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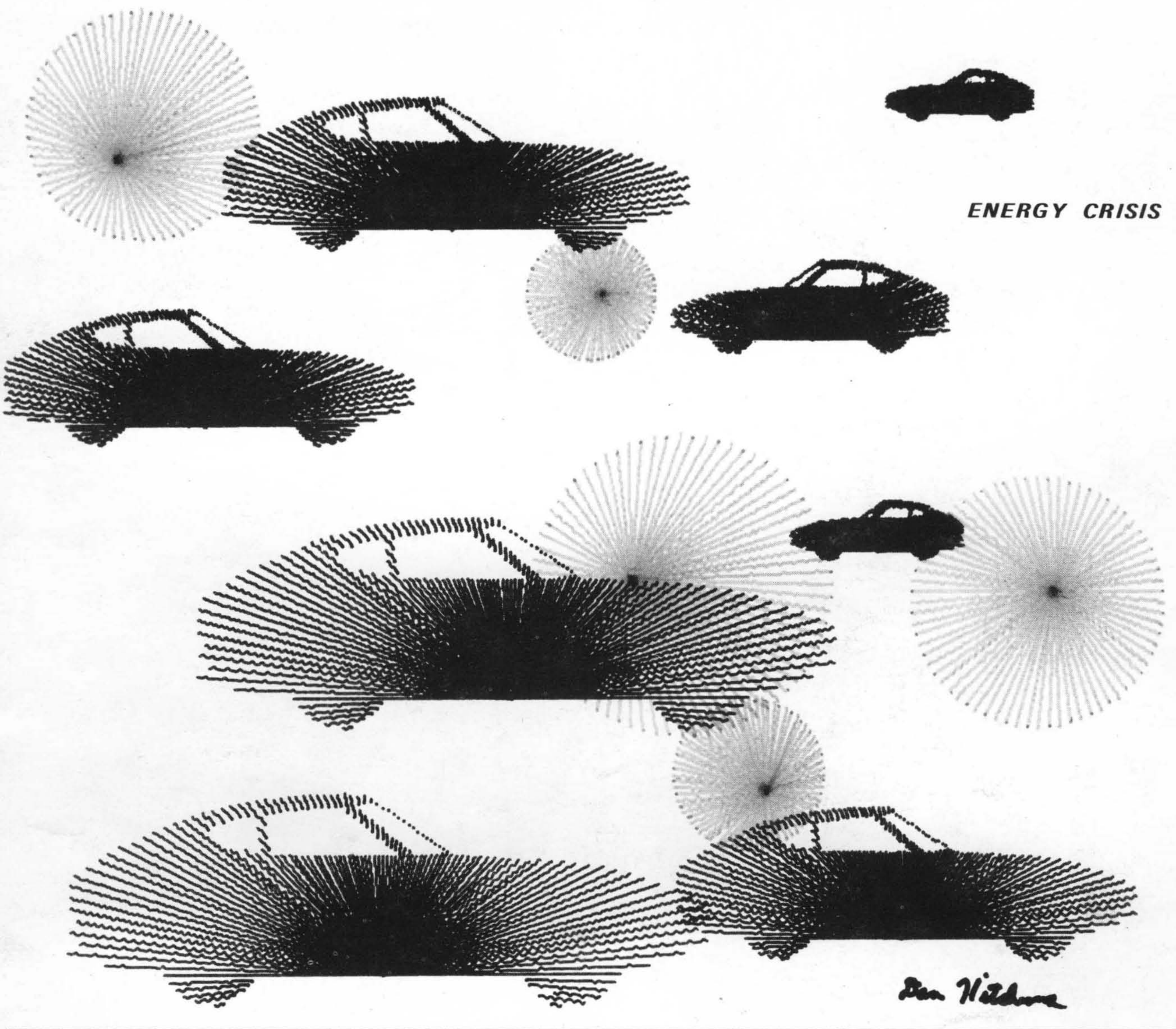

