulting services in the computer field
Le - leasing of computing and data processing equipment
Sf - selling or producing software
S - size (number of employees)
E - established (year organization was established)
*C 71 - information "compiled in 1971"

AEG-TELEFUNKEN, Buecklestrasse 1-5, 775 Konstanz, Germany / (07531) 6011 / *C 71
Large-scale computer systems TR440 for technical-scientific and commercial purposes. 800.000 operations/sec, 1.574 million bytes; cycle time: write = 125 nsec read = 375 nsec. Medium sized digital computer TR86, a general purpose computer for many different uses. 500.000 operations/sec, cycle time: 900 nsec. Computer peripherals, e.g. data display devices, data stations, analog and hybrid computer systems. Devices for direct document handling. Basic and users software for TR440. Compiler for FORTRAN, ALGOL, COBOL, BASIC, GPSS. Software packages for setting-up data banks, information systems, multi-computer systems, time sharing systems. System design, system consultation, development of hardware and software, training courses and maintenance courses for customers / Sv Ti In Sf / S 4200 / E 59

CAMBRIDGE COMMUNICATIONS CORP., Suite 437, 6611 Kenilworth Ave., Riverdale, MD 20840 / (301) 864-5752 / *C 71
Publish abstract and review journals in data processing / - / S 250 / E 56

CENTRAL BANK COMPUTER BUREAU, 1527 Webster St., Oakland, CA 94612 / (415) 465-9400 / *C 71
Hospital: patient accounting, payroll/personnel, accounts payable, general ledger, inventory, fixed asset accounting, statistical reporting. Banking: all services / Sv Ti Co Sf / S 125 / E 69

COMPUCARE, INC., 8550 W. Bryn Mawr Ave., Chicago, IL 60631 / (312) 693-5505 / *C 71
Hospital services: management engineering, pre-architectural planning, systems analysis. Hospital information systems: evaluation, planning, development, implementation. Computer installation of patient and administrative accounting systems. Shared financial control system services for hospitals; educational seminars; facilities management / Sv Ti In Co / S 26 / E 68

COMPUMART, INC., P.O. Box 28691, Atlanta, GA 30328 / (404) 252-9073 / *C 71
Buy, sell and lease computer systems manufactured by IBM / Le / S 4 / E 68

COMPUMATICS, INC., 327 S. LaSalle St., Chicago, IL 60604 / (312) 922-9422 / *C 71
Univac 1108 remote batch timesharing / Sv Ti Co Le Sf / S 10 / E 68

COMPUTER-OPTICS, INC., Berkshire Industrial Park, Bethel, CT 06801 / (203) 744-6720 / *C 71
Design and manufacture electronic systems for data communication and text-editing applications. Manufacture electronic products for outside concerns on contract or subcontract basis. Principal product is an interactive alphanumeric video display terminal (CRT) / - / S 40 / E 68

COMPUTER RESEARCH CENTER, Louisiana State Univ., New Orleans, LA 70122 / (504) 288-3161 / *C 71
Time-sharing services, primarily internal but available to other educational institutions; administer University Computer Sciences curriculum and non-credit seminars / Sv Ti In Co / S 20 / E 64

DATALOG DIVISION, LITTON SYSTEMS, INC., 1770 Walt Whitman Rd., Melville, NY 11746 / (516) 694-8325 / *C 71
Manufacture high-speed non-impact printers and facsimile equipment (transmitters and receivers) / Sv Ti In Co / S 60 / E 70

DETROIT BUSINESS INSTITUTE, 115 State St., Detroit, MI 48226 / (313) 751-6500 / *C 71
Data processing courses / In / S 50 / E 1850

INTERMOD, 2100 Sepulveda Blvd., Manhattan Beach, CA 90266 / (213) 376-9763 / *C 71
Accounting-type data processing service, specializing in architectural and law fields. Numerical control software; Interactive APT, a proprietary system with up to 5-axis capabilities on any 16-bit minicomputer / Co Le Sf / S 6 / E 70

ITT DATA EQUIPMENT AND SYSTEMS DIVISION, E. Union Ave., E. Rutherford, NJ 07073 / (201) 935-3900 / *C 71
Manufacture Alphascope and Gralphascope CRT Display Systems; modems; Envoy Dataprinters; Cryptel, electronic message scramblers. Patient data monitoring systems; Digitor, electronic security monitoring / Le / S 60 / E 69

LINKABIT CORP., 10453 Roselle St., San Diego, CA 92121 / (714) 453-7007 / *C 71
Manufacture specialized I/O interfaces; special purpose digital computers; special purpose data communications equipment and systems; error correction equipment. Services: communications network design and simulation; digital computer models and utilization analysis; analysis of time-shared computer systems; systems analysis. Design and implementation of higher level programming languages / Sv In Co Sf / S 17 / E 68

MACRODYN, INC., P.O. Box 87, Hillsboro, OR 97123 / (503) 287-7057 / *C 71
Software, consulting, systems analysis and design, programming / In Co Sf / S 10 / E 69

GEORGE S. McLAUGHLIN ASSOCIATES, INC., 785 Springfield Ave., Summit, NJ 07901 / (201) 273-5464 / *C 71
Buy, sell and lease used computers and components / Le / S 7 / E 66

MEDICAL COMPUTER SYSTEMS, INC., 1625 W. Mockingbird La., Suite 311, Dallas, TX 75235 / (214) 638-2600 / *C 71
Provide data processing services to medical institutions / Sv Ti / S 84 / E 67

PIMM & CO., LTD., c/o Thai Hotel, Prajathiphatai Rd., Bangkok 2, Thailand / 813633 / *C 71
Consulting services in DP personnel selection and training, DP preliminary analysis and feasibility assessment, systems analysis and programming, software maintenance, pre-installation and post-installation activities. Project evaluation and review and other DP services using outside IBM, UNIVAC and CDC installations. Public relations and marketing consultant services / Sv In Co Sf / S 20 / E 64

POLYMORPHIC CORP., 460 California Ave., Palo Alto, CA 94306 / (415) 328-0303 / *C 71
Systems design and implementation, consulting, training classes. Specialize in manufacture of software systems components; also consulting services and training in software / In Co Sf / S 10 / E 70

PRINCE GEORGE'S COUNTY DATA PROCESSING, Courthouse, upper Marlboro, MD 20870 / (301) 627-3000, Ext. 386 / *C 71
Spectra 70/45 tape, disc and communications for county agencies: assessments, treasurer's, finance, licenses and permits, public works, personnel, social services, hospital, library, police, circuit court, etc. / - / S 100 / E 65

SPECTRA MEDICAL SYSTEMS, INC., 1121 San Antonio Rd., Palo Alto, CA 94303 / (415) 964-4630 / *C 71
Total information processing service for hospitals. The Spectra-2000 handles admissions, entry and recall of physician orders, dispensing of medications, recording of test results and observations, maintenance of medical and administrative records / Sv Le Sf / S 15 / E 69

SUMMIT COMPUTER CORP., 785 Springfield Ave., Summit, NJ 07901 / (201) 273-6900 / *C 71
Buy, sell and lease used computers and components / Le / S 7 / E 68

TECHNICAL ASSOCIATES OF NEW ORLEANS, 4521 W. Napoleon Ave., Metairie, LA 70001 / *C 71
Design and manufacture computer interfacing systems, data acquisition and supervisory control systems and control systems for shipboard use; e.g., throttle control systems, boiler and combustion control systems, data centers / Sv Co Sf / S 190 / E 61

3M CO., 3M Center, St. Paul, MN 55101 / (612) 733-1110 / *C 71
Magnetic, video and instrumentation tape; magnetic tape recorders. Computer-output-microfilm equipment / Sf / S 66,000 / E 02

UNITED COMPUTING CORP., 22500 So. Avalon, Carson, CA 90744 / (213) 830-7720 / *C 71
Provide business and scientific programming services; also develop and sell software products / Sv Co Le Sf / S 40 / E 63

ACROSS THE EDITOR'S DESK

APPLICATIONS

CAR POOL BY COMPUTER

In hopes of reducing its rush-hour traffic by 50 per cent or more, Honolulu is trying computerized car pooling. Business communities have already shown an interest and now Honolulu is going after the average commuter. Computerized car pooling has been tried on a smaller scale by businesses and individuals elsewhere; but Honolulu wants to have the nation's first citywide and cityrun system.

