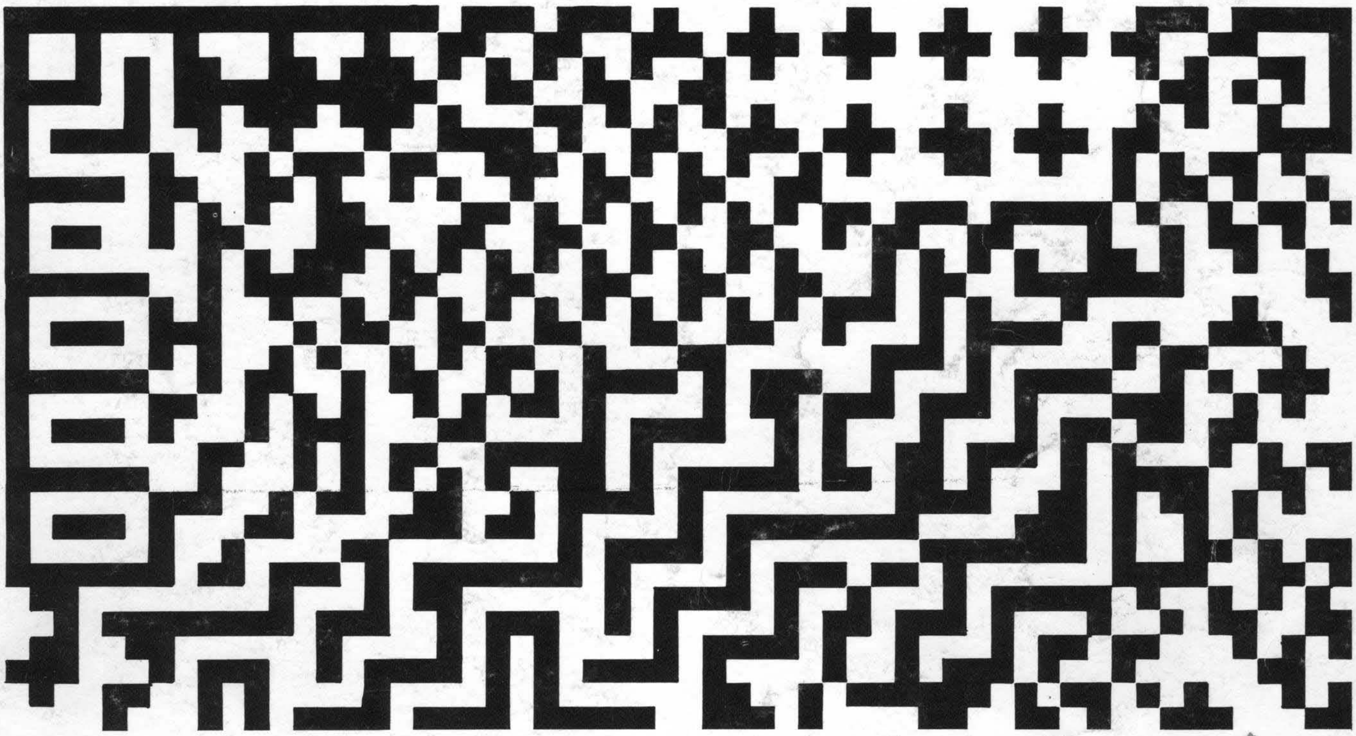
March, 1973

Vol. 22, No. 3

computers and automation and people



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— Harold J. Coate, EDP Manager, St. Joseph, Mo.

Your concept is brilliant, and a welcome antidote to much which is passed off as useful knowledge these days. Keep up the good work.
— Charles E. Abbe, Data Systems Analyst, Pasadena, Calif.

Very good articles; something all managers should read.
— William Taylor, Vice President, Calgary, Alberta

As I am involved with systems work, I can always use one of the issues to prove a point or teach a lesson.
— Edward K. Nellis, Director of Systems Development, Pittsford, N.Y.

Thoroughly enjoy each issue.
— David Lichard, Data Processing Manager, Chicago, Ill.

All are good and thought-provoking — which in itself is worthwhile. Keep it up.
— Richard Marsh, Washington, D.C.

Especially like "Right Answers".
— Ralph E. Taylor, Manager of Research and Development, West Chester, Ohio

Your tendency to deal with practical applications is very rewarding.
— Jeffrey L. Rosen, Programmer, Toronto, Canada

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Vol. 22, No. 3
March, 1973

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Advertising Contact	**The Publisher** **Berkeley Enterprises, Inc.** 815 Washington St. Newtonville, Mass. 02160 617-332-5453

"Computers and Automation" is published monthly, 12 issues per year, at 815 Washington St., Newtonville, Mass. 02160, by Berkeley Enterprises, Inc. Printed in U.S.A. Second Class Postage paid at Boston, Mass., and additional mailing points.

Subscription rates: United States, $9.50 for one year, $18.00 for two years. Canada: add 50 cents a year for postage; foreign, add $3.50 a year for postage.

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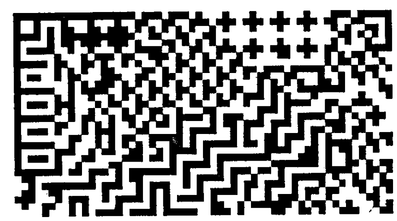
computers and automation and people

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

Corrections

In the November, 1972, issue of *Computers and Automation,* on page 11 at the foot of the page, the following note should appear: "Reprinted from, and © 1972 by, the *American Mathematical Monthly,* June-July, 1972." We regret this unfortunate omission.

In the February, 1973, issue of *Computers and Automation and People,* on page 1 and on page 4, replace "Vol. 21" by "Vol. 22". We regret this stupid mistake.



Front Cover Picture

"Visual Structure No. 98" was produced by Michael Thompson, Rechov Remez 1, Kadima, Israel. He states: "Visual structures can be explored by developing rules capable of generating them. . . . The rules which are stored in the computer determine how to fill in each element in the context of its neighboring cells."

Departments

Key

- [A] – **Article**
- [C] – **Monthly Column**
- [E] – **Editorial**
- [NT] – **Not Technical**
- [T] – **Technical**

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EDITORIAL

PROBLEM SOLVING

In the January 1973 issue of the *American Mathematical Monthly* there is a letter by Dr. George Polya, Professor Emeritus, Stanford University, to an unnamed chairman of a mathematics department in which he says:

> As you may know, I am especially concerned with problem solving . . . That the role of problem solving in mathematics is not understood by nonmathematicians and not duly appreciated by outsiders is not surprising . . . [but] I heard lately that such lack of understanding and appreciation led to denying a promotion to a member of your Department. I feel that there is serious matter of principle involved. . . .
>
> Problems play an essential role both in the progress and in the teaching of science. . . . Problems play an important role on all levels of mathematical instruction . . . . Problem-solving is a perfectly acceptable and respectable professional activity for a mathematician and can favorably influence his teaching . . . . If it is true what I heard that your colleague's promotion was refused because he "only" solved problems and did not publish, such a decision is unwise and unjust.

The basic mission of a computer is to solve problems. With more than 2300 applications of computers (according to a list published in the last issue of the *Computer Directory and Buyers' Guide*), it must be agreed that computers – programmed computers – solve a very large number of significant problems, or else the persons who have paid for them would not have bought them.

But if we consider all the kinds of problems that exist, we must admit there are a great many important problems that neither mathematicians nor computers have solved as yet, and may never solve. Such problems are likely to be solved (or not solved) by human beings, using principles for solving problems that have been gathered for many centuries by human beings.

In spite of the vast numbers of problems, the general methods for solving them are rather small in number, perhaps as many as 60, probably fewer than 300. On the opposite page is a list of principles for solving problems made up some time ago, partly in fun, partly in earnest.

To me there are several very interesting aspects to that list of principles for solving problems.

One aspect is this. For nearly every one of those principles, there actually exist one or more situations to which it applies. Take for example The Principle of Fate ("Allah wills it"). In regard to my own death, this is the principle I adopt, except that in my version of the principle I replace "Allah" by the "Laws of Nature"; the only solution to the problem "How to live forever?" is "No solution". Even the Principle of "Not Invented Here" – for which I have a hearty dislike – applies properly in some cases: a man who writes in to the Patent Office and says he has invented a perpetual motion machine is not given a hearing.

A second aspect is this. Suppose we could make an inventory of say two thousand kinds of situations that occur the most often in the real world. These situations often present problems that human beings must deal with. Suppose a group of practical engineers and scientists could make a handbook of principles for dealing with these common, real world problems. It would be like an engineering handbook, except that it would deal with situations that occur far more often than the situations alluded to in an engineering handbook – or even a consumers' buying guide. I think such a "Handbook for Practical Problem Solving" would be useful; and it would certainly save many mistakes and many losses.

And it might even be computerized.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

PRINCIPLES FOR SOLVING PROBLEMS

by Edmund C. Berkeley

The Principle of Ignorance ("what you don't know won't hurt you")

The Principle of Fate ("Allah wills it")

The Principle of Waiting ("everything comes to him who waits")

The Principle of Postponement ("never do today what you can put off till tomorrow")

The Principle of Procrastination ("if you wait long enough, the problem will take care of itself")

The Principle of Mr. Micawber* ("something will turn up")

The Principle of Pure Chance ("let's flip a coin")

The Principle of Nonsense ("let's see what the horoscope indicates")

The Principle of Denial ("there is really no problem at all – you're just worrying over nothing")

The Principle of Intuition ("let your subconscious work on it while you sleep")

The Principle of Willpower ("man has free will and can choose or not choose")

The Principle of Tolerance (*"de gustibus non disputandum"* – "about tastes there is no sense in disputing")

The Principle of Forgiveness ("forgive them, for they know not what they do")

The Principle of Departure ("that problem is not for me, and I am leaving")

The Principle for Dealing with Mountains ("if the mountain won't come to Mahomet, Mahomet must go to the mountain")

The Principle of Faultfinding ("it's your fault it does not work")

The Principle of Poor Me ("nothing ever goes right for me")

The Principle of Excuse ("this is why it did not work – listen . . .")

The Principle of Not Invented Here ("any method or idea not invented here is no good")

The Principle of Action ("don't just stand there – do something, anything")

The Principle of Authority ("consult an expert, and do what he says")

The Principle of Experience ("experience is the best teacher")

The Principle of Trial and Error ("if at first you don't succeed, try and try again")

The Principle of Successive Approximation ("if at first you don't succeed, try some more – but learn from each trial")

The Principle of Theory and Practice ("theory enriches practice, and practice modifies theory")

The Principles of Calculation ("figure it out, compute it")

The Principle of Feedback Control ("every time the process strays off a little, correct it, bring it back to the desired condition")

The Principles of Science and the Scientific Method ("experiment, draw conclusions, and test them")

The Principles of Systems Analysis and Synthesis ("take all the factors into account")

The Principle of Careful, Systematic Verification ("continually check all statements – they tend to get out of date")

---

* a character in *David Copperfield* by Charles Dickens, published 1850.

Management of Computer Technology

Colonel Carl J. Weinmeister III
111 Yount Circle
Lackland AFB, Texas 78236

"To illustrate computer operations, one way is to imagine a three dimensional planetary system with the various parts as orbital bodies: each body has its orbit, and the orbits intersect."

Overview

Today's computers provide unique opportunities for management innovations.

The creativity of the data processing manager is a key to these innovations. Top and middle management also must provide their imaginative contribution.

This article provides a departure point from which a dialogue can be developed between these various managers.

"Am I running old-fangled computer programs on new-fangled computers?" "Did the organization purchase a faster, more expensive machine to do the same old things — faster?" "Even with these sophisticated machines, management still wants the same old reports — why?" These are some of the questions that plague today's data processing manager. Technology is almost overwhelming him; yet, can he use this technology to do a better job? To answer this last question one must step back, take a thorough look at the setting, evaluate the challenge and set the course that he deems will do the best job.

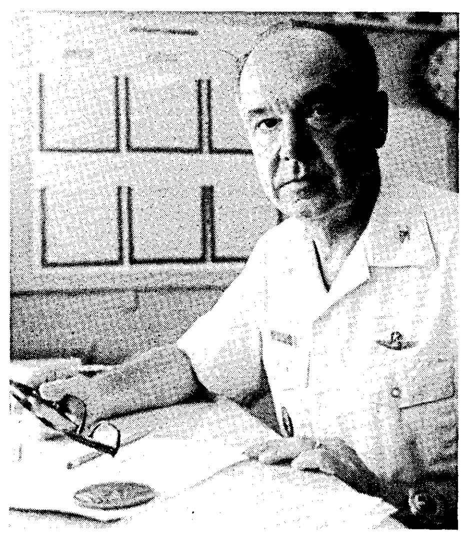
The Setting

The setting consists of:

1. Today's computers.
2. Non-application programs.
3. Data base.
4. Application programs.
5. People.

Today's Computers

Very little need be said about the quality of the computers on the market today. One only has to read any of the many professional magazines or manufacturers' announcements to realize the creativity of computer manufacturers. Technical enhancements are announced daily. They are clearly measurable in speed of processing and new technology in manufacturing. Miniaturization, especially in the mini computers, is opening a whole new concept of operation. Then also there are the new peripherals that include video display devices, teletypewriters, optical character readers, large capacity random-



Colonel Carl J. Weinmeister III is presently the Director of Personnel, Lackland Military Training Center, Lackland Air Force Base, Texas. He previously served as the Data Processing Manager for the Commander-in-Chief's Pacific Automatic Data Processing Group. Colonel Weinmeister holds a BBA degree from Emory University and an MA degree in Personnel Administration from George Washington University, where he specialized in the "people problems" associated with computers.

access devices, and many other new innovations. There is fast developing the concept of a distributed computer network where small satellite computers provide data for larger central computers.

The hardware daily gets better, faster, smaller, and more efficient. It leads the pack. The hardware has always been ahead of all other parts of ADP and it appears that it will keep out front.

There have been many attempts to illustrate the computer operations, but the listener often gets confused because of the subtle interrelation that exists between the various parts. One way to imagine this abstract relationship is to think of computer operations as a three dimensional planetary system with the various parts as orbital bodies. Each body has its orbit and the orbits intersect. (See Figure 1)

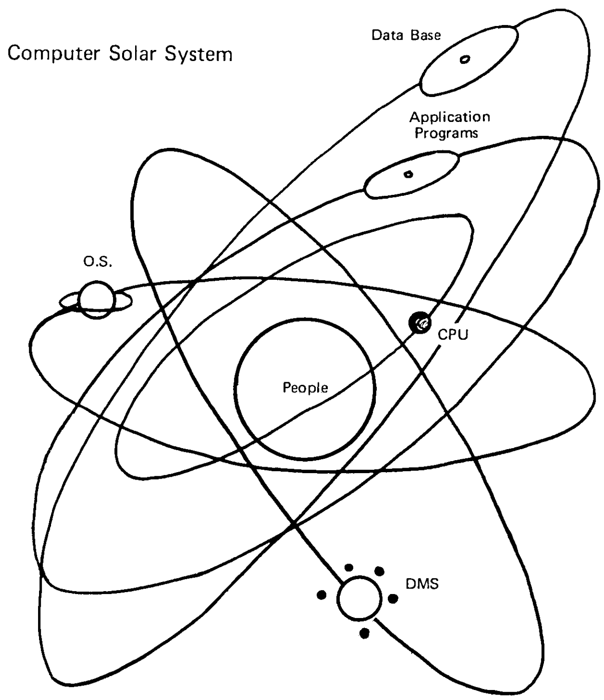


Figure 1

In the first orbit is found the central processing unit (CPU) of the computer. This arithmetic operation has become so commonplace that it is almost forgotten. The processor is a fundamental part of the computer solar arrangement.

Non-application Programs

For the purpose of this discussion, non-application programs are simply all those routines that are not specifically identified with one particular computer program. These programs continue to grow. They might be called the internal software subsystem that combines with the hardware subsystem to form the operating subsystem. Notice that all of these are "subs" because the total system is a composite of all the parts. Too often one tends to think of one's part of the whole as a system. The system only exists when all parts come together to provide the products.

The second orbit in the computer solar system is difficult to clearly delineate. It used to be called the executive program. It now is called the operating system (OS) or some other prestigious name. And prestigious it should be because the executive software that the computer manufacturers deliver today are a powerful extension to sophisticated hardware. Some executive software treats peripherals like core. Some can evaluate applications and see which application should be performed first. Additionally, if a high priority shows up in the queue, today's executive programs get a restart point for the program that is running, clear it from core and put it aside to be done at a later time.

Executive Programs

Today's executive programs accommodate time sharing while doing batch processing in the background. Through the time sharing feature they can support cathode ray terminals, teletypewriter terminals and other remote peripheral devices. These devices, entering the computer through the time sharing mode, offer exciting opportunities for future applications.

A third orbital body in our computer celestial arrangement is the data management system (DMS). This is the new name for computer programs that have existed since the first time that two machine instructions were combined into a computer macro. The data management system really combined all the computer languages into a common environment. It is a hierarchy that begins with assembly language and moves up the scale through JOVIAL, FORTRAN and COBOL to the new higher level languages that use near English sentences and allow non-programmer people to reach into the data base and extract the data needed to provide information to the boss. Data management systems also include those routines that do preprocessing, data checking and edit functions. The DMS also includes communication computer programs that link the center of the computer to remote users throughout the world. It is realized that this definition of a DMS may seem broad; but, when one considers the items being advertised as DMS's, one begins to realize that the new innovations are only more sophisticated languages.

The DMS for each new computer is a powerful tool that must be evaluated to see how far the hardware technology has been expanded through advanced software.

The Data Base

A new celestial body has recently been discovered in orbit in the computer solar system. It is the data base.

Much emphasis in the past was placed on the computer and the computer programs; little attention, if any, was placed on the data that provided information for management. In early applications data was considered a part of the computer application program. Each programming team developed its own "systems" (computer programs) in isolation from other programming teams. A large number of redundant data elements developed.

Increasing attention is being given to development of common data bases. There is now a tendency for the pendulum to swing far to the other side. The establishment of data base administrators (DBA) are suggested. Some proponents go so far as to suggest data base czars just as ADP czars were suggested several years ago.

Recognition of the data base as a component of the information equation is a positive step; but the idea of data base administration must be kept in perspective. This administrator would be a person and he would be responsible for the structure, purity, adequacy and availability of data elements. He would utilize a software package called "data base manager" to keep up with what was in the computer data base and to perform checks on the data as pre-processors do now. This data base manager is an integral part of sophisticated data management systems that are evolving.

The requestor in the new data base concept is the person that uses information. He would ask for a certain information product and the data base administrator would obtain it through the means that he determined was most efficient. If the administrator through his data base manager discovered that he needed more data, he would go to the logical source and ask this source to provide the data. The data base administrator would not be limited to computer data; in fact, if he is truly an information scientist, he will recognize that "all" management data will never be in the computer. A key responsibility of the data base administrator will be to determine what data should be computerized and which should not be computerized.

The concept of a data base separate from the application programs provides some unique opportunities for the creative thinker.

Application Programs

Application programs will be developed in the following environment. The computer is a modern one with an operating system that has the capability for time sharing, multiprogramming, remote batch processing, and normal batch processing. The data management system includes the popular computer languages plus at least one near English language that is operable from either a card reader or remote terminals. There is a separate data base under a data base administrator who is required to know where all data elements are. What is left for the application program and what should it look like?

Application programs should retrieve data from the data base, make calculations as required and provide the product in the format desired. Some of the best products from the computer will be one line statements that answer the manager's question. Others will continue to give results and provide the background through which the final results were obtained. Others will, fortunately or unfortunately, provide a thick printout that includes the whole history of all transactions.

Priorities

With the advent of time-sharing, computer programs will be associated with the priority assigned to the computer product. For example, a program used in an airline reservation system that tells the passenger agent whether or not he can sell a seat has a higher priority than the daily compilation of seats sold that is provided to operations personnel. When the programming team begins to program an application, one of their preliminary actions will be to establish the response time required. If an overnight response is satisfactory, a batch job will be programmed. If a faster response will be required, then the application may be designed to operate as batch, remote batch, or from a remote terminal.

By use of the near English languages, one-time queries will become more common. Some retrievals will be eliminated and some programmed reports will be replaced by queries. Some reports will be submitted only when something is wrong. Programs will be developed that monitor the data base and advise the requestor when data exceeds pre-established parameters.

There will continue to be the standard batch processing of structured data bases but there will be increased emphasis toward determining what management data should be in the computer and what management data must remain manual.

People

People are the most important ingredient of any computer system and as such are the center of the solar system. The creativity of man is what has given us the advances in ADP that we have seen so far; however, to offset this creativity is a tendency for people to resist change. When an idea is new, it is easy to think creatively; but, as policies get established and industry momentum is built up, the ability of people, and the industry, to accept and utilize change becomes less and less. The computer industry has entered a level of maturity where change comes hard.

The data processing manager is the most critical person in the data processing organization. On his shoulders rests the responsibility to establish standards and stabilities while encouraging creativity. He must lead his people so that they grow with the advancement in technology.

Some of the most successful and most senior ADP people are now becoming obsolete because of resistance to change. Time sharing, multiprogramming, remote job entry and other innovations have made obsolete some of the very qualities that made ADP people successful in the past.

Modern Programming Economics

Early programmers were taught to use all parts of the computer because their program was the only one that was running. If they were not ingenious enough to use it all, part of an expensive computer was going to waste. Today, with multiprogramming and multiprocessing, it is desirable to use only that part of the computer which is needed. The remainder can be used by another program. In fact it is desirable to limit the amount of the computer that a programmer can use so several programs can run together. This limiting lends itself nicely toward breaking the program into several parts or modules. Modules can be programmed independently and tied together. All of these concepts plus the concept of the data base administrator require senior programmers to learn new techniques and unlearn old habits.

The cost of computing power as compared to the cost of people is another factor that must be considered in optimum utilization of the components in a computer system. The cost of computing power is going gradually down while the cost of people continues to climb. At some time in the past computer costs went below people costs. Multiprogramming is continually accelerating this separation. In today's typical computer operations, people costs are often three to four times that of the computer. The progressive data processing manager should consider offsetting some of his high people costs with lower computer costs.

The Challenge

With all the factors described above, let's return to the original challenge, "Can the data pro-

(please turn to page 24)

Social Implications of Computerized Information Systems

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"There are literally two directions in which computerized data banks can take us. One leads toward a radical realignment of knowledge and power where the controlling interests have little or no regard for human values. The other path enlists computers in expanding knowledge for the benefit of all ... to help cope with the complexities of modern life."

The information industry is worldwide in nature. And the entire question of social responsibility of computerized information systems is one which must concern all of us.

Apart from glaring exceptions brought about mainly by political considerations, the flow of information is worldwide and is not hindered by national boundaries. And even these political barriers to communication are being removed. Slowly, of course, but removed just the same.

Multinational Companies

Besides political rapprochement, one of the most significant forces in the internationalization of information is the multinational company. Although many people tend to think of the multinational company, or MNC, as an American institution, they are of course as old as trade itself. Many of the larger and more influential of the MNCs are headquartered outside the United States, such as Shell, Lever, Nestle, Bayer. Even Canada has made its contributions to the list of multinationals with such companies as Massey Ferguson and Alcan.

The point is that these companies operate on a worldwide basis and thus transmit and receive data around the globe. Whatever else they might be, and I think that they are generally a force for good, the MNCs have certainly contributed to the worldwide information flow and the worldwide need for equipment to process this information.