ENERGY CRISIS

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computers and people

formerly *Computers and Automation*

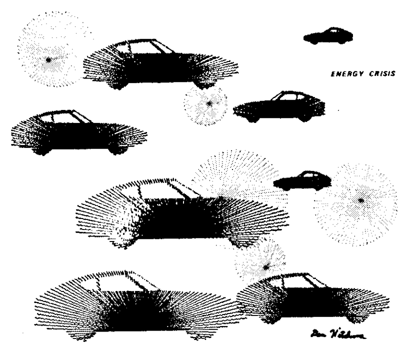
Computers and Programming

Computers and Management

Some Notes on the History and Development of Computers

Computers, Privacy, and Security

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.



Front Cover Picture

"Energy Crisis" is by Dan Hitchens, a senior in the Dept. of Computer Science at Calif. State Univ., Chico. This was produced as part of the work in a course in computer art taught by Grace C. Hertlein, Asst. Professor.

Departments

Key

[A] — Article
[C] — Monthly Column
[E] — Editorial
[F] — Forum
[G] — The Golden Trumpet
[R] — Reference

NOTICE

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EDITORIAL

From "Computers and Automation" to "Computers and People" — II

1. Names

When this magazine was first published in 1951, it was called "The Computing Machinery Field". That was a time when many people were still searching for a short name for "computers". The word "computer" at that time always implied a human being computing, and not a machine. The same view influenced the choice of name of the "Association for Computing Machinery".

In 1953 this magazine changed its name to "Computers and Automation," and has retained that name for twenty-one years. These years have seen great changes in "the computing machinery field," which has become "the computer field". A great deal of automation also has occurred, but computers and not automation have occupied the limelight of public attention.

2. Substance

A great many of the important technical computer problems of the last 21 years have been largely solved; a great many of the important social computer problems are very much unsolved.

For several years it has been evident that the most important field of unsolved problems related to computers is the field of the relations of computers to people. To name just a few of these problems:

- privacy and computers
- monopoly and computers
- crime and computers
- electronic warfare and computers
- medicine and computers
- traffic control and computers
- antiballistic missile systems and computers
- urban problems and computers
- the side effects of computers upon society
- the prevention of doomsday and the application of computers thereto

3. Policy

As we have said before, and will say many times again, we believe that the profession of information engineer includes not only competence in handling information using computers and other means but also a wide responsibility towards people, a professional and engineering responsibility. This includes making sure of:

- the reliability and social validity of the input data;
- the correctness of the processing; and
- the reliability and social validity of the output results.

In the same way, a bridge engineer takes a professional responsibility for the reliability and significance of the data he accepts and uses, and the safety and efficiency of the bridges he constructs on which human beings will cross chasms risking their lives.

Accordingly, as our readers know, we often publish articles and other information related to socially useful input and output of information systems. We seek to publish what is unsettling, disturbing, critical — but productive of thought and a better and safer earth for all humanity to live in — the fragile spaceship in which our children and future generations may have a future instead of facing extinction.

The professional information engineer needs to relate his engineering to the most important and most serious problems in the world today:

- war
- nuclear weapons
- pollution
- the population explosion
- the frightening economics of growth
- the energy crisis

  and much more

In fact, an especially serious and troublesome problem is systematic misrepresentation, deception, and lying by vested interests — a problem we focus on.

4. Name Change

In recognition of these facts and this policy, "Computers and Automation" with this issue changes its name to "Computers and People" — for short, "CAP" instead of "C&A". To change the name is reasonable and seems necessary and desirable.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

People and Computers

With this January issue the central subject to be covered in our magazine becomes "people and computers". This change of emphasis reflects a similar change of emphasis that has taken place in the entire field of computers and data processing.

For, the problems of manufacturing reliable, swift, and powerful computers and peripherals have been overcome. The problems of applying computers in more than two thousand applications have been largely solved. (In *The Computer Directory and Buyers' Guide* for 1973, we published an inventory of over 2400 applications of computers.) The expansion of the field of computers and data processing so that it will become the largest of industries is well on its way. In fact, there are more than 400 societies and associations of persons who are interested in computers and data processing.