The plan, announced by Mayor Frank F. Fasi, will begin by pooling 7,000 city employees. At the same time a campaign is planned to get all of Honolulu's work force involved. A city spokesman said that pooling among city employees alone will take an estimated 1,000 cars from the streets during rush hours. (Presently some 300,000 cars are choking the city's highways.)

The procedure is simple: Residents fill out cards, saying where they live and when and where they work. This information will be fed into the city's computer system, which will match a resident with four others. They then would share the same car.

The effort will include incentives for those who join car pools. One may be special lanes for pooling cars to make the ride to work and back home speedier. Another possibility is to assign the prime parking spots at city agencies and at cooperating businesses to cars used for pooling.

LIVING TISSUE PRODUCTS ANALYZED BY COMPUTER

At the Max Planck Institute, Dortmund, Germany, a computer-based analytical system is helping scientists examine cellular products generated by living tissue. The $96,000 system consists of a Honeywell 516 real-time computer linked through eight special-purpose multiplier networks to a photospectrometer.

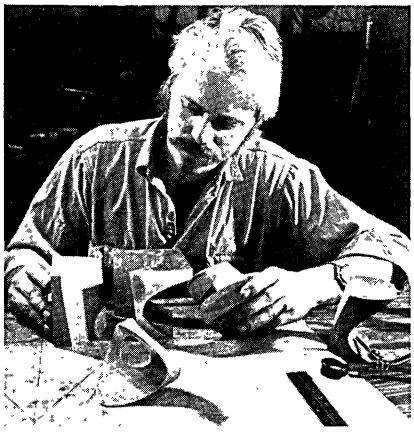
Max Planck scientists use the system to analyze cellular tissue samples by measuring the light-absorption characteristics of specific cell components such as hemoglobin. An analysis consists of a number of measurement cycles occuring at intervals of one-hundredth of a second, each using light of a different wavelength.

The resultant data, referring to eight separate sets of 500 cellular products, is pre-processed by the specially designed multiplier networks before being transferred to the Honeywell 516. Once in the computer the pre-processed data is used to produce eight sums representing the various products for presentation on an oscilloscope display at the end of the analysis.

SCULPTOR'S "ART-BY-COMPUTER" IS GIFT TO 1000 OF NATION'S CORPORATE CHIEF EXECUTIVES

Victor Pickett is a sculptor and an Associate Professor of Art at Old Dominion University in Norfolk, Va. Last September he created a "space age" sculpture out of aluminum, on commission from Lawler Ballard Little Advertising agency, (Norfolk) for its client, the State of Virginia's Division of Industrial Development. The project: a direct mail piece to be sent by the Division to one thousand chief executives of America's leading corporations.

The artist created the contemporary pure form sculpture in eight days. But a computerized machine



has produced one thousand perfect replicas of it, completing two every eight minutes. How was it done?

Charles B. Clark, an art director at Lawler Ballard Little conceived the idea and contacted Pickett, who was enthusiastic about it. Pickett submitted several three-dimensional models to Clark, and one was selected. Pickett then worked with a computer programmer to have the sculpture shaped by a numerically-controlled machine.

The first step in converting Victor Pickett's pure form sculpture to machine production was to put the measurements of the sculpture into a computer program using APT (Automatic Programming for Tools) language. This was done in the Engineering Laboratories of Newport News Shipbuilding, a Tenneco company, where the copies of the sculpture were to be made.

The APT program information was then transferred by punched aluminized mylar tape by Newport News. In the final stage, the punched tape activated the controls which guided the cutting path of Newport News Shipbuilding's Milwaukee-Matic II machine. Each piece of aluminum was positioned by a specially-designed jig to meet the cutting movements of the numerically-controlled machine, thus exactly reproducing Pickett's original sculpture — two perfect copies every eight minutes.

The Kearney and Trecker Horizontal Machining Center's Milwaukee-Matic II is a multi-function machine for metal removal. Its regular productivity at Newport News Shipbuilding is connected with the submarine construction program.

BICENTENNIAL CELEBRATION WILL HAVE CLEAN AIR

Visitors to the nation's Bicentennial celebration in Philadelphia (Pa.) can expect to be breathing "the cleanest air of any major metropolitan area," according to officials in the Quaker City. To help them achieve that goal by 1976, the city has put into operation a computer-controlled air pollution monitoring system. Six of 10 planned automatic sensing stations are now "on-line."

The computer, an IBM 1800 data acquisition and control system, automatically will analyze 4200 measurements per hour to generate detailed air pollution status reports for the city every hour or by request as needed. The six new automatic air monitoring stations (built by Leeds & Northrup Company) measure sulphur dioxide, particulate matter, carbon monoxide, wind speed and direction, and temperature. They will also, in the near future, measure oxidants in the air.

By means of a teleprinter located in the offices of Air Management Services (which is a part of the Philadelphia Department of Public Health), the computer will automatically advise air management officials when air pollution conditions are in "alert," "warning," or "emergency" status. A predetermined

plan of action, which initially affects industry and later transportation, would be activated for each of these progressive le worsening stages.

The computer program for the aerometric system was devised by William E. Belanger, project engineer for Air Management Services. The $252,308 cost of the measuring equipment and monitoring stations has been shared on a two-thirds basis by the federal government and one-third by the city under the Air Management Services' agency development grant through the 1967 Clean Air Act.

COMPUTER-PREPARED "MAPS" SPEED GROCERY DELIVERIES

Truck drivers at Fox Grocery Company, Belle Vernon, Pa., are avoiding traffic jams and late deliveries by relying on computer-produced route lists to speed food shipments to nearly 200 stores throughout western Pennsylvania. An IBM system is programmed to consider factors like distance and driving time between stores, speed limits, normal and unusual traffic patterns and even weather conditions, to arrive at the most efficient route for each of Fox's 40 delivery trucks.

Before leaving the warehouse a driver examines his route list. The list, printed directly on an IBM System/360 Model 30, includes a total manifest of the truck's contents, each destination, departure time from the warehouse, roads to be travelled, scheduled arrival and departure times at each stop along the way and any special instructions concerning unloading merchandise.

Using IBM's Vehicle Scheduling Program, 98 per cent of Fox's shipments arrive at the customers' stores within a half-hour of the promised delivery time, and the amount of manual paperwork for the dispatchers has been significantly reduced, according to Edward Kearns, manager, transportation department. The IBM System/360 Model 30 also prints labels for the food cartons and prepares invoices for customers.

NORTH AMERICAN ROCKWELL INVENTS DEVICE TO DETECT ORGANIC WATER POLLUTION

The analysis of water for the presence of organic pollution has been slow and time consuming. Often the visible effects of pollution and the resultant complaints precede the chemical detection by days. A new method, invented by scientists at North American Rockwell Corporation's (NR) Rocketdyne Division, Canoga Park, Calif., can detect organic pollution in water within 15 to 30 minutes.

The method performs direct water analysis characterizing the qualitative and quantitative nature of organics in a water sample. This automated system utilizes analytical hardware, mathematical logic and computer procedures. Details of the new method were revealed before the American Chemical Society by Peter R. Newton, an environmental specialist at the Rocketdyne Division.

Newton explained how the operation works in these words: "The water solution containing the suspected pollution is heated to a high temperature, causing the breakup of the material or materials into a mixture of gases. This gaseous mixture is then separated into its individual components and each individual component is measured.

"With the aid of mathematics and a computer, the materials can be identified and the amount in the solution can be determined. This technique has been demonstrated with a single material or with a mixture of materials. At the present time we can determine up to four compositions being present in water," Newton said. "In the future, we hope to increase the number that can be handled at one time."

W. F. Rockwell, Jr., NR's chairman of the board and chief executive officer, a member of President Nixon's Citizens Advisory Committee on Environmental Quality and vice chairman of the National Industrial Pollution Control Council, said the method potentially could help the industrial community control its water pollution.

EDUCATION NEWS

BRAILLE COURSE MATERIALS FOR BLIND STUDENTS ARE PRODUCED BY COMPUTER IN ATLANTA SCHOOLS

In Atlanta, Georgia, blind children are placed in regular classes with sighted students and are provided — whenever possible — with braille versions of standard text materials. A "vision teacher" visits schools on a rotating basis to work with each blind student and his regular teacher. Braille course materials, produced by a computer, now are being made available to blind students here, replacing valuable textbooks that were destroyed when the Atlanta school system's braille library burned to the ground in 1969.