To put some of these thoughts in the realm of reality, I would point out that Honeywell manufactures computers and computer-related equipment in the United States, Canada, the U.K., France, Italy and Germany. Our products and services are sold in more than 50 countries.

Specific examples of internationalized information flow include our time sharing network in Europe. A customer dials up the network on his telephone and his input is transmitted by satellite to a computer center in Cleveland, Ohio for processing. It is then sent back to Europe and the customer via the same satellite. Many of our customers are multinational companies. Such well-known names as S.C. Johnson, Ford, General Motors, American Express and Kennicott use Honeywell computers around the world, often communicating with each other.

Worldwide Problems

So it is clear that both information flow, and the need and use of equipment to handle this flow, is worldwide in scope. It is for this reason that problems, both real and potential, arising from computerized information systems must be dealt with on a worldwide basis.

For simplicity I would like to examine two basic areas: (1) privacy; (2) all other social implications of computerized information systems. By this division, I do not mean to imply that privacy is the most important consideration. But the issue of privacy has been given a great deal of treatment in the general and trade media in the past few years and because of its notoriety, I think it deserves some special attention.

A Question of Use

Even the most vocal and vehement defenders of the rights of privacy concede that the computer in itself is not at fault. It is a passive instrument — it can do only what it is told to do by human beings. Therefore what is being urged, and in many quarters demanded, is not the abolition of the computer, but that action be taken regarding the use of computers and their data banks.

By his very nature man is a hoarder of information, particularly about his fellow man. In our complex society, neither government nor business could function without the ability to receive, digest, process and store vast amounts of data. The computer makes this possible.

Each person leaves an ever-increasing trail of statistical information about himself from birth to death; and in this era of the credit card, scarcely a day goes by when the average person does

Based on a speech delivered before the Royal Canadian Institute, Toronto, Canada, November 25, 1972.

not deposit in some computer's records a business transaction at a store, restaurant or gas station.

Much of the material now being fed into computers and data banks has been on record for years, including data relative to birth, schooling, employment, social security, military service, marriage, insurance, courts, hospitals, credit bureaus, churches, clubs and taxes. Many vital decisions regarding jobs, housing, education, etc. are in part determined by the data we have said about ourselves and what others have said about us.

Public Concern — Growing

Despite the obvious significance of this storehouse of personal information, usually held by unknown third parties, until recently there has been little public concern about it. There were two primary reasons: First, until the advent of the computer, the data was scattered around in many different places among many different organizations. Hence its quantity and use never seemed too threatening. Second, most people are quite willing to tell their life stories (or the life story of a neighbor) to almost anyone who appears to have a quasi-legitimate need for this information.

The past several years, however, have seen a new concern mounted over the volume and availability of these personal files, and the computer is the reason for it. With the computer, and its abilities such as time sharing and communication with other computers, the old practical limits of time, effort and cost on the size of manual files have been eliminated. The unprecedented efficiency of the computer in storing, processing, manipulating and disseminating information has created central, highly detailed and easily available dossiers on millions of individuals.

"Privacy" and "Security": Two Distinct Issues

In considering the problems that arise from keeping computerized records, many people use the words "privacy" and "security" interchangeably. In fact there is a great deal of difference between the two and different parties must be responsible for each. In his widely read book, Privacy and Freedom, Prof. Alan Westin described privacy as "the claim of individuals, groups or institutions to determine for themselves when, how and what information about them is communicated to others." In relation to computers, security is the means taken to insure the privacy of the information once it is contained in a data bank. Privacy is a legal, political and philosophical concept and its guarantee properly belongs in the domain of government. Security is a matter of equipment and technique, which is the province of the computer manufacturer. The users of computers should assume responsibility for both privacy and security.

The computer industry today can provide a large number of security devices and systems to guard against the unauthorized use of private information within data banks, and it is working on many more. Such developments have taken place in both the hardware and software areas of electronic data processing. Here are some examples:

Possible Security Devices

Encoding consists of scrambling data transmission so that intercepted messages will be unintelligible unless the interceptor has the code. In principle, data on such storage devices as magnetic tape or discs also can be in cryptographic form.

A number of security devices, however, are designed to prevent unauthorized persons from getting to the encoded information. These constitute systems requiring positive identification of anyone seeking access to the files and the information in question.

The security of the computer room itself is relatively easy to achieve, and yet many installations make the mistake of maintaining a showplace atmosphere behind plate glass windows. The computer room is not an area for casual visitors or even the mass of employees. Aside from privacy considerations, business and government organizations must keep in mind the danger of destruction of vital records by natural disaster or sabotage.

The best location for a computer room is one of isolation from other work areas. It should be fireproof, of course, and for extra protection all files and programs should be stored in a separate room. Never before has it been possible to concentrate so much vital information about an organization in one spot, so the need for the right location and design is imperative. Once that has been accomplished, the usual protective measures of guards, locks, special passes and badges should be enough to secure the computer room.

Time-Sharing Requires Remote Security

The most serious problems result from time sharing or remote entry systems, where the user of the computer may be working from a terminal many miles away, and hence beyond the control which can be maintained at the site of the computer.

The most common remote security measure today requires passwords to identify a user. Nearly all time sharing systems use passwords for entry today — a vital need in many instances where two or more competitors may be tied into the same time sharing system and each want to protect his own files.

A password program can be as simple as an entry code name which can be checked and verified against the computer's files, or as complicated as a long series of questions which only an authorized user can answer — about birthdays, pets' names, grandparents' names, or anything else.

We can also limit not only who has access to a file, but also who can alter a file. The input can also be controlled by designing a format that will accept only certain types of information. A credit bureau or government agency, for example, may be allowed to store information pertaining to age, marital status and income, but not political affiliation, reading habits or health problems. By designing the software to permit only specific data, extraneous information will not be accepted. However, this feature is a function of the user, since software programs designed by the manufacturer can be altered. It is thus the user's responsibility to enforce a restricted software format in order to limit file input.

Nevertheless, a wide variety of ingenious safeguards against unauthorized access via remote terminal is available or under development. The simplest security device is a lock on the terminal so that it will not operate until keys are punched in a special sequence, or a special key or card is inserted into the terminal. More elaborate devices to identify the user, including voice prints, fingerprint scanners and picture phones are under study. Their feasibility and their economics have yet to be positively determined.

"Branch" and "Ring" Security Systems

The data base of a computer's memory can be structured like a tree, with data leaves on its various branches. The system would make security checks on the user at each junction of a branch to the tree trunk. User A, for example, may be authorized for access to only one certain portion of the computer's memory or files of information. When he arrives at that particular junction, his identity will be checked and he will be allowed to examine the data leaves on that branch. If he attempts to access the computer's files at any other junction, his identity will not match and he will be denied entry. This system would allow a computer customer to position his checks at various junctions as he desires.

To guard particular critical information, a user might be asked for further identification at the appropriate junction.

Another system under development at the Massachusetts Institute of Technology, in conjunction with Honeywell, employs what are called "Rings of Protection". In addition to the tree or pyramid structure of conventional data bases, the ring structure is built like concentric circles. Thus segments of the system containing sensitive information can be placed in a privileged ring together with programs which process, update and extract this information in a carefully prescribed and controlled fashion.

A subscriber is allowed to enter a ring only at a carefully defined point, and once he enters a ring the way the information is processed and handled is completely beyond his control. Further, the user's movements are controlled, i.e. he is prevented from moving elsewhere, even within that ring. New, updated computer hardware has just been delivered to MIT so development work can continue.

Another feature designed to maintain the security of files is an audit-monitor to record the identity of the person who requested access to information, as well as when and for how long. The audit-monitor system can note abnormal patterns or frequencies of any given file being accessed, and it can record attempts to access a file which were foiled by other security systems.

This is only a sampling of security measures available today or being studied. There are many other devices including signature recognition devices and typewriters which conceal the typed information so that an unauthorized individual cannot read a password by looking over a user's shoulder.

The problem will not have been solved even when, or if, an absolutely 100 per cent secure system is devised, because ultimately it is the people who operate the system who are responsible.

Maintaining Privacy: The User's Responsibility

It was said earlier that the manufacturer of computer systems is responsible for the provision of security devices required to maintain the privacy of the files (or at least to elevate the level of security to the point where the cost of breaking the security is greater than the value of the information being sought, or greater than the cost of more mundane approaches such as bribery). Actually maintaining that privacy is the responsibility of the user.

It is appropriate to speculate on what the government may demand of the computer user in relation to the privacy issue, and to consider preparatory steps that should be taken now by these users. Such preparation is expedient for several reasons. First, steps taken voluntarily will demonstrate to both government and the public the good intentions of the business community, and hence, business may be in a more favorable position to influence legislation which is designed to control its data processing activities. Secondly, the earlier measures are taken, the less expensive it is to implement them.

What the Government Must Do

The first step the government must take is to define the privacy rights of individuals in terms of today's technology. There is no real precedent in our history for the situation as it exists now, and in fact the constitution of the United States does not mention privacy by name. Nonetheless, it is reasonable to assume that any legislation regarding privacy would have the effect of extending those other rights guaranteed in the constitution.

The First Amendment in our Bill of Rights guarantees freedom of speech and association. The Fourth Amendment states "The right of the people to be secure in their persons, houses, papers and effects, against unreasonable searches and seizures, shall not be violated ..." The Fifth Amendment has potential bearing on the situation. It forbids that "Private property be taken for public use without just compensation". The Fourteenth Amendment prohibits any state from depriving "Any person of life, liberty or property without due process of law". It is not unreasonable to assume that personal information is covered under "life, liberty or property", and the right to be secure in one's "person, papers and effects" extends to personal data.

Of course the Canadian system is vastly different from that in the U.S., since Canada operates on a common law basis similar to that in the U.K. while the U.S. relies on a written and formal constitution. I briefly read the British North America Acts and noted that privacy is not mentioned there, although there are some references to general welfare. And in your system of common law, there is no generally recognized right to privacy.

Blanket Law on Privacy Premature?

The Canadian Business Equipment Manufacturers Association, known as CBEMA, recently submitted a report to the Canadian Government Task Force on privacy and computers. Essentially CBEMA agreed with the position of the Canadian Manufacturers Association. This position is that it would be premature to enact a blanket law on the right to privacy since it would be inconsistent with the historical development of common law, whereby laws are developed by a slow but steady process of responding to specific issues and problems.

The country from which we both draw much of our legal foundations is of course the U.K., and the issue of privacy has gained much attention there. This past summer a Parliamentary Committee on Privacy chaired by The Right Honorable Kenneth Younger issued its report. In relation to computers the report recommended voluntary adoption by computer users of high principles for handling personal information. As far as legislative actions, the committee simply recommended that the government form a standing committee to review the growth and techniques of gathering and handling personal information. Like CBEMA, the Younger Committee felt it would be premature to legislate specific controls or licensing requirements on computer systems.

In the United States, a Committee of the National Academy of Sciences recently issued its report on its study entitled "Data Banks In A Free Society". This committee, headed by Professor Westin, came to essentially the same conclusions as the Younger Committee in Britain. The Westin Committee said that the problem is not as bad as many civil libertarians have suggested, and in any event it is not the computer that is at fault. One of the committee's key phrases is "No technological fix can be applied to the data bank problem".

A similar study of course has proceeded in Canada under the auspices of Robert Stanbury, Minister of Communications, with largely similar conclusions.

Guaranteeing an Individual's Access to His File

For the United States, I feel the single most effective measure to protect privacy would be legislation allowing each person access to his own file, wherever it may be kept, for the knowledge that a person could view and challenge in the courts his file would deter the keeper of the file from irresponsible action. Such an action would mean a complicated set of procedures for business, but such legislation appears all but inevitable. Procedures must be worked out for notifying an individual that a firm has a file about him, for allowing the person to examine this file and change erroneous information, for informing him when and to whom the information in the file is being released, or for securing the persons' permission before the information is disseminated.

Other legislation likely to be considered in the next few years would have the effect of A) controlling the nature of the system itself and/or B) controlling the people who work with the systems.

Certification of Staff and System

To consider the second case first, the staff of a data processing department is still the weakest link in a security chain, for it is the staff that has the technical ability and the best opportunity to tamper with the system or secure sensitive information. Because of this fact, some form of certification of computer operators and systems designers may be required by the government, much like accountants, lawyers, doctors, plumbers or electricians are certified. Such a measure is desirable from many points of view. Because people are vulnerable no matter how secure the system, it is imperative that they be well qualified; and because they would be certified, easily identifiable. Secondly, certification of computer operators places no burden on the businessman, other than to make sure those data processing people he hires are certified.

In addition to certifying the people, it is possible that some steps will be taken to insure that the system itself is certified, and an institution would not be allowed to operate a data bank without certification. The computer, as mentioned, is the focal point for the privacy issue, and the reason is the computer's ability to reorganize a large quantity of information, each element of which is separately harmless, into a more meaningful collection of information which together may reveal more than desired. Thus, one aim of system certification would be to set requirements on the input to a computer's data base. Often-mentioned facets would be to include the identity of the supplier of each bit of information which is included in a person's file and to require dating of all entries.

I would now like to examine some other socially-oriented aspects of computerized information systems. Although many of these concerns will manifest themselves with systems of the future, I think we should begin to consider them now, while we are still in the design stages.

Initial Prevention of Abuses Vital

If I might be permitted an analogy, I think the importance of early consideration will become clear.

Many experts feel that if the problem of obscene telephone calls had been foreseen while the present telephone networks were being designed, preventive devices and systems could have been incorporated in the phone system to easily eradicate the problem. If for example, the problem was foreseen, something like a little red button could have been attached to each phone unit. When someone received an obscene or annoying call, he could push the button to activate an automatic tracing system.

But adding protective mechanisms now that the phone system is installed is nearly impossible and enormously expensive.

Coming: The One-Copy Computer Archive

It is no longer considered just the province of daydreamers to suggest that in the not-too-distant future, we will see the world's knowledge recorded electronically, rather than on the printed page, à la Gutenberg. We will see enormous archival computerized knowledge banks replacing books and libraries.

A problem becomes apparent when you consider that knowledge as it is now recorded in books, newspapers, magazines and so forth, is in part protected by duplications. There are thousands of copies of the same book available for cross checking if you doubt the contents of one edition. There are millions of copies of newspapers and magazines readily available for perusal if you doubt the version of an event as reported by one newspaper. Having physical possession of a manuscript protects an author from liberties that might be taken by a publisher.

But the ultimate in electronic archives might be that there is only one copy of anything — that stored in the knowledge bank. As mentioned in Orwell's 1984, it is so much easier to rewrite history if there is only one copy of the history book.

Integrity and Accuracy Essential

It is obviously essential then that any such archival electronic system have as close to an absolute degree of integrity as possible. A system failure must be avoided at all costs.

We must also take great steps to insure the accuracy of information in the system. We must be sure that the information stored in the system is the same information that was entered. This is not just a matter of possible invasions of privacy. There are now plenty of examples of perfectly private secure bad data stored in computers.

If such knowledge banks are to be truly archival and useful, we must carefully examine the long-term storage characteristics of storage media. Will computer tape or disks stand up to the test of time or will they deteriorate and hence lose the knowledge stored on them? If so, what provisions should be

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Computers, Automation and Technological Change

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"One is frequently asked if technological change is a good or a bad thing. . . . It depends entirely on how technology is used, and who controls it. . . . It is in fact merely an extension of man's own capabilities."

Automation: Freedom or New Bondage?

Right from earliest times a myth has persisted that the introduction of mechanisation and automated processes would automatically free man from soul destroying routine tasks and free him to engage in creative work. This myth has persisted as consistently in the field of intellectual work as it has in that of manual labour. As far back as 1624, when Pascal introduced his first mechanical calculating machine he said, and I quote:

> "I submit to the public a small machine of my own invention, by means of which you alone may without any effort perform all the operations of arithmetic and may be relieved of the work which has so often fatigued your spirit when you've worked with the counters and with the pen."

My union feels that we have a particular social and political responsibility to make a statement on computers, automation, and technological change. That responsibility stems primarily from the fact that we organise the designers and technologists whose skill and ingenuity produce much of the equipment which in Britain makes technological change possible. We take the view that the designer has a profound responsibility to understand the implications of his work and to ensure that the products of his efforts are shared by the community as a whole, and provide the material basis for a more full, cultured and dignified existence. I want therefore to look critically for a few moments at the problems which flow from the introduction of computers and automatic equipment in our profit-oriented society.

In doing so I do not want to be misunderstood. We are not opposed to technological change as such. We are not like some romantics who seem to believe that before the Industrial Revolution the populace spent its time tripping through daisies in unspoiled meadows, or dancing around maypoles. As designers and technologists we are fully aware of the enormous contribution science and technology have made in eliminating disease, ending squalor and improving at least economically the quality of life. Our concern is the mis-use of technology which can only be properly analysed in the broader historical context of technological change as a whole.

Subordination of Employee to Machine

The harsh reality of our experience tends to demonstrate that in many instances the reverse can actually be the case. To understand why this should be so it is necessary to analyse it within the economic base from which this kind of equipment is introduced. Firstly, there is an ever-increasing rate of obsolescence of this kind of equipment. Early wheeled transport existed in that form for thousands of years; steam engines made by Boulton and Watt two hundred years ago were still operating about one hundred and five years later; a hundred years ago, when an employer purchased a piece of machinery, he could rest assured that it would last his lifetime and would be an asset he could pass on to his son. In the 1930s machinery was obsolete in about 25 years, during the 1950s in 10 years, and at the moment computerised equipment is obsolete in about 3 to 5 years. Secondly, the cost of the means of production is ever-increasing. That is not to say that the cost of individual commodities will continue to increase. The most complicated lathe one could get 100 years ago would have cost the equivalent of ten men's wages per annum. Today, a lathe of comparable complexity, with its NC tape control and the total environment necessary for the preparation of those tapes and the operation of the machine, will cost something in the order of one hundred men's wages

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per annum. Confronted therefore with equipment which is getting obsolete literally by the minute, and has involved enormous capital investment, the employer will seek to recoup his investment by exploiting that equipment for 24 hours per day. In consequence of this, employers will seek to eliminate all so-called non-productive time, such as tea breaks, will seek to subordinate the employees more and more to the machine in order to get the maximum performance, and will insist that the equipment is either worked upon on three shifts to attain a 24 hour exploitation, or is used on a continuous overtime basis. This trend has long since been evident in the manual field on the workshop floor. It is now beginning to be a discernible pattern in a whole range of white collar occupations.

Our analysis of this problem in British companies demonstrates that employers will wish to ensure that all their white collar employees who use this kind of equipment accept the same kind of subordination to the machine that they have already established for manual workers on the shop floor. To say that this is so is not to make a prediction about the far distant future. Two years ago our union was involved in a major dispute with Rolls Royce, which cost the union £1¼ million. The company sought, amongst other things, to impose on our members at the Bristol plant the following conditions:

> "The acceptance of shift work in order to exploit high capital equipment, the acceptance of work measurement techniques, the division of work into basic elements, and the setting of times for these elements, such time to be compared with actual performance."

In this instance we were able, by industrial action, to prevent the company from imposing these conditions. They are, however, the sort of conditions which employers will seek more and more to impose upon the white collar workers.

Social Consequences of Shift Work

When staff workers, whether they be technical, administrative or clerical, work in a highly synchronised, computerised environment, the employer will seek to ensure that each element of their work is ready to feed into the process at the precise time at which it is required. A mathematician, for example, will find that he has to have his work ready in the same way as a Ford worker has to have the wheel ready for the car as it passes him on the production line. In consequence of this many graduates, who in the past would never have recognised the need to belong to a real trade union, now find that they need the same kind of bargaining strength that manual workers have accepted on the shop floor for some considerable length of time. In fact, one can generalise and say that the more technological change and computerisation enters white collar areas the more the workers in those areas will become proletarianised.

The consequences of this will not be limited to the work situation. They will spread right across the family, social and cultural life of the white collar worker. If we consider the consequences of shift working you will see what I mean. In a survey carried out in West Germany it was demonstrated that the ulcer rate amongst those working a rotating shift was eight times higher than amongst other workers. Other surveys have shown that the divorce rate amongst shift workers is approximately fifty per cent higher than normal, whilst the juvenile delinquency rate of their children can often be eighty per cent higher. We have a whole series of examples in Britain of the manner in which the cultural and social life of our members has been disrupted by the introduction of this kind of equipment.

Sources of Technological Stress

Thus, whilst it is true that automated and computerised equipment could free man from routine, soul destroying, backbreaking tasks, and free him to engage in more creative work, the reality in our profit-oriented society is that in many instances it actually lowers "the quality of life".

Career Decline

Serious unemployment problems also arise from the introduction of this kind of equipment. Basically, the equipment changes the organic composition of capital in that industries become capital intensive, rather than labour intensive. The tendency is therefore to increase the work tempo of some, whilst putting others into the dole queue, with all the degredation that that implies. In many instances the work tempo is literally frantic. This we have seen in the past on the workshop floor. In one automobile factory in the Midlands in Britain they reckon that they "burn a man up" on the main production line in ten years. They recently tried to get our union to agree that nobody would be recruited for this type of work over the age of 30. Age limits are also gradually being introduced in the white collar areas. In the Sunday Times about a year ago a list was given of the peak performance ages for mathematicians, engineers, physicists and others. For some of these the peak performance age was between 29 and 30. It has been suggested that in order to utilise this high capital equipment as effectively as possible a careers profile should be worked out for those who have to interface with it. When the worker reaches his peak performance age it is suggested that this should be followed by a careers plateau for three or four years, and thereafter, unless the employee has moved into management, that he be subjected to "a careers de-escalation". The obvious extension of the careers de-escalation is redundancy.

The Crime of Aging

Our own practical experience demonstrates, particularly during redundancy, that older men are being eliminated in this way. They are being eliminated or down-graded to lower paid work simply because they have committed the hideous crime of beginning to grow old. We are, as Samuel Beckett once said, "all born of the gravedigger's forceps". Growing old is the most natural process inherent in man. It is a biological process, but in the contradictory nature of our profit-oriented society it is treated almost as a crime. It is true that this kind of equipment imposes very stringent demands upon those who have to interface with it. Seen in terms of the total man/machine system the man is slow, inconsistent, unreliable but highly creative. The machine is the dialectical opposite, in that it is fast, reliable, consistent but totally non-creative. As the man attempts to respond to the machine, enormous stress is placed upon him.

We have identified areas within the design activity where by using inter-active graphic systems the decision making rate of the designer is increased by 1900%. Again we can draw analogies from the shop floor. In the British Steel Corporation a productivity agreement recently introduced medical checks.

In practice these medical checks meant the operator was tested to ensure that his response rates were fast enough to interface with the equipment. He was merely tested for his response rates as a dial might be. A series of occupational suitability tests and character compatibility assessments are now gradually seeking to do the same sort of thing to white collar workers who have to use high capital equipment.

Knowledge Obsolescence

Another source of great stress for white collar workers in these high technology environments is the problem of knowledge obsolescence. We believe that the scale of technological development in the last 25 years is equal to that accomplished in all of man's total existence. The scale of scientific effort, which is closely related to technological change, in the present century has increased out of all recognition. It has been asserted by Professor J. D. Burnall that in 1896 there were perhaps in the whole world 50,000 people who between them carried on the whole tradition of science, not more than 15,000 of whom were responsible for the advancement of knowledge through research. Today the total number of scientific workers in industry, government and academic circles is in the order of 3½ million. Over 90% of all the scientists and technologists who ever lived are alive today. Mathematical models described by authorities such as Sir Frederick Warner indicated that in order to keep abreast of his knowledge an engineer would have to spend 15% of his time in up-dating his current knowledge. Mr. Norman McRae, Deputy Editor of The Economist, stated in the January 1972 issue:

> "The speed of technological advance has been so tremendous during the past decade that the useful life of knowledge of many of those trained to use computers has been about three years".