But the problems of the relation of people to computers still require a great deal of investigation, study, and work. There are many large, unresolved issues involving computers and people. Here is a list of a few of them:

- data banks and privacy;
- computerized crime records and innocence;
- data banks and personal credit;
- "deafness" and "stupidity" by computerized systems to requests for correction (for four years, Xerox Corporation has failed to correct our billing address from 813 Washington St. to 815 Washington St.);
- the use of computers and other information technology to provide nuclear missiles with targets (the problem of uncontrolled nuclear armaments);

and much more.

One of the worst examples of trouble to people from computers is the computerized prison system of the Saigon regime in South Vietnam. In this system over 100,000 persons are imprisoned for political reasons, and many of them are being tortured. The costs of the prisons and of the giant IBM computers being used are paid for by the U.S. Government. This is an "information tyranny" such as alluded to by President James Wiesner of Mass. Institute of Technology in an article in the December issue of *Computers and Automation*.

Furthermore, this system is the prototype of the computerized police state being developed by the military industrial complex (MIC) of the United States, for installation in due course in at least a dozen countries of the world, where control by great American businesses (such as ITT in Chile) is threatened or can be threatened by indigenous groups, who as a matter of course are immediately labeled "socialist" or "Communist" or "Marxist". The logical final target of the MIC is the people of the United States, under such a slogan as "law and order".

If the computers of the Saigon regime are being maintained and serviced by Americans who are trained employees of IBM, and if those Americans have some human decency within them, they would refuse to maintain and service that computer system. Then it would die on the vine. Or they could sabotage it – by making several machine failures occur where there was only one machine failure before; or by putting bugs into the software, etc. The possibilities of nonviolent direct action against the computers of a police state are great. Reverend Martin Luther King, Jr., apostle of nonviolent protest, and Nobel Peace Prize winner, broke the law and was in jail in the United States more than 60 times, before being assassinated in Tennessee in 1968.

I have been told that Sigmund Freud, the founder of psychoanalysis, once said in answer to a question: "My purpose is to help people love, work, and play, and enjoy all of them."

In a similar way, the computer, I believe, can help a person work, can help a person play, and can often give him so much enjoyment that he can fall in love with the computer. In my own case, I have been in the computer field since 1939, and my own life has been made far richer, more exciting, and more interesting because of the computer. From time to time, perhaps I have even "fallen in love" with the computer: one item of evidence – in order to have access to a computer I have many times chosen to work at the computer from 4 a.m. to 7 a.m.

We hope that in the pages of *Computers and People* in the months to come, the rainbow of possibilities of work, play, and love contained within the computer can be made more real to many of our readers. For an example, under the heading of play, we have a game Naymandij described elsewhere in this issue. In days to come a minicomputer will cost much less than 10 cents an hour, and will give much more entertainment than a pinball machine.

But perhaps the greatest promise of all that computers offer to people is the possibility that the giant problems of human society may become solvable by computer. Problems such as the population explosion, the exhaustion of resources, the pollution of the earth, the limits to growth, are not solved well by sitting in an armchair and thinking about them. The chances of solving them using the resources of computers are much greater.

If I were part of the government of a country with an acute population problem, I would be happier if I could say to my constituents, "All the solutions are painful, but this particular solution, No. 606 from computer run 24, seems clearly to be the least painful. Therefore I recommend it."

Edmund C. Berkeley

Edmund C. Berkeley
Editor

The Railroads and Computer Control

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"The computer now seems to have moved the ultimate distance . . . to permit railroad management at any location to have detailed knowledge of what is happening in the operations, and to exercise — again through the computer — any amount of local control determined to be necessary."