The school system's data processing department, working with IBM and MIT, has developed a technique that is believed to be unprecedented, according to Dr. John W. Letson, superintendent of the Atlanta school system. The project was funded under Title VI of the Elementary and Secondary Education Act (ESEA).

Course materials are entered into the computer — an IBM System/360 Model 50 — either by typewriter-like terminals or by devices which can "read" documents printed in special characters. The computer translates the standard text into braille, then prints out pages at the rate of 200 raised characters per second. The pages of braille are bound into books. Additional copies can be printed as needed in a matter of minutes from the master text data which is permanently stored on magnetic computer tape.

The school system uses a cartridge, specially devised by IBM, which modifies a standard computer printed for braille. It can be quickly inserted or removed, enabling the Atlanta computer to perform many other tasks for the school and city. Students at Atlanta high schools also use the computer, by means of remote terminals, to solve problems in algebra, geometry, chemistry and biology.

The computer braille-printing system is designed not for one particular agency, but for anyone with the necessary equipment. The system should begin a new era in providing a better life for the blind.

PLANIT -- PROGRAMMED LANGUAGE FOR INTERACTIVE TEACHING

When a small group of Michigan State University (East Lansing) students report for class next winter term they will find themselves interacting with a space age teacher appropriately known as PLANIT. The students will be enrolled in a basic computer science course and their teacher will be a series of characters on a cathode ray tube, a computer program whose name is an acronym for Programmed Language for Interactive Teaching.

"PLANIT is an adaptation of the familiar programmed text," explains Dr. Mort A. Rahimi, "but the computer allows the use of many more measures of the student's progress. Dr. Rahimi is an assistant professor of computer science. He supervised the installation of the necessary software at MSU and implemented the program.

Technically, PLANIT is called a CAI author language, and its purpose is to allow an instructor to write his entire lesson plan into a computer program. The beauty of PLANIT is its simplicity, according to Rahimi. With no computer background, a teacher can be taught in one hour all he needs to know to write instructional programs and commit them into PLANIT's hands. Similarly, students can use the system after only a few minutes of instruction.

The potential applications are countless, but one of the most fascinating is the possibility of community colleges and other smaller schools, with a minimum of equipment investment, being able to use the computer facilities of larger universities for programmed learning.

MISCELLANEOUS

PITNEY BOWES INTRODUCES TWO COMPUTERIZED MAILING DEVICES

Pitney Bowes, Stamford, Conn., has announced two new computerized devices for high-volume mailing of parcels. The new machines are a computerized combination scale and postage meter stamp machine, and an electronic postage meter for line-printer use,

The scale and meter stamp unit for high-speed parcel mailing will be available for delivery next spring. This unit computes the postage for the parcel being weighed and automatically prints out a meter stamp for the operator. The unit is modular in design, for flexibility in installation.

The other machine, the electronic postage meter, is designed for use with high-speed computer line-printers. It has a sealed electronic metering and accounting control device, and a meter stamp printing unit.

EMPLOYEE ID CARD CHARGES LUNCH IN COMPANY CAFETERIA

Employees at IBM's computer development laboratory in Boeblingen, West Germany, now are able to charge meals in the lab's cafeteria by slipping their regular IBM identification cards into an experimental data entry terminal. The magnetic tape record created by the terminal goes to a computer which deducts each employee's monthly charges from his salary. All the customer has to do is push his card into a slot, with his picture facing the cashier.

Instead of ringing up the price on a cash register, the cashier now keys it into the terminal. The keyboard is partly programmed to store fixed prices such as 1.20 Deutsch Mark for a meal of soup, meat, vegetable and salad, or DM 0.50 for juice. Use of the non-cash system by employees is optional. For those who prefer to pay as they eat, the terminal can display the amount without recording it on the tape cartridge.

The Boeblingen laboratory's Special Engineering group built the experimental terminal around a modified IBM 050 magnetic data inscriber, especially for the cafeteria.

LOW COST SYSTEM CUTS INFORMATION RETRIEVAL TIME FOR DIRECTORY ASSISTANCE OPERATORS

A new system that could cut in half the time it takes a telephone directory assistance operator to find a phone number has been demonstrated to industry executives. The system, developed by Images Enterprises, Inc., Los Angeles, differs from others being proposed for the same job since it is "stand-alone" — it does not require a computer to locate the information.

The new system is expected to cost only one-third to one-quarter as much as other approaches which require computers, input terminals, and computer programming systems. In competitive trials it will show speeds equal to or greater than computer based systems, the company said. Reliability is also high due to the simplicity of the new system.

The speed advantage is clear when looking up a common surname: most computer systems display only the first page of the listing, leaving the operator to key the system a page at a time until the proper page appears. The Images Enterprises approach will permit the operator to immediately locate within a page of the desired listing. The firm is able to place as many as 8,500 pages of material on a 4x6" plastic card. Only one of the cards is needed to contain the entire Manhattan telephone directory.

It is expected that the operator will be able to locate the desired listing in about half the time it now requires. The proper page will be reached in under three seconds.

NEW LITERATURE

MAINE'S "LIFE SCIENCES PARK" DESCRIBED IN NEW REPORT

A 480-acre "Life Sciences Park" concept is described in an 11-page report recently released by the Maine Department of Economic Development. The projected site, which will include 2.27 million square feet of "non-polluting" manufacturing plant space when completed by 1978, will employ 5,323 and provide an estimated yearly payroll of $36.2 million in the manufacturing sector alone. Three major cluster complexes — manufacturing, research and development, and services — are planned.

The manufacturing complex will include growth oriented chemical, instruments and controls, and medical equipment manufacturers. The complex will consist of commercial R & D companies, private research laboratories, and non-profit public and foundation research facilities. The service complex will comprise banking, restaurant, education, motel, transportation, and medical facilities required by employees and industry within the park.

The park, located on 1,000 acres at a site within 20 miles of the Portland, Lewiston-Auburn, Brunswick Triangle, would be within commuting distance for 25% of Maine's one million population. Access to the park via two railroads and interstate highways; airline service to Boston, New York and the Midwest; plus availability of high voltage electricity and natural gas afford additional incentives for new site locations.

Copies of the Maine "Life Sciences Park" report are available without cost by writing Dept. ME/LSP, Suite 901, 20 E. 46 Street, New York, NY 10017.