He further stated:

> "A man who is successful enough to reach a fairly busy job at the age of 30, so busy that he cannot take sabbatical periods for study, is likely at the age of 60 to have about one-eighth of the scientific (including business scientific) knowledge that he ought to have for the proper functioning in his job."

It has even been suggested that if one divided knowledge into quartiles of out-datedness those in the age bracket over 45 would find themselves in the same quartile as Pythagoras and Archimedes.

The stress that this places upon staff workers, in particular older men, should not be under-estimated. It is the responsibility of the trade unions to protect these older men. This they should do not in any patronising, benevolent fashion, but in recognition of the class right of these older men to work at a civilised tempo. For these are the men who in the past have created the real wealth that has made the purchase of this kind of high capital equipment possible. All younger technologists should fully understand that however energetic and forceful they may feel now, they will inevitably begin to grow old, and if they allow older members to be treated in this way they are creating a framework of oppression which will be used against them in the future.

Protecting Man from His Machines

It will be self evident from all of this that the introduction of high capital equipment can create enormous problems for those who have got to operate it. Even in Sweden, where the introduction of this kind of equipment tends to be more civilised, they have now had to establish what they call "protected workshops". Does it not strike you as remarkable that we have now reached a stage in which human beings have to be protected from the very machines which we have been led to believe would free them for more creative work? Is it really true that we are protecting them from these machines? Is it not the case that the machines are inanimate? Is it not really the case that we are protecting them from the manner in which machinery is used in our profit-oriented society? By using equipment in this way, the stress upon our members will continue to grow. One transitional tactical means of protecting our members is to mount a vigorous campaign for a shorter working week, longer holidays and more leisure time. We believe that a campaign for a 35 hour week is not only desirable, but indeed imperative.

Another problem area to be dealt with is the fragmentation of skills. Seen historically, technological change has always meant that jobs are broken down into deskilled, narrow elements. This is also happening in white collar areas. The draughtsman of the 1930's in Britain was the centre of design. He could design the component, stress it, specify the materials to be used, define the method of lubrication, and write the test specs. With the increasing complexity of technology, each of these have now been fragmented into narrow, specialised areas. The designer draws, the stress men carry out the calculations, the metallurgist specifies the materials, the lubricator the lubrication. It has been common for some time to talk about dedicated machines. It is now a fact that when defining a job function employers define a dedicated appendage to the machine, the operator. Even our educational system is being distorted to produce these dedicated men. It is no longer a matter that people are being educated to think, they are being trained to do a narrow, specific job. Much of the unrest amongst students is recognition that they are being trained as industrial fodder for the large monopolies in order to fit man into this narrow fragmented function, and that they will be unable to see in an overall panoramic fashion the work on which they are engaged.

Employers also seek, as they introduce computerised systems to use these pseudo-scientific means, the unequal pay and job opportunities between men and women. They even seek to assert, by their job evaluation schemes, that certain fragmented data preparation functions are what they call "women's work". There is no such thing as women's work, any more than there is women's mathematics, women's science, women's literature or women's music. There is only work, and we must continue to demand that all our members are paid the rate for the work they are undertaking, irrespective of sex or age. We should not hesitate to use industrial action to assert this, when other means fail.

"Rationalisation" or People-Stretching

Coupled with the introduction of this kind of equipment is a re-structuring known as "rationalisation". The epitome of this in Britain is the GEC complex, with Arnold Weinstock at its head. In 1968 this organisation employed 260,000 workers and made a profit of £75 million. In 1971, in consequence of quite brutal redundancies, the company's workforce was reduced 200,000, yet profits were up to £105 million. These are the kind of people who are in-

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Who Knows You: A Look at Commercial Data Banks

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"It can be reasonably assumed that every person in the nation is listed on at least one commercial data bank containing information ... which is accessible, for the most part legally, to any other person in the United States."

Information systems containing data about individuals have long been a subject of civil rights controversy. Computers, with their mass information retrieval and communication capabilities, have greatly increased the amount and dispersion of information in data banks. Consequently the related controversy has also increased. The dynamic nature of data bank computerization juxtaposed with the static nature of regulatory legislation creates a frightening outlook for the future. While "undesirables" files, "suspects" files, credit record files and adverse information files are typical of the emergent pattern for data banks, legislators are hampered in regulation of data banks by lack of guidance from their constituents.

Many articles have been written about the danger of invasion of privacy when data about an individual are distributed without restriction.[1] In particular, much has been written as to the operations of government data banks and the dangers to the right of privacy inherent in those systems.[2]

In contrast, little has been said about commercial data banks. The scope of this paper will be confined to an investigation of some common data banks and the threat they may pose to an individual's privacy. In order for a person to decide whether further control of a commercial data bank is needed, he must first determine whether the operations of that data bank constitute an invasion of his privacy. There are essentially eight questions which could be used to evaluate the operations of commercial data banks:

1. Who has information about you and of what nature?
2. How did they come to possess the information?
3. Do you have access to that information?
4. If so, by what means and what will it cost?
5. What recourse do you have if the information is unfair or incorrect?
6. To whom is the information given and do they pay for it?
7. How long can information about you be kept in a data bank?
8. Are there laws governing data banks in which you are listed?

What are the Problems?

A useful means of describing information systems in general is provided by Dr. Calvin Gotlieb.[3] He proposes to classify data banks according to three definitive characteristics, each subdivided into two or three categories. These characteristics and categories are shown in Table 1.

Table 1

Characteristic	Category
Data Source	P - public record S - supplied by individual O - other
Distribution	I - internal E - external
Inspection	A - automatic R - upon request of individual F - forbidden

According to this system of categorization, a number of common data banks are shown in Table 2.

Table 2

Classification of Some Data Banks

System	Type
Bank Account	OEA
Payroll File	OIR
Who's Who	SEA
Medical Report	OIF
Investigative Reports	OIR
	OEF
Credit Record	OIR
	OER
Sales Prospects' File	PIF
	OIF
Sales Prospects' File for Sale	PEF
	OEF

In his analysis of problems arising from commercial data banks, Dr. Gotlieb projects that problems occur only when:

(1) the data were gathered from a source other than the individual concerned;
(2) the data are distributed externally to the data gathering organization;
(3) the individual concerned is forbidden to see the gathered data.

It seems doubtful that these criteria exhaustively denote all data banks for which problems of invasion of privacy and maintenance of civil rights will arise. Detrimental information about an individual can be harmful whether distributed at large <u>or</u> contained within the data gathering organization. In fact, the latter case may be more injurious than the former. Most oil companies, for example, maintain their own credit files, but due to the large number of credit customers, the information in their files is limited both in scope and accuracy. They simply cannot afford to gather, update, or correct information as often or as thoroughly as credit bureaus whose only business is maintaining credit records.

1. The reader is referred to selected readings in Appendix I.
2. The reader is referred to selected readings in Appendix II.
3. Calvin C. Gotlieb. "Regulations for Information Systems." <u>Computers and Automation</u>, September, 1970, pp. 14-17.

Similarly, while an individual's being forbidden to see gathered data may have harmful consequences, they are probably no more so than when information is available only upon request. The individual must first know that information about him has been collected, which he may request be made available to him. Therefore unless an individual is automatically notified that information has been gathered, he will probably never know of its existence or have the chance to correct inaccuracies.

In support of Dr. Gotlieb's criteria, however, all data banks may contain information which is potentially detrimental or undesirable to the individual concerned. Certainly if that information is gathered from a source other than the individual concerned, the chances of its being both inaccurate and unjustifiably detrimental are increased.

It would seem that Dr. Gotlieb's criteria should be amended to indicate that problems with commercial data banks occur only when:

(1) the data were gathered from a source other than the individual concerned;
(2) the data are distributed either externally to the data gathering organization or retained within it, which means that no matter what the distribution pattern, problems are likely to arise; and
(3) the individual is not automatically notified that data has been gathered.

By having thus re-defined the "problem" criteria, a more inclusive and hopefully exhaustive tool for evaluating commercial data banks is provided.

Three Data Banks

Three types of commercial data banks commonly found throughout the United States were examined: Credit Records; Investigative Reports; and Sales Prospects Files (Mailing Lists). The reader will notice that the data banks studied are outside the scope of Dr. Gotlieb's "problem" criteria, and yet fulfill the revised conditions.

I. Credit Records

A credit record is compiled by a credit bureau. Generally speaking a local credit bureau has credit records only on persons resident in its geographic area, although a credit bureau can obtain credit records from any other credit bureau in the United States.

Every person who has ever received credit is listed in at least one credit bureau. Thus, anyone having paid for a product or service by any means other than "cash-over-the-counter" is definitely listed by a credit bureau or the credit department of a store. Moreover, even those few not listed for the above reason generally are recorded by a credit bureau as having always paid by "cash-over-the-counter".

Most credit records contain name, spouse's name, age, current address, current employer, job description, previous address, previous employer, social security number, approximate income, a history of every credit account you have or have had, and public records. Public records in credit bureau reports generally consist of civil suit actions against you and/or criminal court convictions. (Every state has a Public Information Act which defines what information may be divulged outside government confines).

Most retail merchants are "members" of one or more credit bureaus. Credit bureaus usually "screen" potential members to insure "legal intent" in the usage of credit reports. The retailers pay a monthly membership fee, plus a fixed charge for every credit report requested. Also, retailers provide credit bureaus information on customers having credit accounts with them. The retailer may only obtain a credit report when a person requests credit from him. A credit bureau may obtain records from other credit bureaus only when a member retailer has legitimately requested a credit check.

Every person recorded by a credit bureau has the right to inspect his record at any time. There is usually a small charge ($1.00-$3.00) for this service. Most important, if anyone is refused credit on the basis of a credit report, the merchant refusing credit must give that individual the name and address of the credit bureau which made the negative report. The person refused credit may within 90 days contact the referred credit bureau and see his entire record free of charge. Generally speaking, credit is refused on the basis of one or more credit accounts which have been reported by a retailer as delinquent, a bad debt, etc. If the person disagrees with the retailer's report he may file a "disputed account" report with the credit bureau. The credit bureau is then required to relay this disputed account to any retailers to whom they have given negative reports. The bureau is further required to include the dispute report in all subsequent credit reports.

Derogatory information, including public records, may be retained in a credit record for a maximum of seven years. The only exception is a court record of bankruptcy, which may be retained for fourteen years.

All data banks containing credit record information are federally regulated by the Fair Credit Reporting Act of April, 1971. Most credit bureaus were following the above procedure prior to the Fair Credit Reporting Act, but all are required to do so now.

II. Investigative Reports

Investigative reports are compiled by a variety of agencies, chief among them private investigators and employment agencies. In the past, most investigative reports were background investigations (BI) compiled for use in pre-employment screening, and surveillance reports used in divorce suits. Recent amendments to the Federal Truth in Information Act have altered the investigator's license to conduct background investigations. An investigator commissioned to conduct a BI is now required to inform the individual a priori that he is to be under investigation, and the contents of the final investigative report must be made known to that individual. The individual may deny the investigator permission to conduct a BI or, if dissatisfied with the final report, may prohibit its release. If released, however, the report is accessible only to the person or firm requesting the investigation.

In the case of surveillance reports an investigator is neither required to inform the individual that he is being observed nor make the final report available to that individual. Any investigative report supposedly may contain only information about an individual which can be obtained legally. However, the investigators interviewed for this study indicated they had no problems obtaining such information as credit records, which is strictly forbidden under the Fair Credit Reporting Act.

Investigative reports almost always contain some information detrimental to the individual concerned. In light of this, it is surprising that investigators are required by federal law to maintain eternal files of investigative reports. After compilation a report may be re-released only upon notification of the investigated individual or by court order.

III. Sales Prospects Files

Sales prospects files are used for saturation mailing of business solicitations and for house to house sales campaigns. If you have ever wondered how some company got your address to send you a sample can of a brand new deodorant, sales prospects files is the answer. Sales prospects files are maintained by firms which use them in their own sales campaigns and by firms which offer copies in the form of specialized lists for sale, available to anyone throughout the United States.

One source of sales prospect information is published directories. Schools, professional societies, social groups, city telephone companies, to name a few, publish directories of one sort or another. Another frequent source is welcome services. Almost everyone moving into a city is visited by one or more representatives of local welcome services who offer free samples and gift coupons in exchange, albeit indirectly, for information. Welcome services are informed of new arrivals by local utility companies when new accounts are opened. Retail credit bureaus often are associated with welcome services and begin a credit record on the basis of the new information.

The information contained in sales prospects files is quite extensive, often including name, sex and ages of all family members, current address, employer, occupation, own or rent a home or apartment, credit card accounts, make and model of automobile(s), approximate income level, church of preference, and public record information. (As in credit records, public record information is defined by state public information laws but may include anything from birth records to criminal court convictions).

Mailing lists are extracted from master files containing the above listed information according to predetermined criteria. By far the most common criterion is geographic area. Other criteria frequently used both singularly or in combination are sex, income, age and profession. Criteria used depend upon the product or service being advertised.

There are no laws which directly regulate the use of sales prospect files. Although a resident purchases a mailbox and attaches it to his dwelling, the mailbox is officially maintained by the federal postal service and anything sent through the public mails must reach its addressed destination. The postal patron has no choice except to receive the material and discard it if not desired. The only exception is pornographic material. If a postal patron finds that his address has been placed on a recurring mailing list for pornographic materials he may ask the postal department to have his address removed from the list. The postal department then requires the firm sending the material to remove the postal patron's address from its mailing list.

What's in the Future?

In the evaluation of commercial data banks it is necessary to determine the direction of future operations. The high cost of computer usage currently prevents automation of most data banks. However, more and more operators of small data banks are beginning cooperative computer operations. And, while computers are becoming larger and faster, the cost of computer usage is decreasing. Several commercial data bank operators interviewed indicated that computer usage was the only feasible means of handling the increasing volume of data, and that regional data banks will replace local data banks within the next ten to twenty years. Some operators envisioned a single gigantic national center with terminals in every local office.

The idea of centralized credit record data banks is not too disturbing, but the idea of centralized data banks for investigative reports is alarming. (The man who was most enthusiastic about a national data bank operated a branch office of a national private investigation agency).

What About Security?

Maintaining the security of information in a computer is not simple. Computer centers handling confidential information have elaborate programmed and physical security controls, but unfortunately, they often prove inadequate. One such case is documented as follows:

> Pseudo Sign-On — A couple of enterprising high school students in Amherst wrote the following program for their own "amusement". We have several teletypes in the computing center that are permanently connected to the computer. Operation over permanent leased lines is quite common and would be equivalent. These boys wrote a program which mimicked the normal sign-on procedure of the system and requested (as usual) the user to give his user number and secret code. They would leave the terminal running with this program in the machine and an unsuspecting user coming up to the terminal in question would think he was talking to the system, while actually he would be talking to their program. Once the user number and secret code were captured, the program would write them out onto a file so the students could examine them later, and then it would fake a "disaster" (system crash) so that the user would be forced to sign-on again — this time to the real system, and never know that his code was no longer secret. By the time they were caught these students had "secret" codes of over 100 users. Fortunately, we don't keep classified information on our time-sharing system.[4]

To Answer the Question

At this point it seems almost redundant to answer the question, "Who Knows You?" In looking at only three of the many different types of commercial data banks, we see that virtually anyone who has ever had a credit account, moved to a different city, joined a club or professional society, or worked at a job requiring a background check is listed on one or more data banks. This easily includes one-half of the nation's population. It can be reasonably assumed that every person in the nation is listed on at least one commercial data bank containing information similar to that shown above, which is accessible, for the most part legally, to any other person in the United States.

Laws regulating commercial data banks will not be changed unless the constituency of the United States

4. Caxton C. Foster. "Data Banks — A Position Paper." Computers and Automation, March, 1971, p. 29.

clearly understand the controversy and are provided objective evidence on which to base their opinions. It remains for every American to determine whether scrutiny, measurement, and documentation of his lifestyle constitutes an invasion of his privacy, and further, whether future computerized commercial data banks will curtail his civil rights.

Appendix I

Chu, Albert. "The Need to Know and the Right to Privacy." Business Automation, June 1, 1971.

Foster, Caxton C. "Data Banks — A Position Paper." Computers and Automation, March, 1971.

Gallagher, Cornelius. "Privacy, Human Values, and Democratic Institutions." Computers and Automation, October, 1971.

Scalletta, Phillip. "The Computer as a Threat to Individual Privacy." Data Management, January, 1971.

Weisner, Jerome B. "The Information Revolution and the Bill of Rights." Computers and Automation, May, 1971.

Appendix II

Hirsch, Phil. "Who Guards the Guardians?" Datamation, June 15, 1971.

Land, Steven and John Runtzell. "Extensive Retrieval Capabilities Aid Law Enforcement." Computer Decisions, June, 1972.

Miller, Arthur. "Federal Data Banks and the Bill of Rights." Computers and Automation, October, 1971.

Robinson, Stanley. "The National Crime Information Center (NCIC) of the FBI: Do We Want It?" Computers and Automation, June, 1971. □

Henderson — *Continued from page 14*

made for recopying the data on new media? And who will do the transferring — again keeping in mind the ease of rewriting history when there is only one history book?

The Problems of Access and Time Limitations

Another area of concern is actually accessing the information once it is stored in the system. Consider this for a moment. How would you locate a specific piece of information in a library if there were no card catalogue? Would you simply start at one book stack and proceed through all the thousands of books in front of you until you found what you were looking for? A time-consuming task to say the least.

So in such systems, we would have to make access to information easy and natural for those persons seeking the information. And yet we also have to make such access impossible for persons not authorized to obtain certain information.

There are also many instances where certain information is what we might call time-dependent. Sealed memoirs, for example, may be entered into a system and yet be unavailable for a period of years. Such information must be dated upon entry so the system will know when to remove the restrictions. The Multics System at MIT, as a sidelight, has a system clock that keeps time to the nearest one millionth of a second for a period of 144 years.

Conversely, some information might be available for a certain period of time after it is entered, but not after, say, 10 years. A statute of limitations, if you will, on misdemeanor criminal records.

This leads to another question. Once the statute of limitations has expired, and society has deemed it no longer desirable that this information be available, do we want to destroy it physically, or simply make it absolutely unavailable. We may want parts of the information, for instance some statistical data, but not a criminal offender's name, some years after the records were entered. If we physically destroy the data, then it will be lost forever.

These problems do not plague us with our current system of storing knowledge because we have physical possession of the information and there is a great deal of redundancy in the form of many copies of the material. Only in the most extreme cases of national security or industrial propriety do we find only one copy of a document.

But in spite of the potential problems, I am convinced that sooner or later we are going to be living in the age of computerized knowledge banks. They do offer significant advantages, particularly in the form of speech, and as costs decrease they will be more economical than our present system, because while redundancy may offer a degree of protection it is also uneconomical.

Two Directions Possible

There are literally two directions in which computerized data banks can take us. One leads toward a radical realignment of knowledge and power where the controlling interests have little or no regard for human values.

The other path enlists computers in expanding knowledge for the benefit of all, using the power of computers to help cope with the complexities of modern life.

A great deal can be done to make progress along the right path. Users of computers must exercise a special sensitivity in selecting the personnel who have access to the data banks; for no matter how secure the system, there is always the danger of people being compromised. Trained, dependable people are an absolute necessity in the matter of privacy, security and social responsibility.

The most effective step for every user is to exercise concern over these matters at the very beginning of the system design stage. Requirements must be established. Building concern into the system at the design stage is more effective and more economical than adding devices or altering the system after it has been installed.

Lastly, we must have increased public awareness of both the blessings and dangers of a computerized society, for there is the risk that a little bit of knowledge on the part of the public and legislators will lead to action that is not in the best interests of the country. Before laws are passed regulating computer systems, a thorough understanding of the nature and technology of data banks is needed, and the efforts of the computer industry and the users of computers is vital to bringing about such an understanding.

Computers are essential to the efficient conduct of our complex world, but like every technological advance, they can be used destructively. The time is already short for business and government to join in developing controls to insure that they aid, not damage, our democratic freedoms. □

Engineering for Society

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"The success of systems we are designing now and will live with in the future, will depend largely on the integrity of their parts. . . . The 'quality of life' we may expect will be no better than the quality of design, materials, and workmanship which we put into our technological and social systems."

Throughout the ages engineers have made a great contribution to society. That contribution has created a complex technological civilization replete with many problems of a type, and on a scale, that man has not had to face before. Engineering can be a major factor in solving many of those problems. Furthermore, engineering is now on a course that will see it performing an important new function in society, that of anticipating the needs of society and creating systems that bring man, machine, and nature into a much more harmonious relationship — that may prove essential to human survival.

Traditional Role

If we consider the traditional role of engineering, even a cursory study of history will show that engineers have been among the principal builders of our civilizations. It is their accomplishments, whether in war or peace, in the design and construction of buildings, in mining and manufacturing, in transportation and communication, that have molded our societies and directed much of the course of history. Engineering predated science. And when science came on the scene, it was engineering that became one of its main bridges to society, that helped transform its knowledge into action, its theory into tangible human assets. In each age engineering filled the need of the society of that period, whether it was through the aqueducts that allowed great cities to be created, the cathedrals that acted as man's spiritual centers, or the road, rails, ship, and aircraft that created nations and joined continents.

It is true that each society, each civilization, to some extent abused, overtaxed, or mismanaged the gifts that engineers had given it, sometimes through avarice, sometimes in ignorance, often because they could not anticipate their long-term effects or their relationship to other activities of society. In most cases, engineering came to the rescue, offering new ideas, replacing technologies that became unsuitable and helping to alleviate the problems those technologies might have helped to create.

A New, "Ecological" Approach

But today the complexities of modern civilization demand that society and the engineer operate on a principle far more sophisticated than simply responding to the feedback from individual problems. For while such problems must be attacked individually — whether they be air and water pollution, the conservation of natural resources or the providing of human amenities — they must also be dealt with in terms of their broader relationship within our technological society. The new engineer is charged, therefore, not only to refine and expand his knowledge and skills on the most scientific principles, but to go beyond the traditional disciplines and provide both humanistic and mechanistic systems to create and sustain a higher quality of life. This "ecological" approach to engineering provides the engineer with unparalleled opportunity for problem solving. It gives him the chance to apply the methodology and techniques of engineering to more of the physical and human problems of the world. It also calls for a new dimension of engineering, a new demand on engineering genius. (This is not inappropriate, as the word "engineer" had its roots in the Latin word "ingenium," an invention or product of genius. I think we've come a long way since then, as the original "ingenium" was the battering ram.)

What is involved in this new challenge to engineers? What kinds of demands might be made on them? What innovations might be expected of them? And what might some of their educational requirements be? Let us briefly consider these subjects.

Upgrading Present Technologies

To respond fully to the new opportunities for engineering, engineers will have to work on several levels and on problems of various dimensions and complexity. There will be specific problems and systems problems. Many of the specific problems include the upgrading of known technologies and the improvement of quality and design of materials, machines, structures, products, and services now in use. We must make these safer, more durable, more efficient, and more environmentally and aesthetically acceptable — even while working within economic constraints. This is a tall order, but one essential to fill. For the success of systems we are designing now and will live with in the future will depend largely on the integrity of their parts. In this regard, the "quality of life" we may expect will be no better than the quality of design, materials, and workmanship which we put into our technological and social systems. Engineers can

Based on a talk given at the University of Rochester Symposium on "Engineering in the Public Interest," Rochester, N.Y., Nov. 10, 1972

exert an upgrading influence throughout society by emphasizing this message — both directly through their work and indirectly through their role as concerned citizens.