The history of computerization in the railroad industry is relatively short; yet the accomplishments thus far have been rather substantial. All of us working in the industry in whatever capacity can take a great deal of justifiable pride in what has been done thus far. But it is more useful here to direct our attention to what may be ahead of us in this field.

Computer Exploitation by Railroads

Within our industry there are, I am convinced, a talented group of computer people whose qualifications are exceeded in no other private industry. There is reason to believe that these men — and women — can match their mountains, since there are still mountains ahead in meeting the need in our industry for computer exploitation. This need is unique when compared to any other business.

Our assembly or production line extends thousands of miles between thousands of separate origins and thousands of separate destinations of millions of shipments. Our raw materials include a vast array of diversified freight cars, locomotives and manpower, distributed across the thousands of miles of assembly line. It is, in short, a very complex system. More complex than the U.S. Postal Service? Yes, when you consider that the items we deal with can't be held in the hand or dropped through a slot like a letter or small package. The components of railroading are on a grand scale and must be dealt with by elaborate mechanical means from absolute origin to final destination. What better way, then, is available to us to control such a flow and deliver our product, which is dependable transportation service, than through the effective exploitation of computerization?

James W. Germany served in the Air Force for four years during World War II. But his career in the railroad field began in the Southern Pacific railroad as a yard clerk in Ennis, Texas, in 1941. He has been Train Dispatcher, Assistant Trainmaster, Trainmaster, and Senior Assistant Superintendant; Assistant to the General Manager; Manager, Specialized Operations, General Manager, System Management Services; and is now Vice President-Management Services — all with Southern Pacific. He has completed both the Stanford University Transportation Management Program and the Harvard University Advanced Management Program.

Based on a talk at the "Man of the Year" dinner held by "Modern Railroads" magazine, at the Western Railway Club, Chicago, April, 1973.

Changes in Railroad Control and Management

If we look back over the span of railroad history associated with our own work careers, we can see many changes that have occurred in railroad control and management. Each of the changes tends to have moved in the direction of providing better managerial control and service improvements over a larger geographic area. Our railroad operating divisions were originally established on the basis of the ability of the technology of that time to communicate control information to railroad management. The initial limitation was dictated by telegraph communications which, because of relay requirements, could only be transmitted on a timely basis for a short distance. Telephone communication gave us an expanded geographic area of operational control while at the same time improving the quality of control possible. This resulted in organizational changes that allowed consolidations with increased efficiency and reduced personnel. Data transmissions by teletype also increased our capability for managerial control over larger geographic areas.

The computer now seems to have moved the ultimate distance (in a short span of years) to permit railroad management at any location to have detailed knowledge of what is happening in the operations and to exercise — again through the computer — any amount of local control determined to be necessary. Thus the computer has provided the capability for the control of those raw materials of cars, locomotives and crews, while at the same time it has given us the tools to monitor over the entire assembly line the type of service we wish to provide. The computer quickly points out the weak spots in order that managerial skills and time will be more effectively devoted to them.

These tools now have been applied to most of the larger individual railroads of the United States, but we have fallen short in extending this wonderful capability beyond the separate corporate boundaries.

The Computer: A "Railroad Revolution"

This new computerization has been called a "railroad revolution". If in fact it is a revolution, the computer people of the industry are continually asking themselves why have we not moved further? Why have we not taken more ground in this revolution? We certainly have the power available in the current technology, and we have the guiding force available in our conceptual computer people.

Our ability to provide management information extends now beyond the capability of each individual company. Our internal accomplishments have been substantial in providing the necessary intra-company control. But, as earlier stated, our assembly line actually extends from origin to destination and not merely from origin to interchange. Our raw material is the car fleet of the entire United States, Canada and Mexico, not just the car fleets of our own individual companies. Technology has given us the ability to have our computers converse with one another to exchange those parts of information which are relevant to the control and monitoring of our complete origin-to-destination service. Computers have given us the ability to pass on in a timely fashion to our connecting carrier all that is necessary to move a shipment to destination.