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
GTE Sylvania Inc. Needham, Mass.	U.S. Army, Army Electronics Command, Fort Monmouth, N.J.	Transportable electronic telephone switching systems (18) for increasing speed and versatility of military communications and related communications equipment	$8.9 million
Honeywell Information Systems Wellesley, Mass.	BPA Byggproduktion AB, Stockholm, Sweden	Honeywell Model 6060 computer system for use in processing increasing amount of internal administrative work as well as an information processing center for Swedish labor unions	$4+ million
Univac Division of Sperry Rand Ltd., Blue Bell, Penna.	Nationwide Building Society, London, England	UNIVAC 1106 computer system which will be the center of an on-line branch accounting system involving about 200 terminals	$4 million (approximate)
Infoton, Inc. Burlington, Mass.	Singer Friden	1,000 CRT display terminals	$2 million (approximate)
Hazeltine Corporation Greenlawn, N.Y.	Federal Aviation Administration	Design, development, and test of an Electronic Scan Antenna for the Air Traffic Control Radar Beacon System (ATCRBS)	$900,000+
International Computers Ltd. (France)	International Computers Ltd., London	An INC 19025 computer; will be used as center of a real time system for thirty savings banks in Brittany servicing about 1-1/2 million individual accounts	$720,000 (approximate)
Tempo Computers, Inc. Fullerton, Calif.	Rapidata, Inc.	Installation (at the N.Y. and N.J. time-sharing facilities) of five programmable front-end communication processors; includes Tempo I computers and Temp communications equipment	$500,000
Sanders Associates, Inc. Nashua, N.H.	U.S. Army Medical Research and Development Command	10 cathode ray tube display systems; permit psychiatrists, nurses and other medical personnel in three Army clinics to retrieve and display patient's medical records and other information stored in Walter Reed Army Medical Center, Washington, D.C.; CRT systems will be part of "COMPSY", the Army's computer support in military psychiatry program	$350,000+
Systems Engineering Laboratories, S.A. of France	Compagnie de Raffinage Shell-Berre (French subsidiary of the Shell Oil Co.)	A SYSTEMS 810B/RTX computer, including a wide variety of peripherals for automating pilot refinery units; system will gather data from about 350 sensing devices, control experiments in real-time, and produce statistical and analytical data	$200,000+
Datacraft Corporation Ft. Lauderdale, Fla.	Reflectone, Inc.	A DC 6024/3 system for use in the Variable Cockpit Training System (VCTS) which simultaneously simulates actual helicopter flight characteristics of U.S. Coast Guard aircraft	$140,000+
Boeing Computer Services, Inc. Seattle, Wash.	Bonneville Power Administration	Development of a technique and computer program for determining optimal reservoir regulation of monthly river flows for firm power capability in the Pacific Northwest hydroelectric system	$80,000
A. C. Cossor, Ltd., British subsidiary of Raytheon Company	Northern Ireland Joint Electricity Authority	Eight data display (Cossor 401) terminals to aid in the supervision of electricity distribution grid in Northern Ireland	$50,000 (approximate)
Recognition Equipment France, S.A.	Postal and Telecommunications Ministry of France	A Postal Address Reader - Indexer (PARIS) System which the Ministry will use in the automation of letter-mail sorting	___
International Communications Corp., Miami, Fla.	Japan Air Lines	Data communication equipment which will provide high-speed data traffic between JAL computer in Tokyo and reservation centers in the U.S., Hawaiian Islands, and Canada	___
Honeywell, Dallas Data Center	Varo, Inc., Dallas, Texas	Management of Varo's EDP operations over a two-year term	___
Incoterm Corporation Marlborough, Mass.	Biomedical Computer Services Inc., St. Paul, Minn.	15 programmable terminals for the Edward W. Sparrow Hospital (Lansing, Mich.) as part of comprehensive computerized health care and medical records system	___
Telc-Signal, Kearfott Division, The Singer Company	Federal Aviation Administration	Quantity of medium speed synchronous communications terminals to be used within a FAA Comnet to link outlying air radar surveillance stations to Air Route Traffic Control Centers (ARTCC)	___
Analytical Technology Laboratories, Inc., Bethesda, Md.	NASA, Goddard Space Flight Center	Research and development in advanced methods of spacecraft orbit determination	___
Friden Division, The Singer Company, New York, N.Y.	Department of the Army	Multimillion dollar contract to supply first data processing equipment to U.S. Army Commissaries	___
Control Data Corporation, Minneapolis, Minn.	General Motors Corporation	A Control Data STAR-100 computer system to be used in applications involving graphic display terminals	___

NEW INSTALLATIONS

OF	AT	FOR
Control Data 3170 system	San Fernando Valley State College, Los Angeles, Calif.	Processing data from all college departments and to link College into 19-member State Colleges Communications System
Control Data 7600 system	University of California, Berkeley, Calif.	Collecting and analyzing nuclear energy research and development data; operates in conjunction with two Control Data 6600 computers to provide regional data center services for AEC agencies throughout the northwestern United States (system valued at $8.1 million)
Digital Equipment PDP-10	Compu-Serv Network, Inc., Columbus, Ohio	Doubling computer time-sharing service center's current computer services capabilities (system valued at about $800,000)
Honeywell Model 115 system	Amalgamated Meat Cutters Union, Local 342, Jamaica, N.Y.	Processing membership records, pension fund, welfare fund, credit union, payroll, etc.
Honeywell Model 6040 system	SDK Medical Computer Services Inc., Brookline, Mass.	Data processing services for 18 hospitals in the Northeast, two chains of extended-care facilities and a Massachusetts network of health clinics (system valued at about $1 million)
Honeywell Model 6050 system	Regie Autonome des Transports Parisiens (RATP), Paris, France	A variety of management, technical and scientific applications
Honeywell Model 6070 system	Credito Italiano, Milan, Italy	Variety of applications, including on-line demand accounting
Honeywell Model 6080 system	Ford Motor Company, Dearborn, Mich.	Primarily providing time-sharing and batch computer services for approximately 3,500 engineers, designers and product development personnel
IBM System/3 Model 6	Paul Sybrandt Inc., Bakersfield, Calif.	Writing automobile and homeowner coverage policies
IBM System/3 Model 10	Art-O-Rama, North Pelham, N.Y.	Inventory control of over 1-1/2 million feet of custom frames and moldings; also for accounts receivable and payroll
	L. Karp & Sons, Inc., Elk Grove Village, Ill.	Processing some 125 orders daily, accounts receivable, inventory control and sales analysis, to help supply about 2,000 products nationwide to bakeries, hotels, etc.
	Massachusetts Audubon Society, Lincoln, Mass.	Keeping track of wide range of environmental activities; general accounting, reporting functions and education programs
	O'Connor Lumber Company, Westfield, Mass.	Inventory control, billing, accounts receivable and accounts payable
IBM System /360 Model 40	Roanoke Memorial Hospitals, Roanoke, Va.	Tightening financial controls; information system will also speed hospital services with automated communications
IBM System/370 Model 135	First National Bank of Fort Smith, Fort Smith, Ark.	A single information system to improve customer service and streamline internal operations
IBM System/370 Model 145	The Hecht Co., Washington, D.C.	Wide-range of applications including an inventory control system that will help keep track of the 100,000 large items such as sofas and refrigerators
	City of Wichita Falls, Texas	Applications in every area of city government including processing police records, assessing real estate and improving city bus schedules
IBM System/370 Model 155	Norden Division, United Aircraft, Norwalk, Conn.	A wide variety of design and manufacturing functions; also handles basic accounting functions, inventory control, shop loading and scheduling
NCR Century 200 system	Autonomous University of Guadalajara, Mexico	Computer-assisted instruction in all schools of the University, research program and administrative operations
	City of Pittsburgh, Penna. (2 systems)	Part of law-enforcement program; also for such applications as utility and tax processing, cash control and payroll preparation
	Mercantile Credit, Great Britain (2 systems)	On-line system to link firm's 100 branches to London headquarters; will provide a twelve-fold increase in on-line random-access storage; will include back-up facilities (system valued at $775,000)
NCR Century 300 system	First Security National Bank of Beaumont, Beaumont, Texas	Processing own bank work; also providing services to 28 savings and loan institutions, 16 other banks, and commercial and industrial clients as far away as Louisiana
UNIVAC 1108 system	U.S. Army, Edgewood Arsenal, Md.	Research, development, and testing activities (system valued at $2.8 million)
UNIVAC 9200 system	Cortland County, N.Y.	Social services, probation, tax assessments and jury selection
	Western Publishing Company, Racine, Wis.	Enlarging central data processing complex to handle sales analysis and payroll processing
UNIVAC 9300 system	Nichimen Company, New York, N.Y.	Business forecasting, sales analysis, general accounting and payroll processing
	Streamline Button, Inc., Garden City, L.I., N.Y.	Improving smaller UNIVAC system including automated inventory control, expediting shipping, centralizing billing operations, performing sales analysis, general accounting and payroll processing