Developing Innovations

At the same time that engineers are at work upgrading known technologies, they will be working toward the replacement of those technologies. Innovations will have to be developed, tested, and integrated into the new systems we are creating. A prime example of this can be found in the field of energy where, as we clean up our fossil fuel plants and improve our nuclear fission power systems, we work toward the possibility of fusion power and the use of solar and geothermal energy. Other examples lie in industrial processes, transportation, and communication. With the speed and variety of communications and data processing these days, it seems incredible that we can expect significant change in these areas. Yet the new work in optical communications — bringing together such fields as physical optics and electromagnetic propagation, quantum theory and quantum electronics, and communications theory and engineering — holds many exciting possibilities.

Three Kinds of Systems

In addition to upgrading conventional technologies and devising their replacements, engineers work on still another level which is becoming increasingly important to society. This relates to the relatively new field of systems science and engineering. While engineers have been working with small-scale and medium-scale systems for some time, more attention is now being devoted to large-scale systems — both mechanistic and human.

Let me make the distinction between these three types of systems by offering a few brief examples:

- Small-scale systems typically are those such as motors, generators, electronic circuits in radios and TV sets, and crude macroscopic models of parts of biological and economic systems.
- Examples of medium-scale systems are mini-computers, aircraft systems, major components of manufacturing plants, and small-scale organizations such as hospitals or department stores.
- In large-scale systems, some examples of a mechanistic system might be the nationwide air traffic control system, urban transportation or communications systems, air defense systems, or models for weather prediction. Typical of the humanistic system would be large-scale organizations such as political, religious, or social groups, or large-scale models of biological and economic systems.

Another way of distinguishing the scale of these systems is by the size of the computer necessary to model their mathematical relationships and solve their problems.

Systems science and engineering, particularly when involving the large-scale systems, brings engineers into a whole new realm of work giving them an expanded role in society. A major part of this role involves using the sophisticated techniques of systems analysis to identify problems and create alternative solutions that decision-makers can apply, based on consideration of public goals and values. These alternative solutions, some related to major allocations of resources and the need for changes in institutions and life styles, could call for many large-scale changes and trade-offs in our society.

Applications of Systems Science

There are many problem areas in our society which will benefit from the application of systems science and engineering. When we learn how to understand and deal with our cities and their surrounding suburbs as urban systems, for example, we will be better equipped to control and direct the growth of those cities as well as plan new ones. Applying systems analysis to our transportation problems will enable us to plan and build transportation systems that will move more people more efficiently, hopefully in comfort and with less environmental impact. And systems science and engineering can help us deal with our energy problems in a way that more rationally considers the balance between the need for power and the depletion of resources and the degradation of the environment.

Other broad areas that will benefit from the analysis and planning of systems science and engineering are municipal services — such as the allocation of police, fire, and ambulance services — health care, criminal justice, education, and economic development.

Human Values of Large Systems

As large as these systems seem, even they must be considered in terms of their influence on each other. Where engineers may truly shape the direction of society is in those areas where they present the public with alternatives that call for balancing the advantages of one large-scale system against another and calling for a new value judgment on the part of society. For example, a total telecommunications system could raise questions about how much human mobility is necessary when most information, many services, and business and social contacts could be made available by instant and complete electronic communications. This, of course, raises the question of the human value of personal mobility and contact.

Systems science and engineering, particularly on a large scale, is a relatively new field — and the current state of the art can best be described as primitive. Much experimentation will have to be conducted in conjunction with the modeling of system dynamics. This will include such things as the modeling of performance criteria. And there is bound to be much debate — much useful debate — over the validity and usefulness of many large-scale models. Typical of this are the disagreements over the global forecasts in the "Limits to Growth" study prepared by Dennis Meadows and his associates. Such models, however, may have the beneficial effect of stimulating increased social and technological activities to avoid some of the more dire conditions forecast.

By way of emphasizing the importance of systems science and engineering and its recognition on an international scale, it is interesting to note that we have just signed with the U.S.S.R. and ten other nations an agreement to establish an International Institute of Applied Systems Analysis. This new "think tank," as the newspapers refer to it, will be located near Vienna in Austria and will seek solutions to many of the problems of global development, industrialization, and the environment.

New Directions in Engineering Education

It is obvious that these new activities and directions in engineering will place a new and different burden on engineering education. One demand on engineering education resulting from the new directions will be to broaden its scope and outlook. A number of programs at colleges and universities are changing to accomplish this.

One that we at NSF have supported is "The Experimental Approach in Undergraduate Engineering" at Illinois Institute of Technology. This program will completely restructure the undergraduate engineering curriculum, using an approach in which problems of a broad scope will be posed to project groups of from 4 to 15 students. With factual information provided by modules developed to make self-instruction possible, the faculty will be able to concentrate its efforts on these aspects of teaching which require personal interaction with the students.

An experiment at Worcester Polytechnic Institute broadens its approach even further by eliminating traditional courses and degree requirements and substituting a flexible curriculum tailored to the goals of individual students. In this program, students will demonstrate competence in their field by completing two independent study projects and undergoing a comprehensive evaluation. Their projects could be conducted on campus or at internship centers at Government agencies, industrial corporations, or private labs.

Solving Man-Machine Problems

One of the problems our new engineers will face increasingly is dealing with the interface between man and machine. At the University of Colorado, we are supporting a project that will involve engineers in studying the interaction of humans and computers, seeking to make the machines more compatible with the people who use them. The director of the project estimates that in the next five years this program will be able to supply industry with some 400 graduate engineers qualified to solve man-machine problems. Of course, the man-machine relationship does not always pose a problem. For example, in evaluating their experience with the PLATO IV computer-assisted instruction in being taught Latin, a group of first-year college students said that the computer was a more considerate teacher than most of the human ones they had had.

These are only a few examples of programs that are considering the new needs of engineering education. There are a great many more, and they will continue to grow. Of continuing importance, however, is of course the pursuit of excellence in the traditional engineering disciplines, so that as we broaden our engineering activities and goals we do so on a strong, firm foundation. For while we must have engineers who understand the needs of society, they must also be engineers who know and can meet the demands of engineering. This is so often forgotten in the new rush to relevance.

In summary then, I believe we have entered a new era of "Engineering Enlightenment" — both from the standpoint of what the engineer can do and what is expected of him. His power has increased and so has his responsibility. The demands on him will be broader and also more stringent. And I believe that his new responsibilities and the successful way he carries them out will elevate his position in society and bring him many new rewards. □

Weinmeister — *Continued from page 10*

cessing manager use modern computer technology to do a better job?" The answer is an unqualified, "Yes". But the course must be clearly set.

Setting the Course for Improvement

The first step in setting the course is to establish the departure point. The data processing manager should inventory his present operation. He should see just what capabilities his computer hardware has. He should require that his top programmers completely understand the operating subsystem and the associated data management subsystem. He should appoint a data base administrator who determines what is in the data base and where redundant data elements are. It is emphasized that this is a learning process to establish a point of departure.

Once the manager's position has been established he is ready to launch into the computer solar system that has previously been described. (Figure 1) He should begin with one selected application from the most sophisticated requestor. He will have probably found a timely, flexible data base module that belongs to this most sophisticated requestor's function. The data processing manager should choose his most creative programmer and ask him to get the requestor's data in a minimum time using the most expeditious method.

Creative Programming

The creative programmer will probably use a remote terminal and the highest level query language to get to the data base, manipulate and display the information required. This programmer has set the course for incremental growth to maximum utilization of the people — software — data base — computer combination. After the first trip is successfully completed, others should be made as required by the situation.

This suggestion is not intended to imply that all applications should be on-line real time. Earlier it was stated that programs would take on the priority associated with the request. Standard products (reports, bills, bank statements, etc.) will continue to be run on a scheduled batch basis. Establishment of the correct type of program and their associated priorities will become increasingly important.

As the data base concept is implemented; as the data becomes more current and correct because it is gathered at the source; as all the power of the operating and data management subsystems are brought together to query the data base; as innovative ways are developed to utilize the time sharing capabilities of the computer through remote entry terminals; as the programmers begin to use the relatively inexpensive computer power to develop programs more quickly while conserving people resourses; as the data elements needed by company management are analyzed to see which can be put in the computer; as data base administrators realize that all management data will never be in the computer; as all of these factors come into focus; the data processing manager can set his own course into the computer celestial solar system. After he has set this course he will become more responsive to his requestors. When he enters this computer galaxy he will discover its name is "Management Information System". □

Cooley — *Continued from page 17*

troducing this high capital equipment, and they make their attitude to human beings absolutely clear. Arnold Weinstock, as head of the GEC, is the man who said, "People are like elastic. The more work you give them the more they stretch." We know, however, as engineers that all materials have elastic limit, and when stretched beyond that limit the material breaks, and we see more and more those in industry who have been stretched to their limit and have broken, and the result is nervous disorders and neurosis. One of Arnold Weinstock's managers boasted once of him, "He takes people and he squeezes them 'til their pips squeak." I think it is a pretty sick society that will boast of behaviour of this kind.

Since we are assembled here as an international trade union gathering, it is important that we understand our international responsibilities one to the other. The giant monopolies which are now introducing this kind of equipment in their own interests are also restructuring themselves on an international basis. It is our experience in Britain, when our members or those of other trade unions stand up and demand decent working conditions, these monopolies threaten to move to other countries. It is important that we demonstrate our international solidarity by preventing them from setting one set of workers against the other. It is also vitally important that we understand our responsibilities as designers and technologists, our responsibilities to society as a whole and the class to which we belong.

So concerned are we about the problems which stem from technological change that my union has produced a book, "Computer Aided Design — Its Nature and Implications," which analyses some of these problems. As a service to the community as a whole and the trade union movement in particular we are circulating this booklet free. Any members of any trade union in any country who wish to have copies may obtain them from our Head Office.

Technology Good or Bad — An Extension of Man

One is frequently asked if technological change is a good or a bad thing. This is really a non-question. It depends entirely on how technology is used, and who controls it. We need not have any fear of technological change. It is in fact merely an extension of man's own capabilities. Historically, man sought to extend his eyes by using telescopes, ranging from the time of Galileo to today using radar and radio telescopes. He extended muscular power through mechanisation, and his energy he extended and increased through the harnessing of nuclear power. Even the most sensitive faculty of man, that of memory and his nervous system, he has now in many ways extended by the decision-making techniques used through computers. It was us, and people like us, who used their great skill and ingenuity to create all this technological change.

Members of my union desire earnestly to be able to use that skill and ingenuity to provide the basis for a more full and dignified existence for the community as a whole. This drive for scientific knowledge "into that untravelled land whose margin fades for ever and for ever when I move" is to be welcomed. Indeed, it is one of the guarantees of our future prosperity. It must not, however, be a blind unthinking drive forward. We must ensure that technology is introduced to serve the interests of the people as a whole, and not to maximise profits for the few. □

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 733

```
      M O N E Y        I = Y
          x I S        O = N
    -----------
    O T A L M L
  N W M M L W
  -------------
  S O B T O I L        69441 0328
```

Solution to Numble 732

In Numble 732 in the February issue, the digits 0 through 9 are represented by letters as follows:

B = 0	I = 5
M = 1	O = 6
H = 2	E = 7
S = 3	L = 8
V = 4	R,C = 9

The message is: Love covers blemishes.

Our thanks to the following individuals for submitting their solutions — **to Numble 731:** T. P. Finn, Indianapolis, Ind. — **to Numble 7212:** Marijoe Bestgen, Lenexa, Kan.

The Watergate Crime and the Cover-Up Strategy

Richard E. Sprague
Hartsdale, N.Y. 10530

"Evidence of conspiracy certainly cannot be seen or discovered unless you open your eyes and go looking for it."

Introduction

This article is another installment of a continuing report on the Watergate Crime, its ramifications, and related espionage and "agent provocateur" activities, closely associated with President Richard M. Nixon, and the Republican "Committee to Re-Elect the President", and leading Republicans.

The Watergate Crime

Five men, backed up by two others now called the "Watergate 7", broke into Democratic National Headquarters in the Watergate Hotel, Washington, D.C. on June 17, 1972. Their purpose was to remove bugging devices they had planted there a few weeks earlier. All seven were arrested, indicted, and tried in court in Washington under Judge Sirica in January, 1973.

Five of them, Bernard Barker, Frank Sturgis, E. Howard Hunt, Virgilio Gonzalez, and Eugenio Martinez, pleaded guilty. The other two, Gordon Liddy and James McCord, pleaded not guilty, but were convicted on several counts.

The Segretti Affair

The Segretti Affair is related to the Watergate Crime in that evidence points toward E. Howard Hunt having been coordinator for both sets of espionage activities. Donald Segretti was carrying out extensive, nation-wide spying projects, apparently at the request of, and financing by, the Republican "Committee for the Re-election of the President". According to newspaper reports in the autumn of 1972, these projects were aimed at "digging up dirt" about the leading Democratic presidential candidates and their financial contributors. Segretti telephoned Hunt many, many times in 1972, and met with him on a few occasions, apparently to receive instructions. Segretti remains free because the Justice Department, headed by the Nixon appointee Attorney General Kleindienst, "does not believe" he committed any crimes.

Cover Ups

Any doubts about whether Richard Nixon and his associates would seek to cover up the truth about these affairs, were removed when the Watergate trial took place in Washington, D.C. The Jan. 1973 article in Computers and Automation and People, entitled "President Richard M. Nixon, the Bay of Pigs, and the Watergate Incident," mentioned six separate investigations, suits and trials which Mr. Nixon and the executive branch machinery had slowed down, covered up, suppressed or stopped. The government trial of the seven men was one of these. After delaying the trial beyond the November elections, the Nixon strategy for cover up in the trial itself took an interesting new form. It has been used once or twice before in the past few years by the Federal Government in delicate situations like Watergate. The most notable case was the "trial" of James Earl Ray in Memphis, Tenn., for the assassination of Dr. Martin Luther King.

The strategy consists of working out a pre-arranged "deal" between the defendants and their attorneys and the prosecution in which the defendants plead guilty in exchange for some form of guaranteed or implied protection, remuneration, or pardon. The judge may or may not be party to the arrangement. The important thing is that neither prosecuting attorneys nor defense attorneys will present any witnesses or ask any questions that could prove embarrassing to the President, or to the federal agencies involved in the cover up.

James Earl Ray Trial

Harold Weisberg, in his book Frame Up[2] has called this technique the "Mini Trial," in describing how Percy Foreman, Ray's lawyer, the district attorney for Memphis, Pat Canale, and Judge Battle, handled the case. No evidence about what actually happened was ever presented. No witnesses were presented except the minimum number for the prosecution to summarize the presumed case against Ray. Ray pleaded guilty because Foreman had convinced him that he would be out of jail in a few years. Ray was also convinced by Foreman that if he pleaded not guilty, he would be sentenced to death. Ray's new appeal is partially based on this illegal arrangement which did involve at least the Federal Government (the FBI), the district attorney (Canale), the defense attorney (Foreman), and the judge.

Sirhan Sirhan Trial

Some of the same techniques may have been used in the trial of Sirhan for the assassination of Robert Kennedy. It is not certain that the defense attorneys, Grant Cooper and Russell Parsons, were party to the cover up in the trial. The judge and the district attorney, Evelle Younger, certainly did not present the basic evidence of conspiracy in the case, nor did the defense attorneys. The judge cut off the testimony of Coroner Tom Noguchi on the autopsy of Senator Kennedy. If it had been made part of the record, it would have been the most important evidence of conspiracy.[3]

The evidence from the conducting of the Sirhan trial and its aftermath, points toward a cover up conspiracy involving at least the Federal Government (the FBI and the Justice Department), the district attorney, the Los Angeles police department, and the judge.

The Watergate Trial

The cover up technique required in the case of the Watergate 7 was much trickier, even though the general pre-arrangement strategy was obviously used. First of all, there were a lot more people involved who, unfortunately for the conspirators, surfaced. Also, they were known publicly to be CIA men. Secondly, the news media, as well as the public and Congress, were more aroused and suspicious, as compared to the situation when Robert Kennedy was assassinated and when Sirhan was tried. Suspicions still exist about the King killing and James Earl Ray, but Percy Foreman is held in such general overall esteem and Ray's guilty plea and subsequent escape attempts meant that the news media have not pressed that case.

Third, there was another less controllable investigation scheduled by Senator Sam Ervin's Committee and possibly a second one by Senator Ted Kennedy's subcommittee.

For these reasons, Nixon's strategy had to be somewhat more complex and devious. Those making the arrangements — Charles Colson, H. R. Haldeman, John Erlichman, Richard Kleindeinst, Patrick Gray, John Mitchell, Maurice Stans, E. Howard Hunt, the lawyers for the defendants, and the prosecuting attorney, Earl J. Silbert — had to be extremely careful, and entirely "off the record" in planning the trial. It appears that Judge John Sirica was not made party to the cover up arrangement, or if he was, he played his role like a Hollywood actor, to the hilt. There were four basic parts to the strategy.

The "Line of Innocence," Part 1 of Strategy

The lawyer for G. Gordon Liddy, Peter L. Maroulis, defined part one of the strategy when he used the phrase "line of innocence" on the last day of the trial, Jan. 30, 1973, in his summation. He said that Liddy thought the other six defendants were engaged in a legitimate intelligence operation and he (Liddy) was, like other officials at Nixon headquarters, "on the safe side of the line of innocence".

Nixon saw the obvious last summer. It would be necessary to draw a definite line somewhere between himself and the first five men arrested. All those on one side of the line would have to be considered guilty and be "sacrificed," with suitable secret arrangements made for their later pardons, paroles, support, etc. Those above the line would be considered innocent and would be supplied with all the Presidential back-up required to take the "innocent and ignorant" stance. Lying before grand juries, federal judges, and Congressional committees would be necessary and sanctioned for the good of the Republican party, the President and the United States. This troupe grew larger as the weeks and months passed and the Washington Post, Newsweek, Time, The New York Times and others put on the pressure and certain trustworthy sources began leaking information. Those required to lie in court were restricted by using executive priviledge, and other means. Nevertheless, a stream of government "witnesses" lied through their teeth before Judge Sirica and the jury. The lying became so blatant that Sirica blew his top several times and took over the questioning of witnesses only to be told more lies.

Place yourself in the position of Hugh Sloan, Jr., former treasurer of the Committee to Re-Elect the President, one of those chosen to be above the line of innocence. Would you lie to the judge if you knew you were doing it for your President? Sloan told Sirica and the jury that he met G. Gordon Liddy at the CRP headquarters only hours after the five men were arrested. Liddy said to Sloan, "My boys were caught last night; I made a mistake by using somebody from here (meaning James McCord from CRP headquarters) which I told them I would never do. I'm afraid I'm going to lose my job." Sirica never did ask who "them" was, nor did Silbert or anyone else. However, Sirica was bothered enough by Sloan's testimony to send the jury out of the court and to question Sloan directly. He asked whether Sloan hadn't found Liddy's remark highly suspicious at the time. Sloan obviously lied when he said, "No".

Alfred Baldwin 3rd, a former FBI agent who helped Hunt, Liddy, McCord, Barker and the others monitor the telephone taps and bugs in the Democratic offices, was placed on the safe side of the line of innocence by making him a witness for the prosecution with "immunity" in exchange for testifying. He obviously lied to Judge Sirica when he said he could not remember the name of a Republican committee official to whom he had delivered a transcript of the eavesdropping information. Sirica knew he was lying and asked when he had suffered this lapse of memory. Baldwin replied he started to forget the name as soon as the FBI began questioning him about it. Baldwin then testified about a package at the trial. On Jan. 19 he said that he had delivered a package with the name of the official at Nixon re-election headquarters to whom it was addressed, actually written on the outside of the package. Baldwin said he could not remember the name he himself wrote on the package.

There were many more obvious liars. Those on the guilty side of the line of innocence lied according to Nixon's pre-arranged script in one direction. Those on the other side lied according to script in another direction. It was like watching a well-rehearsed play unfold in which the audience knew the plot in advance. The third act is coming up with the Ervin inquiries. The question is whether the lies and the script will hold up during this phase. One possibility for Nixon is to cut off the play after the second act, by preventing the Ervin hearings altogether. More about that later. The list of liars at the trial and the grand jury hearings included: Bernard Barker, Howard Hunt, James McCord, Gordon Liddy, Virgilio Gonzalez, Eugenio Martinez, Frank Sturgis, Baldwin, Sloan, Maurice Stans, John Mitchell, Jeb Stuart Magruder, Herbert Porter, Robert Odle, Douglas Caddy, Erlichman, and Haldeman. Some of these men took executive privilege or merely submitted affidavits rather than lying outright.

The Guilty Pleas, Part 2 of Strategy

The second part of the strategy was to plan for the CIA people involved to plead guilty in order to avoid testifying and to avoid presenting any evidence or witnesses concerning their role and especially their motives and connections with Mr. Nixon, wealthy Cubans, the Mafia and the CIA from past history. The guilty pleas were obviously arranged for in advance of the trial and then suddenly "sprung" on the judge and the public in an attempt to make it look like Hunt had late second thoughts. The other four, Barker, Sturgis, Gonzalez and Martinez, waited for a day or two to make it look like they had followed their leader.

The enticements for pleading guilty and staying on that side of the line of innocence seem to have been quite varied. Bernard Barker hinted at one form of encouragement when he talked to The New York Times last September, about patriotic acts in an espionage environment. He said, "I don't talk, period. When the time comes, I will face up to whatever responsibilities I have, and I won't cry in my beer, and that will be the end of it. If I have to go to jail and so forth — well, I did 16 months in a German prison camp and this sure as hell isn't going to be as bad as that." Barker, Martinez, and Gonzalez seem to be motivated by what they consider to be pure patriotism. On the other hand, E. Howard Hunt told Time magazine (Jan. 29 edition) that "his people" were prepared to put up plenty of money for the defense of the men. He said that his "friends" would offer each man $1000 for each month spent in prison.

Newsweek (Feb. 5 edition) reported that, "Hunt held out the promise of financial support and a 'Presidential pardon' to get the others to follow suit in pleading guilty. Reliable sources said that the four Miami men had 'no doubt' that they had been working for Mitchell and Stans — and that they had been persuaded by Hunt that they could expect pardons when the publicity died down." The New York Times added (Jan. 13) reports from "sources close to the case" that the Miami four were still being paid by persons unnamed right up to the trial date. Payments were said to average $400 a month and up. Frank Sturgis admitted this to reporters, but said the current payments represented sharp reductions from what he had been getting for awhile after he was arrested.

Hunt's incentives may have involved money from Nixon supporters also. But he may be counting on another income source. He announced on the William Buckley television program (Jan. 23) that he has completed a new book about the Bay of Pigs and his role in it. Hunt looked very composed on the show, and not much like a man who has just lost his wife in an airplane crash or just pleaded guilty in an espionage case. He received a compliment from an anti-Castro lawyer from Miami who said he was a great, patriotic American, by calmly blowing smoke from his cigar. In fact, he looked just like a CIA man who has the President of the United States behind him all the way.