Scheduling a Car From Origin to Destination

Technology has also given us the ability to accomplish these objectives without the necessity of each railroad originating its own information with regard to shipments. In fact, technology has given us the capability of moving cars from origin to destination without the necessity for having paper documents. Technology has given us the capability to distribute to each carrier his portion of the revenue, Technology has given us the capability to develop an entirely new method of interline accounting for the benefit of the entire industry and with sufficient audit trails to minimize manual rechecking. Technology has given us the ability to schedule a car — not just a train — from origin to destination. Many of us here could continue adding to this list of technically feasible improvements which now could be added to modern-day railroading.

The computer people daily view the railroad scene with the attitude of the late Senator Robert Kennedy when he said, "People see things as they are and ask why. I see things as they could be and ask why not." To the question of "Why not?" we in computerization today direct much of our time and thought.

Accomplishments within the industry on the individual railroad's problems to a large degree have been measured in terms of the cooperative effort between the computer technicians and the functional management of each department of the company. If this has occurred on individual railroads, the need seems now to be the same cooperative inter-relationship on a national level between the functional responsibilities and the computer technical people.

Beginning with Defining Problems and Priorities

This should begin with defining in detail the problems that the railroads face and the order of priority for the solution of those problems. Certainly there is adequate generalization on the interline railroad problems of today. But in my judgment there is an inadequate amount of, shall we say, "brain storming" among computer talented people and user departments, on exactly what should be done in what order.

To state it another way, industry goals and objectives must be set through efforts of computer people working with user representatives. Activities then must be directed toward those goals and objectives. It is the feeling of many in my business today that goals and objectives too often evolve from activities, rather than activities coming as a direct result of pursuing defined goals and objectives.

The Project Called "AAR Train II"

The current project called AAR* Train II — or as some have called it, "Son of Train" — is a move in the direction of securing interline car information to improve utilization of the national car fleet. This system, however, will not fulfill all of the requirements necessary for this industry to meet the demands of interline service improvements. Information provided by Train II offers us the potential to extend it to meet the requirements of the future. It's this extension that now needs the attention and cooperative effort of computer people and users to arrive at specific definition of goals.

Even in the application of Train II to car utilization, car service management and operating management must carefully review the capabilities that will be available under the Train II project to determine if changes in the rules governing car movement can effectively contribute to better utilization with the more timely and accurate reports available from the Train II project. It has been the experience of most individual railroad properties that when accurate, timely information is available, decision rules will change and will themselves offer substantial improvement. It is the view of many that the same will occur with car control under Train II.

* Association of American Railroads

Monitoring Service Interline

Although the control of the car fleet has paramount importance, we should not lose sight of the benefits that can follow an ability to monitor service interline. It certainly is technically feasible right now to measure service of shipments that have moved. Perhaps more important is the ability to develop schedules for shipments either before or at the time movement begins.

Much has been said and written about "Management by Exception", which certainly should be our goal in origin-to-destination car scheduling. It is not enough to know that a movement that has completed its journey failed to make its schedule. We must know as a car is moving whether it's moving on its committed schedule. To avoid burying operating personnel with paper, our car scheduling activities should report on an exception basis for cars that because of their movement pattern are forecast to miss connection unless some action is taken. A car scheduling system should contribute to the on-time performance of a car, and not just report that a certain car has not made its schedule.

Interline Data Exchange

Data exchange between carriers has been an item of discussion for many years. The benefits to be gained by the elimination of re-originating information for each car as it passes an interchange have long been realized. Our approach to a solution to the interline data exchange problem perhaps has been wrong. We have through the years devoted ourselves more to the technical aspects of developing code structures that can be associated with each bit of information, in order that these code structures may be universally accepted by all of our machines. While perhaps this is a necessary activity, the code structures in themselves are not the end goal or objective.