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 OCTOBER 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 1. United States Manufacturers								
Autonetics	RECOMP II	11/58	2.5		30	0	30	X
Anaheim, Calif. (R) (1/69)	RECOMP III	6/61	1.5		6	0	6	X
Bailey Meter Co.	Bailey 750	6/60	40-250	(S)	32	3	35	0
Wickliffe, Ohio	Bailey 755	11/61	200-600	(S)	6	0	6	0
(A) (8/71)	Bailey 756	2/65	60-400	(S)	16	6	22	2
	Bailey 855/15	-	50-400	(S)	0	0	0	2
	Bailey 855/25	4/68	100-1000	(S)	11	0	11	3
	Bailey 855/50	-	100-1000	(S)	0	0	0	12
Bunker-Ramo Corp.	BR-130	10/61	2.0		160	-	-	X
Westlake Village, Calif.	BR-133	5/64	2.4		79	-	-	X
(A)	BR-230	8/63	2.7		15	-	-	X
(7/71)	BR-300	3/59	3.0		18	-	-	X
	BR-330	12/60	4.0		19	-	-	X
	BR-340	12/63	7.0		19	-	-	X
	BR-1018	6/71	23.0	(S)	-	-	-	-
Burroughs	205	1/54	4.6		25-38	2	27-40	X
Detroit, Mich.	220	10/58	14.0		28-31	2	30-33	X
(N)	B100/B500	7/65	2.8-9.0		-	-	-	-
(1/69-5/69)	B2500	2/67	4.0		52-57	12	64-49	117
	B3500	5/67	14.0		44	18	62	190
	B5500	3/63	23.5		65-74	7	72-81	8
	B6500	2/68	33.0		4	-	4	60
	B7500	4/69	44.0		-	-	-	13
	B8500	8/67	200.0		1	-	1	5
Computer Automation, Inc.	108/208/808	6/68	5.0	(S)	165	10	175	110
Newport Beach, Calif.	116/216/816	3/69	8.0	(S)	215	20	235	225
(A) (6/71)								
Control Data Corp	G15	7/55	1.6		-	-	295	X
Minneapolis, Minn.	G20	4/61	15.5		-	-	20	X
(R)	LGP-21	12/62	0.7		-	-	165	X
(7/71)	LGP-30	9/56	1.3		-	-	322	X
	RPC4000	1/61	1.9		-	-	75	X
	636/136/046 Series	-	-		-	-	29	-
	160/8090 Series	5/60	2.1-14.0		-	-	610	X
	924/924-A	8/61	11.0		-	-	29	X
	1604/A/B	1/60	45.0		-	-	59	X
	1700/SC	5/66	3.8		-	-	400-450	0
	3100/3150	5/64	10-16		-	-	83-110	C
	3200	5/64	13.0		-	-	55-60	C
	3300	9/65	20-38		-	-	200	C
	3400	11/64	18.0		-	-	20	C
	3500	8/68	25.0		-	-	15	C
	3600	6/63	52.0		-	-	40	C
	3800	2/66	53.0		-	-	20	C
	6400/6500	8/64	58.0		-	-	105	C
	6600	8/64	115.0		-	-	85	C
	6700	6/67	130.9		-	-	5	C
	7600	12/68	235.0		-	-	5	C
								Total: 160 E
Data General Corp.	NOVA	2/69	8.0	(S)	-	-	911	-
Southboro, Mass.	SUPERNOVA	5/70	9.6	(S)	-	-	169	-
(A) (8/71)	NOVA 1200	12/71	5.4	(S)	-	-	502	-
	NOVA 800	3/71	6.9	(S)	-	-	56	-
	SUPERNOVA SC	6/71	11.9	(S)	-	-	15	-
Datacraft Corp.	6024/1	5/69	54-300	(S)	12	0	12	3
Ft. Lauderdale, Fla.	6024/3	2/70	33-200	(S)	42	6	48	46
(A) (6/71)	6024/5	12/71	16-50	(S)	0	0	0	5
Digiac Corp.	Digiac 3060	1/70	9.0	(S)	45	-	-	7
Plainview, N.Y.	Digiac 3080	12/64	19.5	(S)	16	-	-	0
(A) (7/71)	Digiac 3080C	10/67	25.0	(S)	8	-	-	1
Digital Computer Controls, Inc.	D-112	8/70	10.0	(S)	195	35	230	410
Fairfield, N.J.	D-116	11/71	10.0		0	0	0	86
(A) (10/71)								

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)		NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Digital Equipment Corp.	PDP-1	11/60	3.4		48	2	50	X
Maynard, Mass.	PDP-4	8/62	1.7		40	5	45	X
(A) (2/71)	PDP-5	9/63	0.9		90	10	100	X
	PDP-6	10/64	10.0		C	C	23	X
	PDP-7	11/64	0.4		C	C	160	X
	PDP-8	4/65	0.3		C	C	1440	C
	PDP-8/1	3/68	0.4		C	C	3698	C
	PDP-8/S	9/66	0.3		C	C	1024	C
	PDP-8/L	11/68	-		C	C	3902	C
	PDP-9	12/66	1.1		C	C	436	C
	PDP-9L	11/68	-		C	C	48	C
	PDP-10	12/67	8.0		C	C	145	C
	PDP-11	3/70	10.5	(S)	C	C	546	C
	PDP-12	9/69	-		C	C	475	C
	PDP-15	-/69	17.0		C	C	377	C
	LINC-8	9/66	-		C	C	134	C
								Total: 1350 E
Electronic Associates Inc.	640	4/67	1.2		100	60	160	6
Long Branch, N.J. (7/71)	8400	7/67	12.0		21	6	27	0
EMR Computer	EMR 6020	4/65	5.4		C	-	-	C
Minneapolis, Minn.	EMR 6040	7/65	6.6		C	-	-	C
(A)	EMR 6050	2/66	9.0		C	-	-	C
(2/71)	EMR 6070	10/66	15.0		C	-	-	C
	EMR 6130	8/67	5.0		C	-	-	C
	EMR 6135	-	2.6		-	-	-	-
	EMR 6155	-	-		-	-	-	-
								Total: 1350 E
General Automation, Inc.	SPC-12	1/68	-		-	-	945	-
Anaheim, Calif.	SPC-16	5/70	-		-	-	145	-
(A) (10/71)	System 18/30	7/69	-		-	-	100	-
General Electric	GE-PAC 3010	5/70	2.0		2	0	2	18
West Lynn, Mass.	GE-PAC 4010	10/70	6.0		10	0	10	32
(Process Control Computers)	GE-PAC 4020	2/67	6.0		189	54	243	42
(A)	GE-PAC 4040	8/64	3.0		45	20	65	X
(10/71)	GE-PAC 4050	12/66	7.0		23	2	25	1
	GE-PAC 4060	6/65	2.0		18	2	20	X
Hewlett Packard	2114A, 2114B	10/68	0.25		-	-	1182	-
Cupertino, Calif.	2115A	11/67	0.41		-	-	333	-
(A) (8/71)	2116A, 2116B, 2116C	11/66	0.6		-	-	1171	-
Honeywell Information Systems	G58	5/70	1.0		-	-	-	-
Wellesley Hills, Mass.	G105A	6/69	1.3		-	-	-	-
(A) (2/71)	G105B	6/69	1.4		-	-	-	-
	G105RTS	7/69	1.2		-	-	-	-
	G115	4/66	2.2		200-400	420-680	620-1080	-
	G120	3/69	2.9		-	-	-	-
	G130	12/68	4.5		-	-	-	-
	G205	6/64	2.9		11	0	11	-
	G210	7/60	16.0		35	0	35	-
	G215	9/63	6.0		15	1	16	-
	G225	4/61	8.0		145	15	160	-
	G235	4/64	12.0		40-60	17	57-77	-
	G245	11/68	13.0		3	-	3	-
	G255 T/S	10/67	17.0		15-20	-	15-20	-
	G265 T/S	10/65	20.0		45-60	15-30	60-90	-
	G275 T/S	11/68	23.0		-	-	10	-
	G405	2/68	6.8		10-40	5	15-45	-
	G410 T/S	11/69	1.0		-	-	-	-
	G415	5/64	7.3		70-100	240-400	240-400	-
	G425	6/64	9.6		50-100	20-30	70-130	-
	G430 T/S	6/69	17.0		-	-	-	-
	G435	9/65	14.0		20	6	26	-
	G440 T/S	7/69	25.0		-	-	-	-
	G615	3/68	32.0		-	-	-	-
	G625	4/65	43.0		23	3	26	-
	G635	5/65	47.0		20-40	3	23-43	-
	G655	12/70	80.0		-	-	-	-
	H-110	8/68	2.7		180	7	255	0
	H-115	6/70	3.5		30	-	30	-
	H-120	1/66	4.8		800	160	960	-
	H-125	12/67	7.0		150	220	370	-
	H-200	3/64	7.5		800	275	1075	-
	H-400	12/61	10.5		46	40	86	X
	H-800	12/60	30.0		58	15	73	X
	H-1200	2/66	9.8		230	90	320	-
	H-1250	7/68	12.0		130	55	185	-
	H-1400	1/64	14.0		4	6	10	X
	H-1800	1/64	50.0		15	5	20	X
	H-2200	1/66	18.0		125	60	185	-
	H-3200	2/70	24.0		20	2	22	-
	H-4200	8/68	32.5		18	2	20	-
	H-8200	12/68	50.0		10	3	13	-
	DDP-24	5/63	2.65		-	-	90	X
	DDP-116	4/65	0.9		-	-	250	-
	DDP-124	3/66	2.2		-	-	250	-
	DDP-224	3/65	3.5		-	-	60	-
	DDP-316	6/69	0.6		-	-	450	-
	DDP-416	-	-		-	-	350	-
	DDP-516	9/66	1.2		-	-	900	-
	H112	10/69	-		-	-	75	-
	H632	12/68	3.2		-	-	12	-
	H1602	-	-		-	-	-	-
	H1642	-	-		-	-	-	-
	H1644	-	-		-	-	-	-