Not Guilty Pleas, Part 3 of Strategy

Some may argue, why didn't James McCord and Gordon Liddy plead guilty, too, if the mini trial strategy was to be successful? A little logic and a knowledge of law supplies the answer. If all seven men had pleaded guilty, the trial would have been over and there would have been no appeal. All seven could be called before a grand jury or a Congressional committee and they could not take the fifth amendment. Since McCord and Liddy pleaded not guilty and were found guilty, an appeal possibility has been set up, with the long sequence of delays that a series of appeals all the way to the Supreme Court implies. Liddy and McCord, at least, could not be forced to testify before a Congressional committee while these appeals were under way. The strategy, then, may be to block Senator Ervin's committee from any effective inquiry for perhaps a year or two. A motion may even be filed to halt any inquiry or questioning until Liddy and McCords' appeals have been exhausted. If that maneuver is not successful, at least the men who can be called are reduced to the five who Nixon can count on to continue lying for their boss.

That this may be the strategy is indicated by lawyer Gerald Alch, representing James McCord, who stated to reporters after McCord was found guilty, that he would file an appeal and that Senator Ervin would not be able to subpoena McCord while the appeals case was under way.

Patriotic Motives, Part 4 of Strategy

The fourth part of Nixon's strategy is a mixture of emotional fact and fantasy. The concept is that all seven men were motivated by the patriotic call to duty for President and country. Men like Barker could well believe this with all their heart. People as cool and detached as Liddy and Hunt are more likely to be faking it for strategic purposes. The patriotic motives varied from Barker's stated purpose of keeping Communists like McGovern out of the White House, to Sturgis' ideas about combatting left-wing demonstrators on the streets in Miami during the Republican convention. James McCord and his lawyer came up with a "beaut". They argued before Judge Sirica, with the jury out of the room, that McCord had acted under "duress" to protect the President. He said he had been motivated by a fear of violence against Mr. Nixon and other Republicans, planned by radical groups linked to the Democrats. He said he felt justified in planting bugs at Democratic headquarters to effectuate the defense of President Nixon. McCord was, after all, chief of security for the Committee to Re-Elect the President. He was presumably responsible for protecting the President during the Republican convention.

Judge Sirica showed he has a sense of humor when he said to Alch and McCord, "All Mr. McCord had to do if he felt Republican officials were in danger was to call the FBI, the Secret Service or the police. The Republican National Committee is just another political organization. They don't have all the rights in the world; you know they don't have the right to hire someone to go in and bug the Democratic National Committee."

The Donald Segretti Affair

On Jan. 28 a story broke in The New York Times that Dwight L. Chapin, President Nixon's appointments secretary, had decided to leave the White House staff. One high ranking administration official told The New York Times that Chapin was being forced to leave as a result of the Segretti affair. This brought back recollections of stories making headlines in Oct. before the election. Segretti had travelled all over the U.S. hiring young people to plant false information, to spy on Democrats and to collect data for the Nixon Re-Election committee. His old University of Southern California buddy, Dwight Chapin, had obviously been one of his contacts in the White House. Analysis of his telephone bill showed several calls to Chapin's office and home in the spring of 1972. A Segretti friend from U.S.C. told the Washington Post that Chapin was the chief Washington contact for a nation-wide espionage operation financed by a secret fund from reelection committee headquarters.

The New York Times reported that H.R. Haldeman, White House chief of staff and Chapin's boss, asked him to quit right away in Nov. after the election. Chapin protested bitterly, telling Haldeman his prospects for getting a job would be lessened if he became the White House scapegoat for Mr. Segretti's espionage activities. That statement certainly makes it sound as though someone higher up was really responsible. Chapin told Haldeman, according to The New York Times' source, that he would "blow the whistle" if he was immediately dismissed. Haldeman then agreed to let him stay on for awhile until things cooled down and agreed to help him find a job.

The White House denounced the Segretti reports in Oct., and denied The New York Times' story about Chapin being forced out. Ronald Ziegler, the President's press secretary said the article was absolutely unfounded and untrue. He referred to The New York Times as "the publication that serves the city located on the northeastern tip of the United States". Ron Ziegler, Donald Segretti and Dwight Chapin all just happen to be old student friends from the University of Southern California, President Nixon's home ground area.

FBI Cover Up

The intent to cover up the truth about Segretti's operation was clearly indicated by Attorney General Richard Kleindienst on Oct. 24, when he told newsmen that no inquiry into Mr. Segretti's activities was planned because as of that date no evidence had come to the Department of Justice that would indicate the violation of a Federal law. On Jan. 29, The New York Times published an article stating that the FBI made no attempt to investigate fully the political espionage and sabotage activities of Donald Segretti. Justice Department officials learned of some of Mr. Segretti's activities within weeks after the Watergate arrests, but decided then that his actions were legal and therefore beyond the scope of an extensive FBI inquiry. Although Segretti and Hunt met at least twice and conversed by phone many times, the FBI made no effort to determine who placed Segretti in contact with Hunt. White House officials have repeatedly stated they knew nothing about either Segretti's espionage operation, or the Hunt-Liddy operation prior to June 17, 1972.

Part of the cover up strategy with Segretti has been a Nixon-FBI-Justice Department carefully orchestrated plan to make sure he says the right things. Lawrence R. Young, another U.S.C. close friend of Segretti, Ziegler and Chapin, has told newspapers that Segretti said Nixon's aides coached him before his grand jury appearance.

Another Justice Department official who happens to be a Democrat, Henry E. Petersen, apparently was asked to check Segretti for criminal violations and since he had no affirmative recommendations from anybody, therefore called off any further investigations. This is reminiscent of three assassination inquiries and the position of former Justice Earl Warren, who still says he has seen no evidence of conspiracy. It certainly cannot be seen or discovered if you don't open your eyes and go looking for it. The real criminals are not going to call up the FBI and tell them where and how to look for evidence.

Political "Law of the Jungle"

Among things the FBI might have learned, and might have been unhappy to have discovered about Donald Segretti is a particular plan linking Hunt and Segretti to something much worse than political espionage. According to Lawrence Young, who was never interviewed by the FBI, he could have told them about a Miami meeting between Hunt and Segretti which took place in the spring of 1972. Hunt told Segretti about a plan to hire Cuban refugees to pose as McGovern supporters and tear up the inside of the Doral Hotel where George McGovern had his convention headquarters.

In the article in the Oct. 1972 issue of Computers and Automation several activities were described as having been part of the plans of Hunt, Barker, and Sturgis for Miami. This new report from Young further reinforces the idea that a situation might have been the ultimate Watergate and Segretti objective.

Apparently, this possibility has occurred to someone on the editorial staff of The New York Times as well. In the Jan. 18, 1973 edition, the following remarks appeared in the lead editorial, entitled "Veil Over Watergate".

"Chief Judge John J. Sirica spoke for a host of incredulous observers at the Watergate trial when he told defendant Bernard Barker that he simply did not believe his story that $144,000 had arrived in unmarked envelopes from sources unknown....Defense counsel Gerald Alch tried to cloak his clients' acts of political espionage in a mantle of patriotism. The violence which the defendants wanted to intercept, he said, would have been directed against 'Republican officials, including but not limited to, the President'....Guided only by hallucinations akin to the anti-Castro fanaticism that motivated the hirelings in the Watergate plot, any individuals or groups could feel free to take up arms or utilize any other repressive measures their paranoid suppositions dictated. Such a political law of the jungle might readily lead from protective espionage to defensive assassination."

What is There to Hide?

With all of these extensive, widespread efforts on Nixon's part to cover up the truth about Watergate and Segretti, the curious person cannot help wondering and asking, "What else is he trying to hide? Isn't there more to it than just political sabotage and espionage?"

There is more. These questions will be examined and discussed in another article in an early issue of this magazine.

Footnotes

1. The first four articles were published in Computers and Automation in August, October, December, 1972, and January, 1973.
2. Harold Weisberg, Frame Up, New York, 1971.
3. This evidence is discussed in detail in Richard E. Sprague, "The Assassination of Senator Robert F. Kennedy: Proofs of Conspiracy and of Two Persons Firing," Computers and Automation, September, 1972.

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C.a

PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 733: A RANDOM WALK

"What's that, a graph of our booming economy?" asked Mike, looking at the chart Pete was drawing. It looked like a series of gradually rising sawtooth peaks.

"No, it's actually a random walk problem I'm trying to program."

"Doesn't look like the usual random walk with all those segments sloping up and down."

"Well, this is a little different. In this version only diagonal steps up or down are permitted. That is, segments connect grid points at opposite vertices of a unit square."

Mike studied the diagram a moment. "These steps seem to go up or down, but they all go to the right. Are steps to the left allowed?" he asked.

"No. This base line is supposed to represent time. It's all part of a big simulation project."

"What are you trying to program then?"

"Well," said Pete, "one of the problems is to determine the probability of getting to the top. There are five stages in this model and I'm trying to figure the chance of getting through all five."

"Let's see, you could succeed in as few as five time units then, couldn't you?"

"Yes, but there's only a 1/32 chance of that since at each point a step up or down is equally likely."

"You could just have the computer do it, say, 10,000 times, with random sequences of 1's and 0's, 1 for up and 0 for down – make a real random walk out of it."

"I could, but I don't think that will be necessary."

What is the value of the probability Pete is trying to calculate?

Solution to Problem 732: Seance Seating

There were three couples. If men and women alternate there are 3 ! 2 ! or 12 ways of arranging themselves. If there is no restriction this number is 5 ! or 120.

ADVERTISING INDEX

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

U. S. Electronic Espionage: A Memoir
Part 2

Ramparts
2054 University Avenue
Berkeley, Calif. 94704

"One of the instructors gave us a big lecture about classifying material and he said that it was necessary because it would only confuse the American people to be let in on this data. He used those exact words. As a matter of fact, I used those words when I was training the people who worked under me."

Ramparts' interviewee was not identified in the original article. However, Ramparts later introduced him to the press at a news conference in California. He was 26-year-old anti-war activist Perry Fellwock of San Diego. Perry Fellwock enlisted in the Air Force in 1966 at the age of 20. He was subsequently recruited by the National Security Agency for specialized training, and was later promoted to Staff Sergeant. In November 1969, he was discharged from military service after 3 years of overseas duty. He has served as a communications traffic analyst for the National Security Agency in Istanbul, Turkey, West Germany and Indochina.

In a New York Times interview published July 19, 1972, Perry Fellwock stated his reason for leaving as disillusionment with the National Security Agency's activities. He said:

> My experience with the U.S. Government and its global mission has convinced me that the most dangerous threat to me, my family and to world peace itself, is the American military.

He asserted that to bring security and peace to the United States:

> We must take steps to insure that there are no more Vietnams. I believe I have taken such a step. I have done it for neither money nor glory, but to bring to the American people knowledge of which they have a 'need to know'.

Introduction

Part 1 of this article appeared in last month's issue of Computers and Automation and People. The National Security Agency, created in 1952, employs upwards of 15,000 civilian and military personnel to gather, analyze and disseminate over 80 per cent of the viable intelligence received by the U.S. government. All of this information is gathered technologically, by deciphering electronic, radar, and especially radio communications of other nations. The activities cover the communications of "allies" as well as "enemies", the chief "target" however being the Soviet Union. Peck suggested in Part 1 that the completeness and precision of this intelligence operation practically destroys any "balance of terror" in the world, since the United States' information on Soviet military installations puts the United States much closer to a crippling first-strike capacity than is generally supposed. In addition, Soviet military and intelligence operations are, he noted, aimed almost entirely at defense.

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Q. While you were monitoring the Soviet Union what sort of intelligence would have been considered very important or serious?

A. In a way you do this almost routinely. That is, there are certain times that the activities of a targeted entity are of such an important nature that a special type of report has to be sent out. It is called a CRITIC. This is sent around the world to a communications network called CRITICOM. The people in this network, besides NSA (National Security Agency), are those in other intelligence or diplomatic capacities who might come across intelligence of such importance themselves that the President of the United States would need to be immediately notified. When a CRITIC goes out, one analyst working alone can't do it. There is just too great a volume of material to correlate.

Q. What would be an example of something sent out as a CRITIC?

A. Well, one of the strangest I ever read was sent out by our base at Crete. One of the analysts there sent a CRITIC because he had traced a Soviet bomber that landed in the middle of Lake Baikal. He knew it hadn't crashed from the type of communications he monitored, and he thought they had developed a new generation of bombers able to land on water. It turned out to be a bad mistake because he neglected to remember that about three-fourths of the year this lake is completely frozen over.

But actually this sort of thing is rare. Most CRITICs are based on good reasoning and data. You work around the clock, sometimes for 30 hours at a stretch putting things together. These are the times that the job stops being routine. I guess it's why they have a saying about the work in NSA: "Hours of boredom and seconds of terror."

Q. Did you ever issue a CRITIC?

A. Yes, several. During Czechoslovakia, for instance, when it became clear the Soviets were moving their troops up. We also issued a number of CRITICs during the Mideast War of 1967.

Q. Why?

A. Well, I was part of an analysis team that was predicting the war at least two months before it began. I guess we issued our first CRITIC on this in April. We did it on the basis of two sources. One, we and the Crete station had both been picking up data as early as early February that the Israelis had a massive build-up of arms, a massing of men and material, war exercises, increased level of penetration of Arab territory — just everything a country does to prepare for war. Two, there were indications that the Soviets were convinced there was going to be a war. We knew this from the traffic we had on diplomatic briefings sent down from Moscow to a commanding general of a particular region. And by April they had sent their VTA airborne, their version of Special Forces paratroopers, to Bulgaria. Normally, they're based in the Trans-Caucasus, and we knew from their contingency plans that Bulgaria was a launching point for the Middle East. Plus some of these forces were being given cram-courses in Israeli and Arabic languages.

Q. All this leaves the sequence of events that immediately preceded the Six Day War — the various countercharges, the UN pullout, the closing of the Straits — still pretty obscure. Did NSA evidence clear this up?

A. No. Not really. But one of the things that confused us at first was the fact that until the last days before the war the Arabs weren't doing anything to prepare. They weren't being trained how to scramble their air force. This is why there was such total chaos when the Israelis struck.

Q. How did the White House react to your reports about all this?

A. Well, in every message we sent out, we always put in our comments at the end — there's a place for this in the report form — and they'd say something like "Believe there is some preparation for unexpected Israeli attack. Request your comments." They didn't exactly ignore it. They'd send back, "Believe this deserves further analysis", which means something like, "We don't really believe you, but keep sending us information". Actually, we all got special citations when the whole thing was over.

Q. Why didn't they believe you?

A. I suppose because the Israelis were assuring them that they were not going to attack and Johnson was buying it.

Q. You remember about the "Liberty," the communications ship we sent in along the coast which was torpedoed by Israeli gunboats? The official word at the time was that the whole thing was a mistake. Johnson calls it a "heartbreaking episode" in The Vantage Point. How does this square with your information?

A. The whole idea of sending the "Liberty" in was that at that point the U.S. simply didn't know what was going on. We sent it in really close so that we could find out hard information about what the Israelis' intentions were. What it found out, among other things, was that Dayan's intentions were to push on to Damascus and to Cairo. The Israelis shot at the "Liberty", damaged it pretty badly and killed some of the crew, and told it to stay away. After this it got very tense. It became pretty clear that the White House had gotten caught with its pants down.

Q. What were the Russians doing?

A. The VTA airborne was loaded into planes. They took off from Bulgaria and their intention was clearly to make a troop drop on Israel. At this point it became pretty clear that we were approaching a situation where World War III could get touched off at any time. Johnson got on the hot line and told them that we were headed for a conflict if they didn't turn these planes around. They did.

Q. Was it just these airborne units that were on the move?

A. No. There was all kinds of other action too. Some of their naval forces had started to move, and there was increased activity in their long-range bombers.

Q. What about this idea that Dayan had decided to push on to the cities you mentioned. What happened there?

A. He was called back, partly because of U.S. pressure, partly by people in the Israeli political infrastructure. He was somewhat chastised and never given back total control of the Army.

Q. How do you know this?

A. Like I said earlier, NSA monitors every government. This includes Tel Aviv. All the diplomatic signals from the capital to the front and back again were intercepted. Also at this same time we were copying the French, who were very much involved on both sides playing a sort of diplomatic good offices between Cairo and Tel Aviv. As far as Dayan is concerned, the information came from informal notes from analysts at Crete who were closer to the situation than we were. Analysts send these informal notes from one station to another to keep each other informed about what is happening. One of the notes I got from Crete said Dayan had been called back from the field and reprimanded. Obviously, by this time the Israelis were getting heat from the U.S.

Q. What did the Russians do after the situation cooled down a bit?

A. Immediately after the war — well, not even afterwards, but towards the end — they began the most massive airlift in the history of the world to Cairo and Damascus. Supplies, food and some medical equipment, but mostly arms and planes. They sent in MIG-21s fully assembled, fueled, and ready to fly in the bellies of their big 10-10s. At landing the doors would open, and the MIGs would roll out, ready to go. Also there was quite a bit of political maneuvering inside the Soviet Union right afterwards. I don't quite remember the details, but it was mainly in the military, not in the Politbureau.

Q. We routinely monitor the communications of allies like Israel?

A. Of course.

Q. What other sorts of things do we learn?

A. Practically everything. For instance, we know that the Israelis were preparing nuclear weapons at their development site at Dimona. Once the U.S. Ambassador to Israel visited there. They had been calling it a textile plant as a cover, and when he went there they presented him with a new suit. It was a charade, you know. They didn't have warheads deployed then, but they were close to it. I'm sure they must have a delivery system in operation by now. It was said that American scientific advisors were helping them in this development. I mean it was said on the intelligence grapevine. I didn't know it for a fact. But this grapevine is usually fairly accurate.

Q. All of the material you've been discussing is classified?

A. Almost all of it.

Q. Who classified it?

A. I did. Analysts in NSA did. In the Agency, the lowest classification is CONFIDENTIAL. Anything not otherwise classified is CONFIDENTIAL. But SIGINT (Signals Intelligence) data is super-classified, meaning that only those in the SIGINT community have access to it, and then only on a "need-to-know" basis. A lot of the stuff I'd work with was SECRET and TOP SECRET, which is the highest classification of all. But after a while it occurred to me that we classified our stuff only partly because of the enemy. It seemed like they were almost as interested in keeping things from the American public as from the Soviets. Hell, I'd give top secret classifications to weather reports we intercepted from Soviet subs. Certainly the Soviets knew that data. I remember when I was in school back in San Angelo one of the instructors gave us a big lecture about classifying material and he said that it was necessary because it would only confuse the American people to be let in on this data. He used those exact words. As a matter of fact, I used those words when I was training the people who worked under me.

Q. How did you relate to our allies in intelligence matters?

A. I'll have to digress for a moment to answer that. The SIGINT community was defined by a TOP SECRET treaty signed in 1947. It was called the UKUSA treaty. The National Security Agency signed for the U.S. and became what's called the First Party to the Treaty. Great Britain's GCHQ signed for them, the CBNRC for Canada, and DSD for Australia/New Zealand. They're all called Second Parties. In addition, several countries have signed on — ranging from West Germany to Japan — over the years as is supposed to be a general agreement not to restrict data. Of course it doesn't work out this way in practice. The Third Party countries receive absolutely no material from us, while we get anything they have, although generally it's of pretty low quality. We also worked with so-called neutrals who weren't parties to the UKUSA treaty. They'd sell us intelligence. For instance, the Finns were selling us everything they could collect over radar on their Russian border.

As it works out, the treaty is a one-way street. We violate it even with our Second Party allies by monitoring their communications constantly.

Q. Do they know this?

A. Probably. In part, we're allowed to do it for COMSEC purposes under NATO. COMSEC, that's communications security. There's supposed to be a random checking of security procedures. But I know we also monitor their diplomatic stuff constantly. In England, for instance, our Chicksands installation monitors all their communications, and the NSA unit in our embassy in London monitors the lower-level stuff from Whitehall. Again, technology is the key. These allies can't maintain security even if they want to. They're all working with machines we gave them. There's no chance for them to be on par with us technologically.

There's the illusion of cooperation, though. We used to go to Frankfurt occasionally for briefings. The headquarters of NSA Europe, the European Security region, and several other departments in the SIGINT community are located there, inside the I.G. Farben building. We'd run into people from GCHQ there, and from the other countries. It was all fairly cordial. As a matter of a fact, I got to respect the English analysts very highly. They're real professionals in GCHQ, and some are master analysts. They'll stay on the job for twenty-five or thirty years and learn a lot. The CGG is also located in the I.G. Farben building. That's the West German COMINT agency. Most of them are ex-Nazis. We used to harass them by sieg heil-ing them whenever we saw them.

Once I briefed Hubert Humphrey at the I.G. Farben building. It was in 1967, when he was vice-president. The briefing concerned the Soviet tactical air force and what it was capable of doing. It was all quite routine. He asked a couple of pretty dumb questions that showed he didn't have the foggiest notion of what NSA was and what it did.

Q. But you said that you often sent reports directly to the White House.

A. Yes, I did. But the material that goes there is cleaned of any reference as to where the intelligence comes from. Every morning the President gets a daily intelligence summary compiled by the CIA. This information will probably contain a good deal from the NSA in it, but it won't say where it came from and the means used to collect it. That's how a man like the vice-president could be totally ignorant of the way intelligence is generated.

Q. So far we've been talking about various kinds of sophisticated electronic intelligence gathering. What about tapping of ground communications?

A. I'm not sure on the extent of this, but I know that the NSA mission in the Moscow embassy has done some tapping there. Of course all trans-Atlantic and trans-Pacific telephone calls to or from the U.S. are tapped.

Every conversation — personal, commercial, whatever — is automatically intercepted and recorded on tapes. Most of these no one ever listens to and, after being held available for a few weeks, are erased. They'll run a random sort through all the tapes, listening to a certain number to determine if there is anything in them of interest to our government worth holding on to and transcribing. Also, certain telephone conversations are routinely listened to as soon as possible. These will be the ones that are made by people doing an inordinate amount of calling overseas, or are otherwise flagged for special interest.

Q. What about Africa? Does the NSA have installations there?

A. Yes, one in Ethiopia on the East Coast and in Morocco on the West Coast. These cover northern Africa, parts of the Mediterranean, and parts of the Mideast.

Q. Do they ever gather intelligence on African insurgents?

A. I went to Africa once for a vacation. I understood that there were DSUs, that's direct support units, working against Mozambique, Tanzania, Angola, those countries. These DUSs are in naval units off the coast. They are tasked with two problems: first, they copy the indigenous Portuguese forces; and second, they copy the liberation forces.

Q. Is the information used in any way against the guerrilas?

A. I don't know for sure. But I'd be surprised if it wasn't. There is information being gathered. This intelligence is fed back to NSA-Europe, of course. It has no strategic value to us, so it's passed on to NATO — one of our consumers. Portugal is part of NATO, so it gets the information. I know that U.S. naval units were DFing the liberation forces. That's direction finding. The way it worked was that the ship would get a signal, people on board would analyze it to see if it came from guerrillas, say, in Angola. Then they'd correlate with our installation in Ethiopia, which had also intercepted it, and pinpoint the source.

Q. Did you ever have any doubts about what you were doing?

A. Not really, not at this time. It was a good job. I was just 21 years old; I had a lot of operators working under me; I got to travel a lot — to Frankfurt, for instance, at least twice a month for briefings. I was considered a sort of whiz kid, and had been since I'd been in school back in San Angelo. I guess you could say that I had internalized all the stuff about being a member of an elite that they had given us. I was advancing very rapidly, partly because of a turnover in personnel that happened to hit at the time I came to Turkey, and partly because I liked what I was doing and worked like crazy and always took more than other analysts. But, like I said earlier, I had developed a different attitude toward the Soviet Union. I didn't see them as an enemy or anything like that. Everyone I worked with felt pretty much the same. We were both protagonists in a big game — that's the view we had. We felt very superior to the CIA people we'd occasionally come in contact with. We had a lot of friction with them, and we guarded our information from them very carefully.