The need is for an industry dedication to exchange data that may very well dictate changes in the documents necessary for movement of a car from origin to destination. In fact, such dedication might very well be aimed at eliminating the documents that accompany the car. Certainly other railroads elsewhere in the world have been able to accomplish movement from origin to destination without the necessity of a paper document accompanying the car. It's the information shown on the document that allows our operating departments to accomplish the movement of the car, not the paper itself.

The paper document provided in the early days the only method of interline accounting; the need for it for that purpose may now have passed. While there are many problems associated with changing the present system to paperless car movement, the benefits are such that it should demand the attention of our most competent accounting, operating and computer people.

The Processing of Interline Data

Having addressed only a few of the problems associated with more effective interline activities, we now should look for a moment at how accomplishments might be attained.

There is no question but that the processing of interline information wherever performed will require large computer hardware. The capability of new hardware to process greater volumes of information at less cost per item processed continues to improve. The economics of the computer hardware itself does not seem to offer a major constraint to the type of interline system we would all like to see.

Every indication points to decreases in communications cost, which have in the past been the constraint upon a transfer of large amounts of data.

Computers now available or on the horizon place less constraint upon the application programming personnel themselves, which indicates some possible reduction in the programming costs for computer systems.

First: The Establishing of Goals and Priorities

The most important factor in arriving at the realization of an interline system meeting the requirements of the industry is the nature of that group of people who will establish the goals, objectives and timetable for a period of perhaps ten years, and such a plan should be submitted to the AAR Board of Directors for approval. Any plan, of course, must be annually updated, for our world continues to change at a rapid clip.

The problems faced by the railroad industry wherein computerization seems to offer the clear promise of large measures of improvement are such that this type of effort seems essential and should be supported by each and every company of the industry. The alternatives available to us are many and the resources in terms of our computer people, while very effective, are limited. Therefore, those resources should be directed to the things which have been agreed upon as holding greatest promise for the future. Computer activities should not just evolve and unfold, but they should come as a result of detailed planning on an industry basis.

For Railroads, Survival? or Renaissance?

In concluding, let me say that I have no status as railroad economist, lawyer, legislative advocate, rate specialist or public affairs strategist. I get the railroad news as most of us do, from newspapers and magazines. As I make my proposals for the future, I certainly am not unmindful of the near-term problems of a large part of our industry. Although I work for a company which fortunately has been able to make the kind of investment I advocate, I know that other good railroaders work for roads where the problem of the moment is survival as private enterprises and not the sophisticated information systems for tomorrow that are so much in my thoughts.

But, although the railroad news on page one is usually about the latest crisis to be faced and somehow passed, what I read on the inside pages and all I hear and observe convince me that we are headed toward a railroad renaissance in this country.

Factors Leading to Railroad Come-Back

The predicted growth of freight traffic; the inherent position of the railroads as the low-cost carrier; their increasing productivity; and their vast unused capacity; the rising costs of other modes; the saturation of the highway network and the growing public disenchantment with paving over more and more of the landscape and taking it off the tax rolls; the energy conservation, land conservation, the safety and anti-pollution advantages of the railroads; the good prospects for at last righting some of the ancient regulatory and competitive injustices — all of these factors, and more, tell us that the railroads have to get ready and be ready to reassert themselves once again as the dominant form of long-haul freight transportation in our country.

Preservation Today, Improvement Tomorrow, via Computers

We are going to preserve ourselves today so that we may improve ourselves tomorrow. So what I have been saying is not a case of "If I only had some chocolate I could make an ice cream sundae if I only had some ice cream."

My main proposition doesn't call for everyone to rush out and buy anything tonight. Yet I am convinced that all of us will be buying. What we buy for our information systems is going to help cut our costs dramatically while enabling us to give service that few ever dreamed. But this will only happen if we've planned on an interline basis what we need to buy as soon as we're able and exactly what we are going to do with it when we get it.

As an industry we can afford to plan right now. We can't afford not to plan.