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
Honeywell (cont'd)	H1646	-	-	-	-	-	-
	H1648	11/68	12.0	-	-	20	-
	H1648A	-	-	-	-	-	-
IBM	System/Model 6	3/71	1.0	-	-	-	-
White Plains, N.Y.	System/3 Model 10	1/70	1.1	-	-	-	-
(N) (D)	System/7	11/71	0.35 and up	-	-	-	-
(1/69-5/69)	305	12/57	3.6	40	15	55	-
	650	10/67	4.8	50	18	68	-
	1130	2/66	1.5	2580	1227	3807	-
	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
	1401-H	6/67	1.3	180	140	320	-
	1410	11/61	17.0	156	116	272	-
	1440	4/63	4.1	1690	1174	2864	-
	1460	10/63	10.0	194	63	257	-
	1620 I, II	9/60	4.1	285	186	471	-
	1800	1/66	5.1	415	148	563	-
	7010	10/63	26.0	67	17	84	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	2	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7020, 2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-
	7094-I	9/62	75.0	10	4	14	-
	7094-II	4/64	83.0	6	4	10	-
	360/20	12/65	2.7	4690	3276	7966	-
	360/25	1/68	5.1	0	4	4	-
	360/30	5/65	10.3	4075	3144	7219	-
	360/40	4/65	19.3	1260	498	1758	-
	360/44	7/66	11.8	65	13	78	-
	360/50	8/65	29.1	480	109	589	-
	360/65	11/65	57.2	175	31	206	-
	360/67	10/65	133.8	9	4	13	-
	360/75	2/66	66.9	14	3	17	-
	360/85	12/69	150.3	-	-	-	-
	360/90	11/67	(S)	5	-	5	-
	370/135	5/72	14.4	-	-	-	-
	370/145	9/71	23.3	-	-	-	-
	370/155	2/71	48.0	-	-	-	-
	370/165	5/71	98.7	-	-	-	-
	360/195	4/71	232.0	-	-	-	-
Interdata	Model 1	12/70	3.7	150	50	200	50
Oceanport, N.J.	Model 3	5/67	-	N/A	-	200	X
(A) (10/71)	Model 4	8/68	8.5	260	115	375	40
	Model 5	11/70	10.5	70	20	90	10
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	14.7	1	5	6	12
	Model 18	6/71	24.7	2	6	8	8
	Model 70	10/71	6.8	0	0	0	60
NCR	304	1/60	10.0	10	2	12	X
Dayton, Ohio	310	5/61	2.5	8	0	8	X
(A) (6/71)	315	5/62	7.0	425	300	725	-
	315 RMC	9/65	9.0	125	50	175	-
	390	5/61	0.8	290	440	730	-
	500	10/65	1.0	1100	1800	2900	-
	Century 50	2/71	1.6	75	-	75	-
	Century 100	9/68	2.6	1400	450	1850	-
	Century 200	6/69	7.5	405	155	560	-
	Century 300	2/72	20.0	0	0	0	-
Philco	1000	6/63	7.0	16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	40.0	16	-	-	X
(N) (1/69)	2000-212	1/63	52.0	12	-	-	X
RCA	301	2/61	7.0	140-290	100-130	240-420	-
Cherry Hill, N.J.	501	6/59	14.0-18.0	22-50	1	23-51	-
(N)	601	11/62	14.0-35.0	2	0	2	-
(5/69)	3301	7/64	17.0-35.0	24-60	1-5	25-65	-
	Spectra 70/15	9/65	4.3	90-110	35-60	125-170	-
	Spectra 70/25	9/65	6.6	68-70	18-25	86-95	-
	Spectra 70/35	1/67	9.2	65-100	20-50	85-150	-
	Spectra 70/45	11/65	22.5	84-180	21-55	105-235	-
	Spectra 70/46	-	33.5	1	0	1	-
	Spectra 70/55	11/66	34.0	11	1	12	-
Raytheon	250	12/60	1.2	115	20	135	X
Santa Ana, Calif.	440	3/64	3.6	20	-	20	X
(A)	520	10/65	3.2	26	1	27	X
(7/71)	703	10/67	12.5 (S)	172	31	203	2
	704	3/70	8.0 (S)	100	35	135	50
	706	5/69	19.0 (S)	60	14	74	0
Scientific Control Corp.	4700	4/69	1.8	18	0	18	-
Dallas, Texas	DCT-132	5/69	0.9	24	35	59	-
(A) (10/71)							
Standard Computer Corp.	IC 4000	12/68	9.0	9	0	9	4
Los Angeles, Calif.	IC 6000	5/67	16.0	9	0	9	-
(A) (6/71)	IC 7000	8/70	17.0	5	0	4	4
Systems Engineering Laboratories	810	9/65	1.1	24	0	24	X
Ft. Lauderdale, Fla.	810A	8/66	0.9	111	5	216	32
(A)	810B	9/68	1.2	75	1	76	26
(6/70)	840	11/65	1.5	3	0	3	X
	840A	8/66	1.5	36	2	38	X
	840MP	1/68	2.0	31	0	31	2
	Systems 86	-	10.0	0	0	0	2

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
UNIVAC Div. of Sperry Rand	I & II	3/51 & 11/57	25.0	23	-	-	X
New York, N.Y.	III	8/62	21.0	25	6	31	X
(A) (2/71)	File Computers	8/56	15.0	13	-	-	X
	Solid-State 80 I,II, 90, I, II, & Step	8/58	8.0	210	-	-	X
	418	6/63	11.0	76	36	112	20 E
	490 Series	12/61	30.0	75	11	86	35 E
	1004	2/63	1.9	1501	628	2129	20 E
	1005	4/66	2.4	637	299	936	90 E
	1050	9/63	8.5	138	62	200	10 E
	1100 Series (except 1107, 1108)	12/50	35.0	9	0	9	X
	1107	10/62	57.0	8	3	11	X
	1108	9/65	68.0	87	114	201	75 E
	9200	6/67	1.5	1051	822	1873	850 E
	9300	9/67	3.4	387	49	436	550 E
	9400	5/69	7.0	8	0	8	60 E
	LARC	5/60	135.0	2	0	2	-
Varian Data Machines	620	11/65	-	-	-	75	X
Newport Beach, Calif.	620i	6/67	-	-	-	1300	400
(A) (7/71)	R-260i	4/69	-	-	-	50	30
	520i	10/68	-	-	-	150	330
	520/DC	12/69	-	-	-	25	25
	620/f	11/70	-	-	-	60	40
	620/L	4/71	-	-	-	12	250
Xerox Data Systems	XDS-92	4/65	1.5	10-60	2	12-62	-
El Segundo, Calif.	XDS-910	8/62	2.0	150-170	7-10	157-180	-
(R)	XDS-920	9/62	2.9	93-120	5-12	98-132	-
(2/71)	XDS-925	12/64	3.0	20	1	21	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	28-35	0	28-35	-
	XDS-9300	11/64	8.5	21-25	1	22-26	-
	Sigma 2	12/66	1.8	60-110	10-15	70-125	-
	Sigma 3	12/69	2.0	10	0	10	-
	Sigma 5	8/67	6.0	15-40	6-18	21-58	-
	Sigma 6	6/70	12.0	-	-	-	-
	Sigma 7	12/66	12.0	24-35	5-9	29-44	-
	Sigma 9	-	35.0	-	-	-	-

c.a PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 7111: TOO FEW OR TOO MANY?

When Bill entered the office he heard Art muttering, "Sparse data is a headache."

"What's your gripe now?" asked Bill. "Not another one of those binary matrices, I hope."

"Right the first time! One of those 100 by 100 jobs, which means a million bits. But practically all of them are zero – just an occasional 1 here and there."