Q. Was there a lot of what you'd call esprit de corps among the NSA people there?

A. In some ways, yes; in other ways, no. Yes, in the sense that there were a lot who were like me — eating, drinking, sleeping NSA. The very fact that you have the highest security clearance there is, makes you think a certain way. You're set off from the rest of humanity. Like one of the rules was — and this was first set out when we were back at San Angelo — that we couldn't have drugs like sodium pentothal used on us in medical emergencies, at least not in the way they're used on most people. You know, truth-type drugs. I remember once one of our analysts cracked up his car in Turkey and banged himself up pretty good. He was semi-conscious and in the hospital. They had one doctor and one nurse, both with security clearances, who tended him. And one of us was always in the room with him to make sure that while he was delirious he didn't talk too loud. Let me say again that all the material you deal with, the code words and all, becomes part of you. I'd find myself dreaming in code. And to this day when I hear certain TOP SECRET code words something in me snaps.

But in spite of all this, there's a lot of corruption too. Quite a few people in NSA are into illegal activities of one kind or another. It's taken to be one of the fringe benefits of the job. You know, enhancing your pocketbook. Practically everybody is into some kind of smuggling. I didn't see any heroin dealings or anything like that, like I later saw among CIA people when I got to Nam, but most of us, me included, did some kind of smuggling on the side. Everything from small-time black marketeering of cigarettes or currency all the way up to the transportation of vehicles, refrigerators, that sort of thing. One time in Europe I knew of a couple of people inside NSA who were stationed in Frankfurt and got involved in the white slave trade. Can you believe that? They were transporting women who'd been kidnapped from Europe to Mideast sheikdoms aboard security airplanes. It was perfect for any kind of activity of that kind. There's no customs or anything like that for NSA people. Myself, I was involved in the transportation of money. A lot of us would pool our cash, buy up various restricted currencies on our travels, and then exchange it at a favorable rate. I'd make a couple of thousand dollars each time. It was a lark. My base pay was $600 a month, and looking back I figure that I made at least double that by what you'd call manipulating currency. It sounds pretty gross, I know, but the feeling was, "What the hell, nobody's getting hurt". It's hard for me to relate to the whole thing now. Looking back, it's like that was another person doing those things and feeling those feelings.

Q. All this sounds like a pretty good deal — the job, what you call the fringe benefits, and all that. Why did you go to Vietnam?

A. Well, I'd been in Istanbul for over two years, that's one thing. And second, well, Vietnam was the big thing that was happening. I wasn't for the war, exactly, but I wasn't against it either. A lot of people in Europe were going there, and I wanted to go to see what was happening. It doesn't sound like much of a reason now, but that was it.

Q. You volunteered?

A. Right. For Vietnam and for flying. They turned me down for both.

Q. Why?

A. Because of my classification. What I knew was too delicate to have me wandering around in a war zone. If I got captured, I'd know too much. That sort of thing. But I pulled some strings. I'd made what you'd call high-ranking friends, you know. Finally I got to go. First I had a long vacation — went to Paris for awhile and that sort of thing. Then I was sent back to the U.S. for schooling.

Q. What sort of schooling?

A. It was in Texas, near Brownsville. I learned a little Vietnamese and a lot about ARDF — that's airborne radio direction finding. It was totally different from what I'd been doing. It was totally practical. No more strategic stuff, just practical analysis. I had to shift my whole way of thinking around. I was going to be in these big EC-47s — airborne platforms they were called — locating the enemy's ground forces.

After this first phase in Texas, I went to a couple of Air Force bases here in California and learned how to jump out of planes, and then up to Washington state to survival school. This was three weeks and no fun at all. It was cold as hell, I guess so we could learn to survive in the jungle. Never did figure that one out. We did things like getting dropped up in the mountains in defense teams and learn E&E — that's the process of escape and evasion. You divide the three-man team up into certain functions — one guy scrounges for food, the other tries to learn the lay of the land, that sort of thing. We were out for two days with half a parachute and a knife between us. Strangely enough, we did manage to build a snare and catch a rabbit. We cooked it over a fire we built with some matches we smuggled. It was awful. We'd also smuggled five candy bars, though, and they were pretty good. Then we got captured by some soldiers wearing black pajamas. They put us in cells and tried to break us. It was a game, but they played it serious even though we didn't. It had its ludicrous moments. They played Joan Baez peacenik songs over the loudspeaker. This was supposed to make us think that the people back home didn't support us anymore and we'd better defect. We dug the music, of course. After this, I slipped out.

Q. How long were you in Vietnam?

A. Thirteen months, from 1968 to 1969.

Q. Where were you stationed?

A. In Pleiku most of the time.

Q. Is that where the major intelligence work is done?

A. No, there's a unit in Da Nang that does most of the longer-range work, and the major unit is at Phu Bai. It's the most secure base in Vietnam. An old French base, just below Hue and completely surrounded by a mine field. It's under attack right now. The people based there — a couple thousand of them — will probably be the last ones out of Vietnam. I don't know if you know of this or not, but the first American killed in Vietnam was at Phu Bai. He was in NSA, working on short-range direction finding out of an armored personnel carrier — you know, one of those vans with an antenna on top. It was in 1954. We were told this to build up our esprit de corps.

Q. So what kinds of things did you do there?

A. Like I said, radio direction finding is the big thing, the primary mission. There are several collection techniques used there. Almost all of them are involved with the airborne platforms I mentioned. They are C-47s, "gooney birds," with an E in front of the C-47 because they're involved in electronic warfare. The missions go by different names. Our program was Combat Cougar. We had two or three operators on board and an analyst, which was me. The plane was filled with electronic gear, radios and special DF-ing equipment, about $4 million worth of it, all computerized and very sophisticated. The technology seemed to turn over about every five months. As a sideline, I might tell you that an earlier version of this equipment was used in Bolivia, along with infrared detectors, to help track down Che Guevara.

Q. So what would be your specific mission?

A. Combat Cougar planes would take off and fly a particular orbit in a particular part of Indochina. We were primarily tasked for low-level information. That is, we'd be looking for enemy ground units fighting or about to be fighting. This was our A-1 priority. As soon as we located one of these units through our direction finding, we'd fix it. This fix would be triangulated with fixes made by other airborne platforms, a medium-range direction finding outfit on the ground, or even from ships. Then we'd send the fix to the DSUs on the ground — that's direct support units — at Phu Bai or Pleiku. They'd run it through their computers and call in B-52s or artillery strikes.

Q. How high did you fly?

A. It was supposed to be 8000 feet, but we couldn't get close enough, so we went down to 3000.

Q. You hear a lot about seismic and acoustic sensors and that sort of thing being used. How did this fit into what you were doing?

A. Not at all. They aren't that effective. A lot of them get damaged when they land; some of them start sending signals and get stuck; others are picked up by the Vietnamese and tampered with. Those that come through intact can't tell civilian from military movements. Whatever data is collected from sensors on the trail and at the DMZ is never acted on until correlated with our data.

Q. How did the NVA and NLF troops communicate their battle orders? They seem to take us by surprise, while from what you said earlier the Soviet Union can't.

A. That's because there are no grand battle orders except in a few cases. Almost everything is decided at a low level in the field. That's why most of our intelligence was directed toward these low-level communications I've been talking about. NSA operations in Vietnam are entirely tactical, supporting military operations. Even the long-range stuff, on North Vietnamese air defense and diplomacy, on shipping in and out of Haiphong — the data collected at Da Nang, Clark Air Force Base in the Philippines and somewhat in Thailand — is used in a tactical sense only. It's for our bombers going into North Vietnam. They aren't engaged in probing or testing the defenses of a targeted entity like in Europe. It's all geared around the location of enemy forces.

Q. What would be the effect if the U.S. had to vacate ground installations like the ones you've mentioned?

A. Well, we wouldn't have that good intelligence about the capabilities of the North Vietnamese to shoot our planes down. We wouldn't know what their radar was doing or could do, where their ground-to-air missile sites were, when their MIGs were going to scramble. We'd still be able to DF their troops in the field of course. That won't change until our air forces, including the airborne platforms I flew on, go out too.

Q. NVA and NLF troops must have some sort of counter-measures to use against operations like the one you were in. Otherwise they wouldn't be as effective as they are.

A. Basically you're right, although you shouldn't under-estimate the kind of damage done by the strikes we called in as a result of our direction finding. To a certain extent, though, the Vietnamese have developed a way to counteract our techniques. Their headquarters in the North is known as MRTTH — Military Region Tri Tin Hue. It is located on the other side of the Valley, somewhere just into Laos. MRTTH has a vast complex of antennas strung all over the jungle. When they're transmitting orders, they play with the switchboard, and the signal goes out over a several-mile area from these different antennas. When you're up in one of these airborne platforms, the effect is like this: you get a signal and fix it. First it will be nine miles in one direction and then, say, twelve miles in another, and fifteen in another. We never found MRTTH. It's one of the high priorities.

Q. But you'd say that the sort of data you collected through DF-ing had some effect?

A. Right, generally. At least in locating field units. It also leads to some large actions. For instance, the first bombing that ever occurred from ARDF data occurred in 1968. There was an area about 19 kilometers southwest of Hue that we'd been flying over. Some of the communications we collected and a pattern analysis that was performed on it indicated that there were quite a few NVA or VC units concentrated in a small area, about a mile in diameter. General Abrams personally ordered the largest B-52 raid that had ever taken place in Vietnam at the time. There was one sortie an hour for thirty-six hours, thirty tons dropped by each sortie on the area. Afterwards it was just devastated. I mean it was wasted. It was a long time before they could even send helicopters into the area to evaluate the strike because of the stench of burning flesh. On the perimeter of the area there were Vietnamese that had died just from the concussion. The thing of it was, though, there wasn't any way to tell which of the dead were military and which were civilian. It was pretty notorious. Afterwards, it was called Abrams Acres. It was one of the things that began to turn me off to the war.

Q. You've said that your A-1 priority was locating enemy units on the ground. What were the other targets?

A. Mainly supplies. We tried, not too successfully, to pinpoint their supply capabilities. All along the Trail the Vietnamese have these gigantic underground warehouses known as "bantrams", where either men or supplies are housed. The idea is that in case of an offensive like the one that's going on now, they don't have to go north for supplies. They've got them right there in these bantrams, enough to last for a long time at a fairly high level of military activity. They had about 11 bantrams when I was there. We knew where they were within twenty-five or thirty miles, but no closer. I remember the first Dewey Canyon invasion of Laos. I flew support for it. It happened because the 9th Marines went in there to locate a couple of bantrams. Their general was convinced he was going to end the war. It was a real macho trip. He got called back by the White House pretty quick, though, when his command got slaughtered.

Q. What about the idea of an invasion from the north. How does this equate with what you collected?

A. It doesn't. There's no invasion. The entire Vietnamese operation against Saigon and the U.S. is one unified military command throughout Indochina. Really, it's almost one country. They don't recognize borders: that's seen in their whole way of looking at things, their whole way of fighting.

Q. But you made a distinction between VC and NVA forces, didn't you?

A. There are forces we'd classify as VC and others as NVA, yes. But it was for identification, like the call signs on Soviet planes. The VC forces tended to merge, break apart, then regroup, often composed differently from what they were before. As far as the NVA is concerned, we'd use the same names they were called back home, like the 20th regiment. Hanoi controls infiltration, some troops and supplies coming down the Trail. But once they get to a certain area, MRTTH takes over. And practically speaking, MRTTH is controlled by the NLF-PRG.

Q. How did you know that?

A. We broke their messages all the time. We knew the political infrastructure.

Q. You mean that your intelligence would have in its official report that this MRTTH base, which was on the other side of the Ashau Valley, was controlled by the NLF?

A. Of course. Hanoi didn't control that area operationally. MRTTH controls the whole DMZ area. Everything above Da Nang to Vinh. The people in control are in the NLF. MRTTH makes the decisions for its area. Put it this way: it is an autonomous political and military entity.

Q. What you're saying is that in order to gather intelligence and operate militarily, you go on the assumption that there is one enemy? That the NLF is not subordinate to the North Vietnamese Command?

A. Right. That's the way it is. This is one thing I wish we could bring out. Intelligence operates in a totally different way from politics. The intelligence community generally states things like they are. The political community interprets this information, changes it, deletes some facts and adds others. Take the CIA report that bombing in Vietnam never really worked. That was common knowledge over there. Our reports indicated it. Infiltration always continued at a steady rate. But of course nobody back at the military command or in Washington ever paid any attention.

Q. What were some of the other high intelligence priorities besides locating ground units, MRTTH, and the bantrams?

A. One of the strange ones came from intelligence reports we got from the field and copies from North Vietnam. These reports indicated that the NLF had two Americans fighting for them in the South. We did special tasking on that. We were on the lookout for ground messages containing any reference to these Americans. Never found them, though.

Q. When you were there in Vietnam did you get an idea of the scope of U.S. operations in Southeast Asia, or were you just involved with these airborne platforms exclusively?

A. I was pretty busy. But I took leaves, of course, and I saw a lot of things. One thing that never came out, for example, was that there was a small war in Thailand in 1969. Some of the Meo tribesmen were organized and attacked the Royal Thai troops for control of their own area.

Q. What happened to them?

A. Well as you know, Thailand is pretty important to us. A stable Thailand, I mean. CAS-Vientiane and CAS-Bangkok were assigned to put down the uprisings.

Q. What does CAS mean?

A. That's the CIA's designation. Three of our NSA planes were taken to Udorn, where the CIA is based in Thailand, and flew direct support for CIA operations against the Meos. We located where they were through direction finding so the CIA planes could go in and bomb them.

Q. You mean CIA advisors in Thai Air Force planes?

A. No. The CIA's own planes. They had their own attack bombers, flown by their own spookies.

Q. Pilots?

A. Yes. The CIA has its own planes. Not Air America — those are commercial-type planes used just for logistics support. I'm talking about CIA military planes. They were unmarked attack bombers.

Q. What other covert CIA operations in the area did you run into?

A. From the reports I saw, I knew there were CIA people in Southern China, for instance, operating as advisors and commanders of Nationalist Chinese commando forces. It wasn't anything real big. They'd go in and burn some villages, and generally raise hell. The Chinese always called these "bandit raids".

Q. What would be the objectives of these raids besides harassment?

A. There's some intelligence probing. And quite a bit if it is for control of the opium trade over there. Nationalist Chinese regular officers are occasionally called in to lead these maneuvers. For that matter, there are also CIA-run Nationalist Chinese forces that operate in Laos and even in North Vietnam.

Q. Did you ever meet any of these CIA people?

A. Sure. Like I've said, I flew support for their little war in Thailand. I remember one of the guys there in Vientiane that we were doing communications for, said he'd been into Southern China a couple of times.

Q. You got disillusioned with the whole Vietnam business?

A. Yes.

Q. Why?

A. Well, practically everybody hated it. Everybody except the lifers who were in the military before Vietnam. Even after that wasting of the area called Abrams Acres that I told you about before, everybody else was really sick about it, but these lifers kept talking about all the commies we had killed.

For me, part of it was when we crashed in our EC-47. We'd just taken off and were at about 300 feet and it just came down. We crash-landed in a river. We walked out of it, but I decided that there was no easy way to get me into an airplane after that. We got drunk that night, and afterwards I spent two weeks on leave in Bangkok. When I got back to Saigon I got another three days vacation in Na Trang. The whole thing was getting under my skin. I told them that I wasn't going to fly anymore. And mainly they left me alone. They figured that I'd snap out of it. But finally they asked me what my reasons for refusing to fly were. I told them that it was crazy. I wasn't going to crash anymore. I wasn't going to get shot at anymore, I was afraid. I told the flight operations director that I wasn't going to do it anymore, I don't care what was done to me. Strangely enough, they let me alone. They decided after a few days to make me Air Force liaison man up at Phu Bai. So I spent the last three months up there correlating data coming in from airborne platforms like the one I'd flown in and sending DSU reports to the B-52s. It happened all of a sudden, my feeling that the whole war was rotten. I remember that up at Phu Bai there were a couple of other analysts working with me. We never talked about it, but we all wound up sending the bombers to strange places — mountain tops, you know, where there weren't any people. We were just biding our time till we got out. We were ignoring priorities on our reports, that sort of thing.

It's strange. When I first got to Nam, everybody was still high about the war. But by the time I left at the end of 1969, morale had broken down all over the place. Pot had become a very big thing. We were even smoking it on board the EC-47s when we were supposed to be doing direction finding. And we were the cream of the military, remember.

I loved my work at first. It was very exciting — travelling in Europe, the Middle East, Africa; knowing all the secrets. It was my whole life, which probably explains why I was better than others at my job. But then I went to Nam, and it wasn't a big game we were playing with the Soviets anymore. It was killing people. My last three months in Nam were very traumatic. I couldn't go on, but I wasn't able to just quit. Not then. So I faked it. It was all I could do. Now I wish I had just quit. If I had stayed in Europe, I might still be in NSA, I might have re-enlisted. In a way, the war destroyed me.

Q. What happened when you mustered out?

A. Well, having the sort of credentials I had, I had my pick of a lot of jobs. Some ex-NSA people get jobs with private corporations. A lot of them run their own SIGINT operations. For instance, oil companies will have SIGINT against Middle East sheikdoms that have pretty primitive intelligence operations. But I didn't want to do this sort of thing. NSA offered me a nice civilian job. The CIA said they'd pay me a $10,000 bonus in two installments if I'd come to work with them — $5000 on signing up, and $5000 at the end of two years. They said they'd give me a GS-9 rating — that's about $10,000 a year — and promote me to GS-11 in a year. But I didn't want any of it.

Q. Why is it you wanted to tell all this?

A. It's hard for me to say. I haven't digested it all; even though I've been out almost two years now, I still feel as though I'm two people — the one who did all the things I've laid out and another, different person who can't quite understand why. But even being against the war, it's taken a long time for me to want to say these things. I couldn't have done it nine months ago, not even three months ago. Daniel Ellsberg's releasing the Pentagon Papers made me want to talk. It's a burden; in a way I just want to get rid of it. I don't want to get sentimental or corny about it, but I've made some friends who love the Indochinese people. This is my own way of loving them too. □

CALENDAR OF COMING EVENTS

Mar. 7-8, 1973: 1973 Annual Spring Conference of the Association for Systems Management, Royal York Hotel, Toronto, Ontario / contact: Mr. R. H. Crawford, Comptroller's Department, Imperial Oil Limited, 825 Don Mills Rd., Don Mills, Ontario, Canada

Mar. 7-9, 1973: 6th Annual Simulation Symposium, Tampa, Fla. / contact: Annual Simulation Symposium, P.O. Box 22573, Tampa, FL 33622

Mar. 9, 1973: 4th Annual AEDS Conference on the Development and Evaluation of Educational Programs in Computer Science and Data Processing, St. Louis, Mo. / contact: Ralph E. Lee, P.O. Box 951, Rolla, MO 65401

Mar. 12-14, 1973: A Programming Language (APL), Goddard Space Flight Center, Greenbelt, Md. / contact: Cyrus J. Creveling, Code 560, Goddard Space Flight Center, Greenbelt, MD 20771

Mar. 26-28, 1973: Data Processing Institute's Conference and Trade Show, Skyline and Holiday Inn Hotels, Ottawa, Canada / contact: Derek Hasler, Conference/73, Box 2458, Ottawa, Canada K1P 5W6

Mar. 26-29, 1973: IEEE International Convention (INTERCON), Coliseum & New York Hilton Hotel, New York, N.Y. / contact: J. H. Schumacher, IEEE, 345 E. 47th St., New York, NY 10017

Mar. 27-29, 1973: 1st Conference on Industrial Robot Technology, University of Nottingham, England / contact: Organising Secretary, CIRT, Dept. of Production Engineering and Production Management, University of Nottingham, Nottingham NG7 2RD, England

Mar. 29-31, 1973: 10th Symposium on Biomathematics and Computer Science in the Life Sciences, Houston, Texas / contact: Office of the Dean, The University of Texas Graduate School of Biomedical Sciences at Houston, Division of Continuing Education, P.O. Box 20367, Houston, TX 77025

April 1-3, 1973: 10th Annual ASM Atlantic Systems Conference, Kutscher's Country Club, Monticello, N.Y. / contact: Ms. Bertha Kitover, Group Health Inc., 227 W. 40th St., New York, NY 10018

April 2-5, 1973: SOFTWARE ENGINEERING FOR TELECOMMUNICATION SWITCHING SYSTEMS, University of Essex, Essex, England / contact: Mrs. Penelope Paterson, Institution of Electrical Engineers Press Office, Savoy Place, London WC2R OBL, England

April 10-12, 1973: Datafair 73, Nottingham University, Nottingham, England / contact: John Fowler & Partners Ltd., 6-8 Emeral St., London WC1N 3QA, England

April 10-13, 1973: PROLAMAT '73, Second International Conference on Programming Languages for Numerically Controlled Machine Tools, Budapest, Hungary / contact: IFIP Prolamat, '73, Budapest 112, P.O. Box 63, Hungary

April 16-19, 1973: 11th Annual Association for Educational Data Systems Convention, The New Orleans Marriott, New Orleans, La. / contact: AEDS, 1201 16th St., N.W., Washington, DC 20036

April 24-26, 1973: I.S.A. Joint Spring Conference, Stouffer's Riverfront Inn, St. Louis, Mo. / contact: William P. Lynes, c/o Durkin Equipment, 2384 Centerline Ind. Dr., St. Louis, MO 63122

April 30-May 2, 1973: 1st Symposium on Computer Software Reliability, Americana Hotel, New York, N.Y. / contact: David Goldman, IEEE Hdqs., 345 E. 47th St., New York, NY 10017

May 2-3, 1973: 18th Annual Data Processing Conference, Tuscaloosa, Ala. / contact: C. E. Adams, Director, Conference Activities, University of Alabama, Box 2987, University, AL 35486

May 2-5, 1973: DECUS Spring Symposium, Holiday Inn, Penn Center, Philadelphia, Pa. / contact: DECUS, 146 Main St., Maynard, MA 01754

May 3-4, 1973: 10th Annual National Information Retrieval Colloquium, Independence Mall Holiday Inn, 400 Arch St., Philadelphia, Pa. / contact: Martin Nussbaum, Computamation, 2955 Kensington Ave., Philadelphia, PA 19134

May 13-16, 1973: 1973 International Systems Meeting, Hilton Hotel, Denver, Colo. / contact: R. B. McCaffrey, Association for Systems Management, 24587 Bagley Rd., Cleveland, OH 44138

May 14-16, 1973: DPSA International Meeting, Aperghi Hotel, Athens, Greece / contact: C. A. Greathouse, DPSA, P.O. Box 1333, Stamford, CT 06904

June 4-6, 1973: 1973 8th PICA Conference, Radisson Hotel, Minneapolis, Minn. / contact: IEEE Hdqs., Tech. Svcs., 345 E. 47th St., New York, NY 10017

June 4-8, 1973: National Computer Conference and Exposition, Coliseum, New York, N.Y. / contact: AFIPS Hdqs., 210 Summit Ave., Montvale, NJ 07645

June 18-21, 1973: SIAM 1973 National Meeting, Sheraton Conference Center, Hampton, Va. / contact: SIAM, 33 S. 17th St., Philadelphia, PA 19103

June 20-22, 1973: Canadian Computer Conference, Hotel Macdonald, Edmonton, Alberta / contact: Mr. Jim Wilcox, P.O. Box 1881, Edmonton, Alberta, Canada T5J ZP3

June 22-23, 1973: 11th Annual Computer Personnel Conference, Univ. of Maryland Conference Center, College Park, Md. / contact: Prof. A. W. Stalnaker, College of Industrial Management, Georgia Institute of Technology, Atlanta, GA 30332

June 26-28, 1973: Workshop of Computer Architecture, Université de Grenoble, Grenoble, France / contact: Grenoble Accueil, 9, Boulevard Jean-Pain, 38000, Grenoble, France

June 26-29, 1973: DPMA 1973 International Data Processing Conference & Business Exposition, Conrad Hilton Hotel, Chicago, Ill. / contact: Richard H. Torp, DPMA International Hdqs., 505 Busse Highway, Park Ridge, IL 60068

July 17-19, 1973: Summer Computer Simulation Conference, Queen Elizabeth Hotel, Montreal, Canada / contact: Stuart Trask, Sun Life Assurance Co. of Canada, P.O. Box 6075, Montreal 101, P.Q., Canada

July 20-22, 1973: 1973 International Conference of Computers in the Humanities, University of Minnesota, Minneapolis, Minn. / contact: Prof. Jay Leavitt, 114 Main Engineering Bldg., University of Minnesota, Minneapolis, MN 55455

July 23-27, 1973: 3rd Annual International Computer Exposition for Latin America, Maria Isabel-Sheraton Hotel, Mexico City, Mexico / contact: Seymour A. Robbins and Associates, 273 Merrison St., Box 566, Teaneck, NJ 07666

ACROSS THE EDITOR'S DESK
Computing and Data Processing Newsletter

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APPLICATIONS

HEMPSTEAD BANK'S CHAIRMAN CALLS "IT" A SUCCESS

Arthur M. Farbizio
Assistant Vice President
Hempstead Bank
40 Main St.
Hempstead, N.Y. 11551

Bruce Wood Hall, Chairman of Hempstead Bank, Long Island, New York, has labeled the bank's experiment with the world's first checkless/cashless society system as "very successful". The test ended on December 31, 1972. The system, known as Instant Transaction ("IT"), was first introduced in Syosset, Long Island on November 1, 1971. During the experiment, checking account customers of Hempstead Bank's Syosset Office used plastic "IT" cards, instead of checks or cash, to make purchases at thirty-two stores. The participating merchants included local branches of A & P, three other supermarkets, and a variety of other neighborhood retailers.