"But you have to store them all. Is that what's bothering you? Why not merely note the positions where the 1's occur?"

"I could do that, but each position would have to be represented in BCD and that would mean four bits per digit. I'm not sure there'd be any saving."

"There might be if the 1's were few and far between. How often do you hit a 1?"

"Well, in the last matrix like this I had – let me see." Art consulted a sheet on his desk. "There were exactly 44378 1's, which is just about one every 23 bits according to my figures."

"If that's any guide you'd probably do better to note the positions of the 1's, even using four bits per digit."

Is he right?

Solution to Problem 7110: Operation Search

If N is of the form $2^n - 1$, n operations will be necessary. Otherwise the number of operations will be 2a + b + 4c – 3 where a is the number of 0's, b the number of consecutive final 1's and c the number of other 1's in the binary representation of N.

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.

Berkeley *(Continued from page 30)*

One such happening is the mind-set (and the consequent lying to the people of the United States) held by Lyndon B. Johnson, Robert McNamara, Walter Rostow, McGeorge Bundy, Dean Rusk, and others — all revealed by the Pentagon Papers released by Daniel Ellsberg. Nor does this comfortable view explain many other events that undeniably happened, such as the informing of the FBI (and therefore J. Edgar Hoover) at least several days before November 22, 1963 of the plot to kill President Kennedy in Dallas.

Question 4: Why have not Computers and Automation and its editors aroused opposition from and suppression by the government?

Answer: We are not important yet. As soon as we become as important as District Attorney Jim Garrison of New Orleans, or as the Black Panthers, we can expect the same sort of treatment.

In the meantime, the best strategy to be used against us is ignoring us, on the obvious ground that what we are saying is totally unimportant and not worth attention. Many of our former subscribers, I am sure, feel the same way.

CALENDAR OF COMING EVENTS

Nov. 1-2, 1971: Computer Science and Statistics: Fifth Annual Symposium on the Interface, Oklahoma State University, Stillwater, Okla. / contact: Dr. Mitchell O. Locks, Oklahoma State Univ., Stillwater, Okla. 74074

Nov. 3-5, 1971: 25th IEEE Northeast Electronics Research and Engineering Meeting (NEREM), Sheraton-Boston Hotel and the John B. Hynes Auditorium, Boston, Mass. / contact: IEEE Boston Office, 31 Channing St., Newton, Mass. 02158

Nov. 4-5, 1971: 1971 American Production & Inventory Control Society (APICS) International Conference, Chase Park Plaza Hotel, St. Louis, Mo. / contact: Henry F. Sander, American Production & Inventory Control Society, Inc., Suite 504 Watergate Bldg., 2600 Virginia Ave. N.W., Washington, D.C. 20037

Nov. 7-11, 1971: 34th Annual Meeting of the American Society for Information Science (ASIS), Denver Hilton Hotel, Denver, Colo. / contact: Miss Sheryl Wormley, ASIS, 1140 Connecticut Ave., N.W., Suite 804, Washington, D.C. 20036

Nov. 12, 1971: 4th Annual Society for Information Display One Day Technical Conference, Statler-Hilton Hotel, Dallas, Texas / contact: Society for Information Display, Suite 5, 654 No. Sepulveda, Los Angeles, Calif. 90049

Nov. 16-18, 1971: Fall Joint Computer Conference, Las Vegas Convention Center, Las Vegas, Nev. / contact T. C. White, AFIPS Headquarters, 210 Summit Ave., Montvale, N. J. 07645

Nov. 18, 1971: First National Conference of the Society for Computer Medicine, American Hospital Association, 840 North Lake Shore Drive, Arlington, Va. / contact: Society for Computer Medicine, 3839 26th St. North, Arlington, Va. 22207

Nov. 30-Dec. 3, 1971: Systems '71, Munich, Germany / contact: Andre Williams, BIC-938, Commercial Exhibitions Div., U.S. Department of Commerce, Washington. D.C. 20230

Dec. 7-8, 1971: Workshop on Digital Systems, Lehigh Univ., Bethlehem, Pa. / contact: Frank M. Towell, Western Electric Co., Allentown, Pa. 18103

Dec. 7-10, 1971: Applications of Simulation, Waldorf Astoria Hotel, New York, N.Y. / contact: Joseph Sussman, MIT, 77 Massachusetts Ave., Cambridge, Mass. 02139

Dec. 16-18, 1971: IEEE Conference on Decision and Control (including the 10th Symposium on Adaptive Processes), Americana of Bal Harbour, Miami Beach, Fla. / contact: Prof. J. T. Tou, Univ. of Florida, Gainesville, Fla.

Feb. 2-4, 1972: 1972 San Diego Biomedical Symposium, Sheraton Hotel, Harbor Island, San Diego, Calif. / contact: Norman R. Silverman, M.D., San Diego Biomedical Symposium, P.O. Box 965, San Diego, Calif. 92112

Mar. 20-23, 1972: IEEE International Convention & Exhibition, Coliseum & N. Y. Hilton Hotel, New York, N. Y. / contact: IEEE Headquarters, 345 E. 47th St., New York, N. Y. 10017

April 5-8, 1972: "Teaching Systems '72", International Congress, Berlin Congress Hall, Berlin, Germany / contact: AMK Berlin, Ausstellungs-Messe-Kongress-GmbH, Abt. Presse und Public Relations, D 1000 Berlin 19, Messedamm 22, Germany

April 25-28, 1972: Conference on Computer Aided Design, Univ. of Southampton, Southampton, England / contact: IEE Office, Savoy Place, London W.C. 2, England

May 15-18, 1972: 5th Australian Computer Conference, Brisbane, Queensland, Australia / contact: A. W. Goldsworthy, Chmn., Australian Computer Society, Inc., Computer Center, Australian National Univ., P. O. Box 4, Canberra, A.C.T. 2600

May 15-18, 1972: Spring Joint Computer Conference, Convention Ctr., Atlantic City, N.J. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

May 16-17, 1972: IIT Research Institute Second International Symposium on Industrial Robots, Chicago, Ill. / contact: K. G. Johnson, Symposium Chairman, IIT Research Institute, 10 West 35 St., Chicago, Ill. 60616

May 21-24, 1972: 7th Annual Mass Retailers' Convention and Product Exposition, Marriott Motor Hotel, Atlanta, Ga. / contact: MRI Headquarters, 570 Seventh Ave., New York, N. Y. 10018

May 24-26, 1972: Second Annual Regulatory Information Systems Conference, Chase-Park Plaza Hotel, St. Louis, Mo. / contact: William R. Clark, Missouri Public Service Commission, Jefferson City, Mo. 65101

June 12-14, 1972: International Conference on Communications, Sheraton Hotel, Philadelphia, Pa. / contact: Stanley Zebrowitz, Philco-Ford Corp., 4700 Wissahickon Ave., Philadelphia, Pa. 19144

June 19-21, 1972: International Symposium on Fault-Tolerant Computing, Boston, Mass. / contact: John Kirkley, IEEE Computer Society, 8949 Reseda Blvd., Suite 202, Northridge, Calif. 91324

Sept. 19-22, 1972: Western Electronic Show & Convention (WESCON), Los Angeles Convention Ctr., Los Angeles, Calif. / contact: WESCON, 3600 Wilshire Blvd., Los Angeles, Calif. 90005

Oct. 8-11, 1972: International Conference on Systems, Man and Cybernetics, Shoreham Hotel, Washington, D.C. / contact: K. S. Nurendra, Yale Univ., 10 Hill House, New Haven, Conn. 06520

Nov. 1-3, 1972: Northeast Electronics Research & Engineering Meeting (NEREM), Boston, Mass. / contact: IEEE Boston Office, 31 Channing St., Newton, Mass. 02158

Nov. 13-16, 1972: Fall Joint Computer Conference, Convention Center, Las Vegas, Nev. / contact: AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645

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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 the agency, if any.

BERKELEY ENTERPRISES, INC., 815 Washington St., Newtonville, Mass. 02160 / Pages 35, 37
COMPUTERS AND AUTOMATION, 815 Washington St., Newtonville, Mass. 02160 / Pages 2, 3, 27, 28
IBM Corporation, 1133 Westchester Ave., White Plains, N.Y. 10604 / Page 52 / Geer, DuBois & Co., Inc.
NEW YORK TIMES Book & Education Div., 299 West 43 St., New York, N.Y. 10036 / Page 51 / Kingen Feleppa O'Dell
VOICE OF WOMEN NEW ENGLAND, 811 Washington St., Newtonville, Mass. 02160 / Page 16

Who's Who in Computers and Data Processing

A CONTINUING PUBLICATION:
FIFTH EDITION AND SUPPLEMENTS ——→ SIXTH EDITION

Who's Who in Computers and Data Processing is published jointly by Quadrangle Books (a New York Times Company) and Computers and Automation.

In view of the financial depression in the computer field, the Who's Who will until further notice be published as the FIFTH EDITION plus a number of SUPPLEMENTS.

The First Supplement (26 pages, over 1,000 entries) was published in the June 1971 and July 1971 issues of Computers and Automation. The Second Supplement will be published in the next few months. Each supplement consists of entries that update existing information, and entries of capsule biographies for computer professionals not previously included.

Every supplement is free on request to each purchaser of the set of the Fifth Edition (3 volumes, hardcover, over 1,000 pages). This edition contains over 15,000 capsule biographies of computer professionals. Price, $75.00, including all supplements as issued.

If you wish to be considered for inclusion in the Who's Who (or if information for you has been previously published and requires updating), please complete the following form or provide us with the equivalent information.

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

1. Name? (Please print)_____

2. Home Address (with Zip)?_____

3. Organization?_____

4. Its Address (with Zip)?_____

5. Your Title?_____

6. Your Main Interests?

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

7. Year of Birth?_____ 8. Education and Degrees?_____

9. Year Entered Computer Field?_____ 10. Your Present Occupation?_____

11. Publications, Honors, Memberships, and other Distinctions?_____

_____
(attach paper if needed)

12. Do you have access to a computer? ( ) Yes ( ) No

a. If yes, what kind of computer? Manufacturer?_____ Model?_____

b. Where is it installed: Organization?_____

Address?_____

c. Is your access: Batch? ( ) Time-Shared? ( ) Other? ( ) Please explain_____

d. Any remarks?_____

13. In which volume or volumes of the Who's Who —

	(a) Have you been included?	(b) Do you think you should be included?
Vol. 1 — Systems Analysts and Programmers	( )	( )
Vol. 2 — Data Processing Managers and Directors	( )	( )
Vol. 3 — Other Computer Professionals	( )	( )

14. Do you subscribe to Computers and Automation? ( ) Yes ( ) No — to The New York Times? ( ) Yes ( ) No

15. Associates or colleagues who should be sent Who's Who entry forms?

Name and Address

_____

_____

_____

_____
(attach paper if needed)

When completed, please send promptly to: Who's Who Editor, Computers and Automation,
815 Washington St., Newtonville, Mass. 02160

The New York Times and
Computers and Automation
have published 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 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

WHO'S WHO IN COMPUTERS AND DATA PROCESSING

This is the most extensive register of computer professionals ever published. It is arranged in three volumes:

1. *Systems Analysts and Programmers*
2. *Data Processing Managers and Directors*
3. *Other Computer Professionals* (from professors of computer science to attorneys versed in the computer field)

Each volume has an index to the entire set of entries.

Each computer specialist has a capsule biography detailing: *Birth Date . . . Education . . . Year Entered Computer Field . . . Title . . . Honors . . . Memberships . . . Special Skills* (from applications to logic to sales) . . .

PLUS both home and business addresses. For example:

> CHAPIN, Ned / consultant / born: 1927 / educ: PhD, IIT; MBA, Univ of Chicago / entered computer field: 1954 / main interests: applications, business, logic, management, programming, systems, data structures / title: data processing consultant / organization: InfoSci Inc, Box 464, Menlo Park, CA 94025 / publications, honors: 3 books, over 50 papers; member, over 12 associations; CDP; lecturer for ACM / home address: 1190 Bellair Way, Menlo Park, CA 94025

This reference is particularly useful for: personnel managers; employers; recruiting organizations; libraries; conference planners; directors of computer installations; . . . anyone who needs to keep up with the important people in the field.

FIFTH EDITION – Over 1000 pages

The coupon below will bring you the 3-volume set at the price of $75. There is no risk involved. *10-Day Free Examination.*

WHO'S WHO IN COMPUTERS AND DATA PROCESSING
Edited by Edmund C. Berkeley
3 volumes in durable hard-cover bindings
Retail price $75 the set

(may be copied on any piece of paper)

Who's Who in Computers and Data Processing,
815 Washington St., Newtonville, Mass. 02160

( ) Please send the 3-volume set WHO'S WHO IN COMPUTERS AND DATA PROCESSING at $75. You will bill me *after delivery* and I may return the set within 10 days if not fully satisfied.

( ) Please make this order a standing order for the 5th and later editions – so that I will receive all updating supplements free automatically.

( ) I have already bought the 5th Edition. Please change my record of purchase to a standing order, and send me Supplement 1 FREE.

NAME _____

TITLE _____

ORGANIZATION _____

ADDRESS _____

CITY _____ STATE & ZIP _____

YOUR SIGNATURE _____ P.O. # (IF COMPANY ORDER) _____

21 ways to improve your computer system's performance.

Here are some of over 150 IBM program products to help your computer do more work. And do it more profitably.

There's a program that lets your salesmen search the computer's file while he's got a customer on the phone.

A program that helps your company's executives decide which products to make, when to make them, where to ship them.

There are programs that help your programmers become more productive. By letting them spend more time writing programs, less time debugging them.

If you'd like a complete description of these and other programs, just fill in the coupon below. Or call your local IBM office.

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1. PL/I Optimizing Compiler (OS, DOS) Offers greatly increased execution, new language features, improved debugging aids and communication with existing FORTRAN and COBOL object modules.

2. ANS Full COBOL Version 3 (OS, DOS) Contains major improvements in debugging aids, additional functions and ASCII support.

3. FORTRAN IV (H Extended) Compiler (OS) Supports extended precision arithmetic, two new forms of input/output for ease of use, and improved compilation speed and reliability.

4. Interactive Terminal Facility (ITF) (OS, DOS) Provides time sharing for problem solvers using BASIC and Interactive PL/I.

5. OS-Sort/Merge 1 (OS-SM1) (OS) Improved speed and functions over previous OS sorts. Provides support for IBM 3330 Disk Storage.

6. Assembler H (OS) A new high performance assembler language processor for OS users. Requires no reprogramming or conversion for current OS assembler users.

7. 1130 COBOL Specifically designed compiler featuring high speed compilation and fast execution for small to medium IBM 1130 users.

8. APL/360 (OS, DOS) A user-oriented program with a language designed for problem solving and a time sharing capability that lets many users work independently at the same time.

Data entry, data base

9. Customer Information Control System (CICS) (OS, DOS) The link between your computer's data base and the applications you want to put on-line. By providing many of the standard control functions, CICS lets your programmers concentrate on coding the applications. Helps you save implementation time and cost.

10. Data/360 (OS, DOS) A general purpose data-entry program. Data is entered and verified through IBM displays, edited and written out on disk files.

11. Data Base Organization and Maintenance Processor (DOS) A system to integrate data files into a central data base for query applications involving existing multiple customer files.

12. Generalized Information System/2 (GIS/2) (OS) A high-level query and file maintenance system particularly useful for meeting spontaneous information requirements or handling repetitive jobs.

13. Information Management System/360 (IMS/360) Version 2 (OS) Facilitates use of medium to large common data bases and accommodates teleprocessing and batch processing, concurrently or separately.

Applications

14. Project Management System IV (PMS IV) (OS) A powerful program in modular form for resource allocation, cost analysis and precedence input analysis.

15. Requirements Planning (OS) A materials management system designed to determine what, when and how much to order in a manner that will help minimize component inventories.

16. Shop Floor Control (OS, DOS) Establishes and maintains a shop order data base and provides for shop order release, status and inquiry for timely management decisions.

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18. General Purpose Simulation System V (GPSS V) (OS, DOS) Powerful, easy-to-use tool for simulating the behavior of systems in engineering and management sciences.

19. Bill of Material Processor (System/3 Model 6 and Model 10 Disk) Establishes and maintains basic manufacturing files describing the structure of products and their manufacturing procedures.

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