Mr. Hall, who is the creator of the system, commented about the experiment by saying, "Our customers used the "IT" card to purchase everything from groceries and prescriptions to clothing, appliances and hardware. Even the local 5¢ & 10¢ store participated. It proves that the age of electronic payments is attainable today. The customers and merchants embraced this system more enthusiastically than we ever imagined. Many of them, I'm sure, are unhappy to see the end of the test period." Mr. Hall added, "Our success refutes the conclusions of some research studies which seemed to indicate that consumers were not ready for an automated payment system." He said, "The disparity between those assumptions and our experience is understandable since we are the first organization to evaluate consumer attitudes after they have had an opportunity to try an automated payment system."

Instant Transaction involves a plastic "IT" card and a terminal which connects the merchant's store (via telephone lines) with the bank's central computer. Funds are instantly transferred from the customer's bank account to the merchant's account at the moment of purchase. No corresponding paper documents are processed. A security code number, known only to the customer, authorizes each sale by entering this number on a component of the terminal.

The objectives of Instant Transaction from the banking industry's point of view are twofold. First, the system will eliminate fraud losses by verifying the cardholder's identity and by the computer determining whether the customer has sufficient checking account funds, or available credit, for the sale.

In June of 1971, the Federal Reserve Board announced that it had adopted, as "a matter of urgency," policies aimed at reforming the check system to keep the economy from strangling on its own paper. Board member George W. Mitchell, in a statement issued for public release, said of Hempstead Bank's Instant Transaction System, "The Hempstead "IT" service represents a final link in payment systems development ... It is transacting funds at point of sale. It is eliminating paper processing and is introducing immediate, convenient consumer credit. Hempstead has in fact been faithful in setting up a paper-free system."

Hempstead Bank plans to expand Instant Transaction to other regions so that the card will have widespread appeal. Mr. Hall commented, "We have had conversations with bankers in several areas of the country. Some of them are close to a decision about implementing the system."

PSYCHIATRIC INTERVIEWS CONDUCTED BY COMPUTER

Susan Rodewald
University News and Publications Service
University of Wisconsin-Madison
Bascom Hall
Madison, Wisc. 53706

The compact high-speed digital computer in University of Wisconsin-Madison Hospitals east wing bears little resemblance to a psychiatrist. It wears neither white coat, beard, nor spectacles; in looks, its closest kin is a four-track tape recorder. Yet the LINC (Laboratory Instrument Computer) has "talked" to over 90 psychiatric patients in University Hospitals since June. Through three console terminals, LINC has collected case histories which would otherwise have cost about 200 doctor hours.

"Computer interviews are superior to doctor interviews in many respects", Dr. John H. Greist said. "The machine never forgets to ask a question, and it stores all answers in clear, standardized form. It matches the patient's pace. A computer is never bored or pressured by other duties. If the patient doesn't understand a question, the computer is programmed to explain its meaning."

Computer interviews have an eight-year history at University Hospitals. The first experimental models, developed by Dr. Warner V. Slack and Lawrence J. Van Cura, collected allergy, gynecologic, and general medical histories directly from patients. Favorable reaction from patients and physicians led to design of other interview types and in 1968, an initial psychiatric history was developed by Dr. Max Maultsby and tested with 60 patients.

Dr. Greist and his colleague Dr. Marjorie H. Klein have encountered resistance to using computer interviews in psychiatry. "Many question the intrusion of machines into human interactions," the doctors explained. "Certainly, the present level of computer interviewing does not match the potential interviewing sophistication of a talented and highly motivated human interviewer. However, few patients can spend two or three hours with the likes of Freud, and patients have made it quite clear they can effectively communicate about their personal problems with a computer. Machines are clearly non-human, but their use is not necessarily inhumane."

Drs. Klein and Greist have developed two types of interviews for psychiatric patients. The first, an interview for patient symptomatic change, is designed to accompany therapy. In the initial interview, the patient defines his major problems and describes their effect upon his life. Selection of "target symptoms" helps him to clarify personal goals for therapy. The patient types his narrative response to these questions directly into the computer. The computer then presents a list of standardized symptoms and asks the patient to rate each in terms of its frequency and intensity. Symptoms are grouped into seven problem areas, such as anxiety, depression, or relationship problems. Each symptom cluster is introduced by a general screening question. If the computer receives a positive response to the screening question, it branches into assessment of related symptoms. If the patient selects "Don't Know" or "Don't Understand", the interview branches to further definition and explanation of the problem category. A flat "No" leads directly to the next screening question.

The symptom change interview is repeated four times, in order to evaluate change in initial complaints and symptom levels. The computer stores each conversation, and can prepare a cumulative summary for comparison of subsequent interviews. Both patient and therapist can trace patterns of progress during treatment. Dr. Greist believes that the symptom change interview has many implications for future research. The computer's capacity to collect and store information could provide the basis for comparative study of psychiatric case histories.

The second psychiatric interview developed by Drs. Greist and Klein in conjunction with Prof. David Gustafson of Industrial Engineering deals with suicide risk and therapy. Its format resembles the symptom change interview in problem definition and assessment. In addition, the interview probes factors which have proved statistically significant in predicting risk of suicide. Given data on the patient's social, medical, and psychiatric history, LINC can generate an estimate of actual suicide risk. With further adaptation, it also may be able to furnish therapy recommendations. Both suicide risk and symptom change interviews have been developed and tested under grants from the National Institutes of Mental Health.

EDUCATION NEWS

FIRST 12 STUDENTS GRADUATE FROM COMPUTER HARDWARE EDUCATION CENTER

James E. Talbot
Lewis & Gilman, Inc.
1700 Market St.
Philadelphia, Pa. 19103

While software training institutes fill the newspaper classified sections, independent schools that give detailed courses in computer hardware, especially IBM hardware, are relatively rare. One such school, the Education Center of Computer Hardware Maintenance Co. in Newton, Pa., recently graduated its first 12 students. They received completion certificates for a course that is the initial building block in a training program to produce senior customer engineers (CEs) for the company's fast-growing field maintenance force. Currently CEs are drawn from the parent company, Computer Hardware Consultants & Services, Inc.

The 12 students, who came from CHCS plants, received intensive, fast-paced instruction in Common I/O and System I/O. Instruction consists of four hours of lecture and four hours of lab, five days a week. In the laboratory, which typifies a client's computer room, the students reinforce theory learned earlier by taking equipment apart and putting it back together again under the guidance of instructors. They also troubleshoot bugs planted in the equipment by instructors to simulate common equipment failures.

Richard Cockley, Director of Education and formerly an IBM Education Manager, says that this seven-week course gives students a basic grounding in the common peripheral equipment for IBM 360 systems, including tie-in with Model 30s. The course exactly parallels that given by IBM to its trainees, using the same books and materials. With this background and a month's experience at a CHCS plant, the men will be effective field maintenace backup men, able to handle over 75% of computer maintenance calls for clients.

Future training will not be limited to CHSC employees. State licensing and accreditation procedures are underway to make the material available to outsiders as well. Prospective students are expected to come from computer companies, electronic vocational schools, and the military service.

PSYCHOLOGY INSTRUCTOR DEVELOPS CAI PROGRAM IN ADVANCED STATISTICS

Martha Larson
Office of University Relations
Lawrence University
P.O. Box 1847
Appleton, Wisc. 54911

Computer-power is expanding at Lawrence University through a research and instructional project formulated by Francis T. Campos, instructor in psychology. With $27,000 in funds from the National Science Foundation (NSF) and Lawrence University, Campos has developed a computer-assisted instructional program in advanced statistics. The money made possible the purchase of four computer terminals and a disk storage unit which increases the memory capacity of the university's PDP-11 computer by

1.2 million words. The year-old computer now has 12 terminals.

The course plan which Campos has developed went into use the second term beginning Jan. 3. It uses the computer as a resource for basic information, previously supplied by the course instructor in class lectures, and also serves as a student's personal homework aide. The computer is available around the clock, seven days a week.

"We know pretty much what we want everybody to know," Campos said in regard to the statistics course. "It doesn't change much from year to year because it's only a tool, a solid base of information, which is necessary to interpret and design experiments." The computer program provides that solid base of information which can be revised when necessary.

The goal of the project is to help students achieve at least a minimum level of competence in statistics more efficiently. With this method Campos sees no reason why students should get a grade of D or below. The program is designed so that a student can approach the material at his own pace. With a computer doing the basic teaching, the instructor and student are freed from the classroom lecture to resolve individual problems on a one-to-one basis. The result is more individualized instruction.

Statistics was chosen for the pilot program because it was most easily adapted to the computer system. Two more statistics-oriented courses — elementary and multivariate statistics — are planned for development. It will take a few years to organize the additional courses because there are no devised programs of this sort. Other eventual goals for the computer-assisted instructional program are to include more areas of mathematics and encompass a short introductory psychology course.

MISCELLANEOUS

18-YEAR-OLD MATH WHIZ DEVELOPS TIME-SHARING MONITOR FOR IBM 1130

Steve Goodrich
News Office
Drew University
Madison, N.J. 07940

An electronics firm eager to convert from military to peacetime production, an 18-year-old math whiz, and a community goodwill gesture by a private university have sparked a breakthrough boost in the capabilities of a modest computer used by thousands of institutions and small businesses across the nation. The advance gives the computer, the IBM 1130, sophisticated talents previously possessed only by much larger and enormously more expensive equipment.

For several years, Drew University has offered classes on a tuition-free or reduced tuition basis to extra-bright students in Madison High School. In 1969, 15-year-old sophomore Steve Adamczyk took advantage of the offer that has led to a computer science "first".

Representing Drew at a 1971 national convention of 1130 users, Adamczyk took up a challenge from Les Burston, national sales manager for the Logicon Corp. of Torrance, California. The firm, said Burston, had developed, as spinoff from a military contract, a device capable of converting the 1130 from one-project-at-a-time "batch mode" operation to time-sharing use by up to 16 users working on as many different problems. However, Logicon lacked the software (programming) capability to make the hardware operative, he explained, and would team with the first user to complete the package, which would then be marketed by Logicon.

Adamczyk rose to the bait. Entering Massachusetts Institute of Technology as a second semester freshman with almost unlimited curricular freedom, and working on the Logicon challenge both in his spare time and as part of a project at MIT, he developed a time-sharing "monitor" within the semester. "A monitor," explains Dr. Charles Lytle, director of Drew's Computer Center, "is a housekeeping program that prevents the computer from tripping over its own transistors while 'talking' simultaneously with a number of users." Dr. Lytle is the professor of math at Drew whom Adamczyk credits with challenging and backing his interest in computers from the beginning "even when others thought I was too young".

Last June, together with hardware known as LI/ON (Logical Input/Output Network), Adamczyk's time-sharing monitor debuted at a computer conference at Georgia Tech in Atlanta. Last month, Burston announced the availability of the complete package at users conventions in Chicago and Miami.

Adamczyk is far from through with Drew's 1130. Continuing to work at the Center on vacations and some weekends, he is trying for yet another major data processing coup. The batch and time-sharing modes in Drew's computer are mutually exclusive, the daily schedule being divided between two modes. Very large and advanced third generation computers, however, have a capability known as "background batch," which allows work on batch and time-sharing problems simultaneously. Dr. Lytle is confident Adamczyk can give Drew's modest third generation 1130 the same capability. If so, even with simultaneous servicing of many time-sharing users, together with a batch mode project, the response of the computer would never be delayed by more than a few seconds — hardly enough time to take up knitting.

Outside of his extraordinary gifts in the areas of math and computer science, Steve Adamczyk looks, sounds, and behaves very much like any other long-haired college sophomore. It's just that he continues to hang around computer centers the way some youths his age hang around record stores or gyms or automotive speed shops.

COMPUTER X-RAY DEVICE WINS TOP AWARD

The Montreal Star
241 St. James St.
Montreal, Quebec, Canada

A new, computerized device reported to have revolutionized the technique of head x-rays, has won a major award for its inventor, Godfrey Hounsfield.

The machine, called Emi-scanner, produces 100 times more information from the same amount of x-ray photons used in conventional techniques. In many cases it also eliminates the need to inject fluids, radioactive material or air into the head to obtain better contrast x-ray pictures of the brain. Some of these techniques required general anaesthesia and a stay in the hospital.

The top prize in British engineering, the $65,000 Macrobert award, was given to Mr. Hounsfield and the Emi Electronics group for which he works, and was presented by Prince Philip. Judges called the scanner the greatest discovery in its field since German physicist Wilhelm Konrad Roentgen accidentally discovered x-rays in 1895.

The scanner looks like a large washing machine. The patient's head is inserted in it while he lies prone, and the machine rotates about his head in 180 one-degree steps. The scanner x-rays the brain in a series of thin layers. At each of the 180 stops, 160 readings are taken of the amount of radiation absorbed by the tissue from a pencil-slim beam of x-rays.

The information is fed to a small computer, which calculates the 28,800 readings taken from each layer. These are converted into cathode ray tube pictures within about six minutes. The picture can be photographed, or a numerical absorption chart can be printed.

ADAPSO EXPANDS PROGRAM TO FIGHT ILLEGAL MARKETING PRACTICE

J. L. Dreyer
ADAPSO, Inc.
551 Fifth Avenue
New York, N.Y. 10017

Thomas J. O'Rourke, President of the Association of Data Processing Service Organizations, Inc. ("ADAPSO") announced, in mid-January, an expansion of the Association's program to deal with the problems created by unfair or illegal practices in the sale of data processing services.

"All of the responses we have received from our Members and others," stated O'Rourke, "have indicated that this problem is one of the key economic issues in the computer services industry. Our membership welcomes and encourages fair competition. However, it will fight tooth and nail competition from organizations who use monopoly positions and power developed in other lines of commerce, to restrain free trade and competition in our industry."

O'Rourke stated that the enlarged program would be a several pronged one. "First, ADAPSO will act as a communications center or clearing house, accumulate evidence of unfair or illegal marketing problems, whether furnished us by our members or third parties. Second, ADAPSO will do whatever it lawfully can to assist members who are actively fighting this problem, whether before administrative agencies, in the Congress, in the courts or otherwise. This would include, under appropriate circumstances, participation by ADAPSO as a plaintiff in litigation. Third, to the extent we are able to do so, we will also financially assist members who are under unlawful attack from incremental marketers."

ADAPSO issued its position paper on the incremental marketing issue on October 27, 1972. The statement of position indicated that coercion should be presumed and an unlawful tie-in held to exist, whenever a seller marketing a product in a separate line of commerce also markets a not insubstantial volume of computer services, and where the following circumstances are present:

1. The first (tying) product is patented or copyrighted, or otherwise a lawful monopoly of the seller.

2. There exists some special relationship between the seller and the purchaser which is independent of the particular purchase-sale relationship giving rise to the questioned transaction, such as by way of dealership, franchise or license.

3. The seller offers its computer services only to those purchasing the tying product and not generally.

4. The tying product is important to the business of the computer services organizations in the pertinent market.

5. The seller is of large size relative to the computer services organizations in the pertinent market.

6. The seller operates in an oligopolistic or monopolistic line of commerce.

The number of these circumstances necessary to justify the presumption will vary, depending on the facts of each case. Thus, where 4, 5, and 6 are present, as in the case of communications carriers and banks, 1, 2 and 3 are not required. The existence of all six should never be necessary.

TAXATION OF COMPUTER PROGRAMS SEEN AS THREAT TO DP INDUSTRY

John Heston
Bozell, Jacobs & Wallrapp, Inc.
655 Madison Ave.
New York, N.Y. 10021

The winter conference of the Association of Data Processing Service Organizations (ADAPSO) was warned that states may turn to taxation of computer "software" in their search for new tax bases.

Paul Rosenthal, chairman of ADAPSO's California Software Tax Committee, said that the whole problem hinged on the definition of software as tangible or intangible property. Rosenthal pointed out in a joint paper written with Joseph D. Frascella, legal counsel for System Development Corporation, that California had ruled that any basic operational software program — the program without which the computer could not carry out its basic functions — is subject to ad valorem tax. He told the conference that the California experience could foreshadow actions of the taxation authorities in other states, and suggested that the data processing industry must be prepared to testify in its own behalf on short notice at statewide taxation hearings or face serious financial consequences.

Rosenthal noted that basic operational software programs can be "bundled" — that is, sold as an integral part of the computer and peripheral equipment — or they can be priced and delivered separately: in either case they fall under the California ad valorem tax. The California ruling will probably be appealed by major companies in the industry as

(please turn to page 45)

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
System Development Corp., Santa Monica, Calif.	U.S. Air Force Systems Command, Electronic Systems Div. (ESD), L.G. Hanscom Field, Mass.	Developing, installing and testing Space Computational Center System Segment (a satellite data processing system) of the North American Air Defense Command's (NORAD's) Cheyenne Mountain Complex Improvement Program (427m)	$15.8+ million
Fabri-Tek Inc., Minneapolis, Minn.	Control Data Corp., Minneapolis, Minn.	Delivery of extension memories for IBM System 360 Models 30, 40, 50 and 65 over a 2-year period	$6 million
Sperry Univac, Div. of Sperry Rand Corp., Blue Bell, Pa.	University of Rome, Italy	A UNIVAC 1110 1x1 computer system for exclusive use in scientific and technical applications in engineering, physics, chemistry and mathematics; system will be connected to remote data communications terminals in each of University's 11 faculties, and be available on a time-sharing basis to other scientific, research and educational organizations in the Rome area	$3 million (approximate)
Teledyne Inet Div. of Teledyne Inc., Gardena, Calif.	Litton Industries, Beverly Hills, Calif.	Solid state power conversion systems in the U.S. Navy Spruance-class (DD-963) destroyers	$2 million (approximate)
Computer Sciences Corp., Los Angeles, Calif.	U.S. Navy	Upgrading computer programs used for anti-submarine warfare by the P-3C, a land-based Navy aircraft	$1.5 million
Memorex Corp., Santa Clara, Calif.	TESLA of Czechoslovakia	Disc storage systems from Memorex's Santa Clara, Calif. and Liege, Belgium facilities; also training of TESLA personnel in Czechoslovakia, Belgium and England	$1 million
COMTEN, Inc., St. Paul, Minn.	Data Processing Dept., City and County of San Francisco, Calif.	A dual COMTEN 45 computer communications message switching system, for Computer Assisted Bay Area Law Enforcement (CABLE) System; 5-year contract covers hardware, software and maintenance services	$880,000 (approximate)
Ampex Corp., Marina del Rey, Calif.	IBM Corp., White Plains, N.Y.	Modified Model ATM-13 airborne digital tape drives for the U.S. Air Force Airborne Warning and Control System (AWACS)	$600,000+
National Cash Register Co., Dayton, Ohio	Flah's, Albany, N.Y.	NCR 280 electronic retail data terminals in all 13 stores; equipment includes 150 terminals and an NCR 725 "in-store" computer	$550,000
Varian Data Machines, Irvine, Calif.	New South Wales Department of Public Works, South Wales, Australia	An interactive graphics system calling for 2 Varian 620 computers, special systems software under Varian's VORTEX operating system, and a wide range of display and peripheral equipment; system is designed to produce complete contract documents, specifications and plan drawings required in large-scale building projects	$263,000
Computer Products, Inc., Fort Lauderdale, Fla.	Data Technology, Pty. Ltd., Sydney, Australia	RTP line of analog and digital input/output equipment to be used in a large industrial acquisition and control computer system for the Gladstone Power Station	$170,000
General Electric Research and Development Center, Schenectady, N.Y.	Transportation Systems Center, U.S. Dept. of Transportation	Building a unique multi-purpose data collection device to be used in design of a world-wide satellite navigation and communication system for ships and aircraft	$100,000
International Communications Corp., Miami, Fla.	Western Union Telegraph Co.	Data communication equipment, including 2,000 modems (based on ICC's new Modem 24 LSI design for delivery this year	——
Jay-El Products Inc., Gardena, Calif.	Texas Instruments Inc., Dallas, Texas	New switching systems for Lockheed P3C anti-submarine aircraft replacing former toggle switch boxes to expand capability of the switching function without expanding size	——
Shared Medical Systems Corp., King of Prussia, Pa.	Medical College of Virginia Hospitals, Virginia Commonwealth Univ., Richmond, Va.	Provide total computerized hospital financial management service	——
System Development Corp., Santa Monica, Calif.	San Gabriel Valley Tribune, West Covina, Calif.	Producing and installing TEXT II, a computer based typographic composition system supporting news, classified, production and accounting departments	——
System Development Corp., Santa Monica, Calif.	Cadence Industries Corp., Hackensack, N.J.	Multi-year facility management; will supply personnel on a 24 hour, 7 day week basis	——
SYSTEMS Engineering Labs., Fort Lauderdale, Fla.	Combustion Div., Combustion Engineering, Inc., Windsor, Conn.	Supplying nuclear plant monitoring and supervisory computer systems built around SYSTEMS 85 computer; systems are for several electric utilities for whom Combustion Engineering designs and fabricates pressurized water reactor nuclear steam supply systems	——
Xerox Corp., El Segundo, Calif.	Philip Morris Inc. Richmond, Va.	A Xerox Sigma 8 computer system to serve needs of up to 30 of PM's scientific labs; replaces a smaller Sigma 5 computer	——

NEW INSTALLATIONS

OF	AT	FOR
Honeywell 6060 system	Imperial Iranian Air Force, Tehran, Iran	Controlling spare-parts inventory for all military aircraft (system valued at $3.1 million)
IBM System/370 Model 135	Kable News Co., Inc., Mount Morris, Ill.	Keeping 25 million copies of magazines and paperback books headed for right newsstands each month, some warehousing and inventory, and providing sales analysis data for publishers and KNC salesmen
IBM System/370 Model 165	Chicago Bridge & Iron Co., Oakbrook, Ill.	Helping engineers design structures ranging from elevated water tanks to nuclear reactors and offshore drilling platforms
NCR Century 50 system	Midwest City Memorial Hospital, Midwest City, Okla.	Payroll and in-patient accounting; system uses punched-tape input
	Motion Picture and Television Relief Fund Hospital, Woodland Hills, Calif.	In-patient and out-patient billing, payroll and accounts receivable; equipment includes punched-card peripherals
	Oneida City Hospital, Oneida, N.Y.	In-patient accounting, post-discharge accounts receivable and payroll; system uses punched-tape input
	Serra Memorial Hospital, Sun Valley, Calif.	In-patient and out-patient billing, payroll and accounts receivable; equipment includes punched-card peripherals
NCR Century 101 system	Burnham City Hospital, Champaign, Ill.	In-patient and post-discharge accounts receivable and payroll; also processes City's payroll and parking tickets for the local police department
	Clinton County Bank and Trust Co., Frankfort, Ind.	Establishing a Central Information File (CIF) monitoring all bank activities including a check sorter and 1200-line-a-minute printer
	Norwegian Caribbean Lines, Miami, Fla.	Booking reservations and assigning personal choice of stateroom up to nine months in advance
	Pioneer Hi-Bred, Inc., Tipton, Ind.	Payroll, order entry, sales reporting, inventory control, accounts receivable and general ledger accounting
NCR CENTURY 200 system	Grossman Paper and Bag Co., Irvington, N.J.	Order billing, payroll preparation and receivables monitoring
	Harrisburg School District, Harrisburg, Pa.	Fiscal and financial accounting, personnel accounting, payroll, and earned-income tax accounting for 54 tax districts in 3 surrounding counties
	Lenox Candles, Inc., Oshkosh, Wisc.	Order entry and invoicing
	Loctite Corp., Newington, Conn.	Order entry, sales analysis and payables and receivables
	Edward Malley Co., New Haven, Conn.	Computerizing accounts receivable, and handling accounts payable and sales ordering
	Norwood Mills, Janesville, Wisc.	Controlling a 40,000 inventory, production scheduling, accounts receivable and payable, cost and general ledger accounting, payroll and sales analysis
	Sackner Products, Grand Rapids, Mich.	Inventory control, production scheduling and production requirements planning
	Sunnyland Packing Co., Thomasville, Ga.	Inventory control, invoicing and payroll
Univac 1106 system	Treasury Dept. of the Government of Mexico, Mexico City, Mexico	Preparing and controlling all payments to federal employees (system valued at approximately $2.4 million)
Xerox Sigma 6 system	Advanced System Labs., New York Institute of Technology, Westbury, L.I., N.Y.	Serving two university campuses, eight high schools and junior high schools in two Long Island school districts, and a private secondary school (system valued at over $1 million)

Across the Editor's Desk — *Continued from page 43*

well as industry organizations, on the grounds that unbundled basic software is intangible.

According to Rosenthal, the industry has generally argued that:

a. Tangible objects are manufactured and thereby have easily identifiable costs and therefore value;

b. Intangible objects are created by intellectual activities and reproducible by communication or copying;

c. Since software is so difficult to value, it must be because it has the proportion of intangible objects;

d. Since only bundled software is easy to value, it is probably the only type of tangible software property, and therefore the only type taxable.

In his view, Rosenthal told the meeting, "software is clearly intangible in nature and is therefore subject to sales and ad valorem taxation only under very specific and limited conditions". He said that the conditions would probably cover control programs which are fundamental and necessary to any use of a computer and are an integral part of it in commerce (i.e., bundled pricing). "If this approach is adopted," Rosenthal said, "valuation would be a simple task since the purchase or lease cost of the hardware system would determine taxation valuations. However, if taxation authorities attempt to tax unbundled software, an extremely difficult problem in valuation occurs." □

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

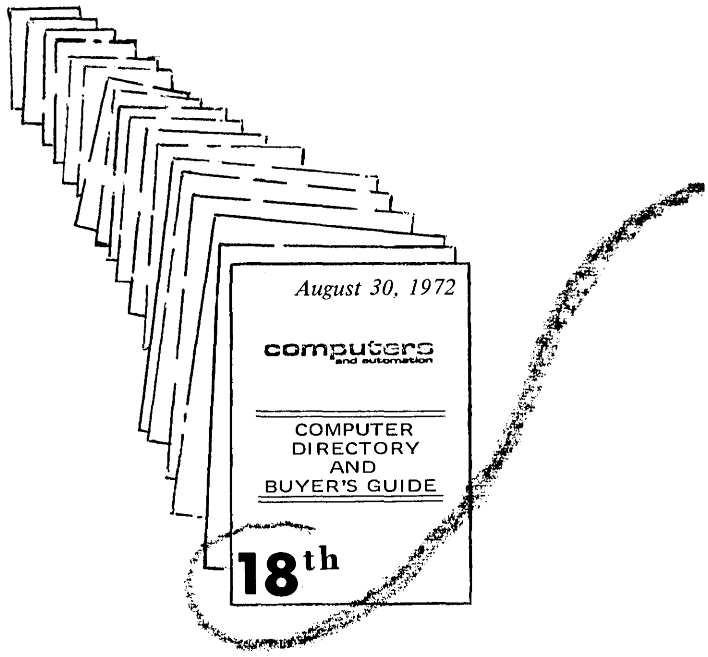
SUMMARY AS OF FEBRUARY 15, 1973

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								
Adage, Inc.	AGT 10 Series	4/68	X		32	3	35	X
Brighton, Mass.	AGT 100 Series	1/72	100-300	(S)	10	4	14	2
(A) (Jan. 1973)								
Autonetics	RECOMP II	11/58	X		30	0	30	X
Anaheim, Calif.	RECOMP III	6/61	X		6	0	6	X
(R) (Jan. 1969)								
Bailey Meter Co.	Metrotype	10/57	40-200	(S)	8	0	8	0
Wickliffe, Ohio	Bailey 750	6/60	40-250	(S)	37	15	52	0
(A) (June 1972)	Bailey 755	11/61	200-600	(S)	7	0	7	0
	Bailey 756	2/65	60-400	(S)	15	12	27	2
	Bailey 855/15	12/72	50-400	(S)	0	0	0	2
	Bailey 855/25	4/68	100-1000	(S)	16	0	16	0
	Bailey 855/50	3/72	100-1000	(S)	0	0	0	12
Bunker-Ramo Corp.	BR-130	10/61	X		160	-	-	X
Westlake Village, Calif.	BR-133	5/64	X		79	-	-	X
(A) (Jan. 1973)	BR-230	8/63	X		15	-	-	X
	BR-300	3/59	X		18	-	-	X
	BR-330	12/60	X		19	-	-	X
	BR-340	12/63	X		19	-	-	X
	BR-1018	6/71	23.0	(S)	-	-	-	-
	BR-1018C	9/72	-		-	-	-	-
Burroughs	B100/500	7/65	2.8-10.0		1141	677	1818	25
Detroit, Mich.	B200	11/61	5.0		-	-	500	-
(N) (R) (Feb. 1973)	B205	1/54	X		19	2	21	X
	B220	10/58	X		23	2	25	X
	B300	7/65	7.0		-	-	600	-
	B1700	8/72	-		2	-	-	-
	B2500	2/67	4.0		277	123	400	30
	B2700	8/72	-		-	-	-	-
	B3500	5/67	12-14		572	285	857	110
	B3700	11/72	-		-	-	-	-
	B4700	10/71	-		4	-	-	-
	B5500	3/63	23.5		153	47	200	-
	B5700	12/70	32.0		27	8	35	22
	B6500	2/68	33.0		-	-	60	2
	B6700	8/72	30.0		5	4	9	60
	B7500	4/69	44.0		-	-	-	13
	B7700	2/72	85.0		-	-	2	4
	B8500	8/67	200.0		1	-	-	-
Computer Automation, Inc.	108/208/808	6/68	5.0	(S)	165	10	175	110
Newport, Calif.	116/216/816	3/69	8.0	(S)	215	20	235	225
(A) (April 1971)								
Consultronics, Inc.	DCT-132	5/69	0.7		35	65	100	-
Garland, Texas								
(A) (Dec. 1972)								
Control Data Corp.	G15	7/55	X		-	-	295	X
Minneapolis, Minn.	G20	4/61	X		-	-	20	X
(R) (Feb. 1973)	LGP-21	12/62	X		-	-	165	X
	LGP-30	9/56	X		-	-	322	X
	M1000	-	-		1	-	-	-
	RPC4000	1/61	X		-	-	75	X
	636/136/046 Series	-	-		-	-	29	-
	160/8090 Series	5/60	X		-	-	610	X
	921/924-A	8/61	X		-	-	29	X
	1604/A/B	1/60	X		-	-	59	X
	1700/SC	5/66	3.8		-	-	428-478	0
	3100/3150/3170	5/64	10-16		-	-	93-120	C
	3200	5/64	13.0		-	-	55-60	C
	3300	9/65	20-38		-	-	205	C
	3400	11/64	18.0		-	-	17	C
	3500	8/68	25.0		-	-	15	C
	3600	6/63	52.0		-	-	40	C
	3800	2/66	53.0		-	-	20	C
	6200/6400/6500	8/64	58.0		-	-	117	C
	6600	8/64	115.0		-	-	88	C

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Control Data (cont'd)	6700	6/67	130.9	-	-	5	C
	7600	12/68	235.0	-	-	12	C
	Cyber 70/72	-	-	2	6	8	-
	Cyber 70/73	-	-	1	3	4	-
							Total: 160 E
Data General Corp.	Nova	2/69	9.2 (S)	-	-	925	-
Southboro, Mass.	Supernova	5/70	9.6 (S)	-	-	210	-
(A) (Dec. 1972)	Nova 1200	12/71	5.4 (S)	-	-	2430	-
	Nova 800	3/71	6.9 (S)	-	-	385	-
	Nova 820	4/72	6.4 (S)	-	-	140	-
	Nova 1210/1220	2/72	4.2;5.2 (S)	-	-	1025	-
Datacraft Corp.	6024/1	5/69	52-300 (S)	17	0	17	2
Ft. Lauderdale, Fla.	6024/3	2/70	33-200 (S)	108	13	121	55
(A) (Nov. 1972)	6024/5	12/71	11-80 (S)	28	0	28	65
Digiac Corp.	Digiac 3060	1/70	9.0 (S)	78	-	-	8
Plainview, N.Y.	Digiac CT-10	-	9.0	20	-	-	1
(A) (May 1972)							
Digital Computer Controls, Inc.	D-112	8/70	10.0 (S)	667	103	770	-
Fairfield, N.J.	D-116	1/72	10.0 (S)	553	38	591	-
(A) (Nov. 1972)							
Digital Equipment Corp.	PDP-1	11/60	X	48	2	50	X
Maynard, Mass.	PDP-4	8/62	X	40	5	45	X
(A) (May 1972)	PDP-5	9/63	X	90	10	100	X
	PDP-6	10/64	X	-	-	23	X
	PDP-7	11/64	X	-	-	100	X
	PDP-8	4/65	X	-	-	1402	X
	PDP-8/I	3/68	X	-	-	3127	X
	PDP-8/S	9/66	X	-	-	918	X
	PDP-8/L	11/68	X	-	-	3699	X
	PDP-8/E	-	4.9 (S)	-	-	3787	-
	PDP-8/M	-	3.9 (S)	-	-	365	-
	PDP-8/F	5/72	3.9 (S)	-	-	2	-
	PDP-9	12/66	X	-	-	436	X
	PDP-9L	11/68	X	-	-	40	X
	DECSystem-10	12/67	700-3000 (S)	-	-	243	-
	PDP-11/20	-	10.8 (S)	-	-	2740	-
	PDP-11R20	-	13.8 (S)	-	-	14	-
	PDP-11/05	-	10.8 (S)	0	0	0	-
	PDP-11/45	-	-	0	0	0	-
	PDP-12	9/69	-	-	-	620	-
	PDP-15	2/61	17.0 (S)	-	-	545	-
	LINC-8	9/66	X	-	-	200	X
						Total: 18456	
Electronic Associates Inc.	640	4/67	1.2	109	61	170	1
West Long Branch, N.J.	8400	7/67	12.0	21	8	29	0
(A) (Feb. 1973)	PACER 100	7/72	1.0	20	30	50	20
EMR Computer	EMR 6020	4/65	5.4	15	1	16	0
Minneapolis, Minn.	EMR 6040	7/65	6.6	6	0	6	0
(A) (Nov. 1972)	EMR 6050	2/66	9.0	15	2	17	0
	EMR 6070	10/66	15.0	7	8	15	0
	EMR 6130	8/67	5.0	34	13	47	0
	EMR 6135	-	2.6	36	5	41	4
	EMR 6145	-	7.2	-	-	-	8
	EMR 6140	-	-	-	-	-	0
General Automation, Inc.	SPC-12	1/68	-	-	-	1500	-
Anaheim, Calif.	SPC-16	5/70	-	-	-	900	-
(A) (Jan. 1973)	System 18/30	7/69	-	-	-	225	-
General Electric	GE-PAC 3010	5/70	2.0	25	1	26	35
West Lynn, Mass.	GE-PAC 4010	10/70	6.0	30	4	34	32
(Process Control Computers)	GE-PAC 4020	2/67	6.0	200	60	260	32
(A) (Oct. 1972)	GE-PAC 4040	8/64	X	45	20	65	X
	GE-PAC 4050	12/66	7.0	23	2	25	1
	GE-PAC 4060	6/65	X	18	2	20	1
Hewlett Packard	2114A, 2114B	10/68	0.25	-	-	1182	-
Cupertino, Calif.	2115A	11/67	0.41	-	-	333	-
(A) (July 1972)	2116A, 2116B, 2116C	11/66	0.6	-	-	1171	-
	2100A	3/71	0.5	-	-	2080	-
Honeywell Information Systems	G58	5/70	1.0	-	-	4	-
Wellesley Hills, Mass.	G105A	6/69	1.3	-	-	6	-
(R) (Feb. 1973)	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	X	11	0	11	X
	G210	7/60	X	35	0	35	X
	G215	9/63	X	15	1	16	X
	G225	4/61	X	145	15	160	X
	G235	4/64	X	40-60	17	57-77	X
	G245	11/68	X	3	-	-	X
	G255 T/S	10/67	X	15-20	-	-	X
	G265 T/S	10/65	X	45-60	15-30	60-90	X
	G275 T/S	11/68	X	-	-	10	X
	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	310-500	-
	G420 T/S	6/67	23.0	-	-	-	-
	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	X	23	3	26	X

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)	G635	5/65	47.0	20-40	3	23-43	-
	H-110	8/68	2.7	180	7	187	0
	H-115	6/70	3.5	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-2015	-	-	2	-	-	-
	H-2040	-	-	3	-	-	-
	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-6030	-	-	-	2	-	-
	H-6040	-	-	-	2	-	-
	H-6060	-	-	-	3	-	-
	H-8200	12/68	50.0	10	3	13	-
	DDP-24	5/63	2.65	-	-	90	X
	DDP-116	4/65	X	-	-	250	X
	DDP-124	3/66	X	-	-	250	X
	DDP-224	3/65	X	-	-	60	X
	DDP-316	6/69	0.6	-	-	452	-
	DDP-416	-	X	-	-	350	X
	DDP-516	9/66	1.2	-	-	900	-
	H112	10/69	-	-	-	75	-
	H632	12/68	3.2	-	-	12	-
	H1602	-	-	-	-	-	-
	H1642	-	-	-	-	-	-
	H1644	-	-	-	-	-	-
	H1646	-	-	-	-	-	-
	H1648	11/68	12.0	-	-	20	-
	H1648A	-	-	-	-	-	-
IBM	305	12/57	3.6	40	15	55	-
White Plains, N.Y.	650	10/67	4.8	50	18	68	-
(N) (D) (Jan. 1973)	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	62	-
	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	-
	System/3 Model 6	3/71	1.0	5	-	-	-
	System/3 Model 10	1/70	1.1	2	-	-	-
	System/7	11/71	0.35 and up	9	-	-	-
	360/20	12/65	2.7	7161	6075	13236	1780
	360/25	1/68	5.1	1112	759	1871	1287
	360/30	5/65	10.3	5487	2535	8022	-
	360/40	4/65	19.3	2454	1524	3978	1363
	360/44	7/66	11.8	109	57	166	39
	360/50	8/65	29.1	1135	445	1580	662
	360/65	11/65	57.2	604	144	748	562
	360/67	10/65	133.8	57	6	63	99
	360/75	2/66	66.9	50	17	67	12
	360/85	12/69	150.3	11	1	12	55
	360/90	11/67	-	5	-	-	-
	360/190	-	-	13	2	15	-
	360/195	4/71	232.0	-	-	9	48
	370/125	4/73	8.2-13.8	-	-	-	-
	370/135	5/72	14.4	11	-	-	-
	370/145	9/71	23.3	1	-	-	-
	370/155	2/71	48.0	1	-	-	-
	370/158	-/73	49.5-85.0	-	-	-	-
	370/165	5/71	98.7	3	-	-	-
	370/168	-/73	93.0-170.0	-	-	-	-
	370/195	6/73	190.0-270.0	-	-	-	-
Interdata	Model 1	12/70	3.7	244	75	319	-
Oceanport, N.J.	Model 3	5/67	-	-	-	200	X
(A) (Jan. 1973)	Model 4	8/68	8.5	274	115	389	32
	Model 5	11/70	X	70	20	90	X
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	X	1	6	7	X
	Model 18	6/71	X	2	7	9	X
	Model 50/55	5/72	6.8	22	3	25	3
	Model 70	10/71	6.8	268	55	323	75
	Model 74	2/73	-	2	0	2	50
	Model 80	10/72	14.9	6	0	6	15

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
Microdata Corp.	Micro 400/10	12/70	0.1-0.5	129	0	129	-
Santa Ana, Calif.	Micro 800	12/68	0.2-3.0	1925	770	2695	-
(A) (Jan. 1973)	Micro 1600	12/71	0.2-3.0	295	88	383	-
NCR	304	1/60	X	5	2	7	X
Dayton, Ohio	310	5/61	X	8	0	8	X
(A) (Dec. 1972)	315	5/62	7.0	255	200	455	-
	315 RMC	9/65	9.0	55	35	90	-
	390	5/61	0.7	160	325	485	-
	500	10/65	1.0	1100	1750	2850	-
	Century 50	2/71	1.6	580	0	580	-
	Century 100	9/68	2.6	1175	780	1955	-
	Century 101	12/72	3.7	50	-	-	-
	Century 200	6/69	7.0	575	330	905	-
	Century 300	2/72	21.0	5	5	10	-
Philco	1000	6/63	X	16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	X	16	-	-	X
(N) (Jan. 1969)	2000-212	1/63	X	12	-	-	X
Raytheon Data Systems Co.	250	12/60	X	115	20	135	X
Norwood, Mass.	440	3/64	X	20	-	-	X
(A) (Jan. 1973)	520	10/65	X	26	1	27	X
	703	10/67	12.5	(S) 177	33	210	2
	704	3/70	7.2	(S) 260	70	330	40
	706	5/69	19.0	(S) 75	17	92	0
Standard Computer Corp.	IC 4000	12/68	9.0	9	0	9	2
Los Angeles, Calif.	IC 6000-6000/E	5/67	16.0	3	0	3	-
(A) (June 1972)	IC 7000	8/70	17.0	4	0	4	1
	IC-9000	5/71	400.0	(S) 1	0	1	-
Systems Engineering Laboratories	SYSTEMS 810B	9/68	2.6	168	10	178	-
Ft. Lauderdale, Fla.	SYSTEMS 71	8/72	0.9	-	-	-	-
(A) (Dec. 1972)	SYSTEMS 72	9/71	1.0	14	3	17	-
	SYSTEMS 85	7/72	6.0	3	1	4	-
	SYSTEMS 86	6/70	10.0	31	1	32	-
UNIVAC Div. of Sperry Rand	I & II	3/51 & 11/57	X	23	-	-	X
New York, N.Y.	III	8/62	X	25	6	31	X
(A) (April 1972)	File Computers	8/56	X	13	-	-	X
	Solid-State 80 I,II, 90, I, II, & Step	8/58	X	210	-	-	X
	418	6/63	11.0	80	39	119	23 E
	490 Series	12/61	30.0	76	14	90	15
	1004	2/63	1.9	1522	610	2132	-
	1005	4/66	2.4	617	248	865	72
	1050	9/63	8.5	136	59	195	-
	1100 Series (except 1107, 1108)	12/50	X	9	0	9	X
	1107	10/62	X	8	3	11	X
	1108	9/65	68.0	103	129	232	58 E
	9200	6/67	1.5	1106	835	1941	725
	9300	9/67	3.4	412	62	474	510 E
	9400	5/69	7.0	82	41	123	83 E
	LARC	5/60	135.0	2	0	2	-
UNIVAC - Series 70	301	2/61	7.0	143	-	-	-
Blue Bell, Pa.	501	6/59	14.0-18.0	17	-	-	-
(A) (Feb. 1973)	601	11/62	14.0-35.0	0	-	-	-
	3301	7/64	17.0-35.0	74	-	-	-
	Spectra 70/15, 25	9/65	4.3	18	-	-	-
	Spectra 70/35	1/67	9.2	95	-	-	-
	Spectra 70/45	11/65	22.5	265	-	-	-
	Spectra 70/46	11/68	33.5	30	-	-	-
	Spectra 70/55	11/66	34.0	10	-	-	-
	Spectra 70/60	11/70	32.0	18	-	-	-
	Spectra 70/61	4/70	42.0	7	-	-	-
	70/2	5/71	16.0	63	-	-	-
	70/3	9/71	25.0	7	-	-	-
	70/6	9/71	25.0	25	-	-	-
	70/7	12/71	35.0	7	-	-	-
Varian Data Machines	620	11/65	X	-	-	75	X
Newport Beach, Calif.	620i	6/67	X	-	-	1300	X
(A) (Aug. 1972)	R-620i	4/69	-	-	-	80	-
	520/DC, 520i	12/69;10/68	-	-	-	350	-
	620/f	11/70	-	-	-	201	3
	620/L	4/71	-	-	-	474	114
	620/f-100	6/72	-	-	-	13	16
	620/L-100	5/72	-	-	-	22	19
	Varian 73	-	-	-	-	-	12
Xerox Data Systems	XDS-92	4/65	1.5	43	4	47	-
El Segundo, Calif.	XDS-910	8/62	2.0	170	10	180	-
(N) (R) (Dec. 1972)	XDS-920	9/62	2.9	120	12	132	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	32	3	35	-
	XDS-9300	11/64	8.5	25-30	4	29-34	-
	Sigma 2	12/66	1.8	163	36	199	-
	Sigma 3	12/69	2.0	13	0	13	-
	Sigma 5	8/67	6.0	29	14	43	-
	Sigma 6	6/70	12.0	2	-	-	-
	Sigma 7	12/66	12.0	30	7	37	-
	Sigma 8	2/72	-	3	-	-	-
	Sigma 9	-	35.0	2	-	-	-



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