Because, the railroads are coming back, and computers rightly used are one of the reasons why. ☐

Programming Considerations for Minicomputers

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"Minicomputers are becoming serious competition for the large computers. Several minis put together can outperform a large computer at a fraction of the hardware cost. But to accomplish this they need an operating system to make them work together."

The subject of this article is considerations for programming minicomputers. And the place to begin, it seems to me, is with a review of some history.

Some History of Software for the Big Computers

In 1951 Eckert-Mauchly Computer Corporation introduced the UNIVAC 1. It had a mercury delay line storage of 12,000 characters. In 1953 International Business Machines introduced the IBM 701. It had a Williams tube memory of the same number of characters. Both computers came with almost no software. The whole science of computer software had yet to be developed. And it was developed rather slowly over the next twenty years. Even the concepts of a symbolic assembly program or an operating system had to be developed.

The first operating system with which I worked required 256 words of memory. Even at that size, users complained that the operating system took too much memory.

When the IBM 360 was delivered, its software required 8 million lines of code.

The probability is good that in the next ten years operating software will grow in size by a factor of 10. Bugs that are in software of that size will be almost impossible to find because of the complexity of the software and because no one programmer, before he moves on, can become thoroughly familiar with all parts of the software.

Minicomputer Software

Now, minicomputer software is going through the same stages of development. Only, the development lags about 10 years behind the corresponding software on the big computers.

The first mini's that were delivered were delivered without software in order to keep costs down. The memory sizes corresponded to the memory sizes available on the UNIVAC 1 or IBM 701. The instruction sets were elementary on both sets of machines.

The main differences are that the early versions of the big computers were much slower and the hardware was much more expensive. This affects the computer's availability to the programmer. Today's minicomputer, because an employer can afford to give the programmer almost unlimited access to it, can be considered the programmer's toy. The programmer can work much more closely with the machine, and is allowed much more time at the computer console.

A minicomputer has the same intoxicating affect on a programmer as does a time sharing terminal. He can spend more time at the computer console than is wise.

Based on a talk before the Data Processing Management Association, Las Vegas, Nevada, October 1973

Another difference is that for operating system software for minicomputers we can draw on the experience gained on the big computers. And we don't need to invent the symbolic assembly program or invent the linkage editor. We only need to decide whether the idea will work on a minicomputer.

The Typical Mini

A few years ago you could define a typical mini. It would have been a computer with 6 or 8 very elementary instructions and about 4000 words of 16 bit memory. The instructions would be very basic, like: ADD, JUMP, STORE, INCREMENT, and TEST. A programmer who was accustomed to working with the big machines needed about one week working with the mini to get used to the fact that he needed to code two or three times as many instructions on the mini as he would code on a large computer. But he could afford to write all the extra instructions because the mini was his toy. He could sit next to the computer and take the time necessary to debug the additional instructions.

But, for the same reason that the mini is the programmer's toy, it is also the computer designer's toy. The computer designer could afford to try hardware innovations that would be too risky in a big computer. Consequently, we now have in the minicomputer field not only computers with very elementary instructions, but the following:

- a complete set of decimal and floating point arithmetic instructions making them equivalent to an IBM 370, for example;
- those with a general but higher level language built in, such as BASIC; and
- those whose instruction set is designed to one specific application, such as reading and writing magnetic tapes and printing the data read.

We also have some minicomputers that make the micro programming available to the user, so that if he is very clever, he can invent his own instruction set.

Despite this variation however, here we will discuss mostly the elementary mini, the one that has only 6 or 8 instructions.

Small Instruction Sets

Having a small instruction set isn't necessarily bad, when we consider that one of the biggest computers available, the Control Data 6600, has only as many instructions. They are instructions for doing floating point arithmetic and make a very fast and efficient machine for that kind of work.

Multiplication, division, and floating point arithmetic must be done by subroutine. These subroutines use the same techniques as were used back on the UNIVAC 1 and IBM 701 where programs were quite frequently run in interpretive mode.

Thus, what we are doing with the minicomputer software is repeating the development that took place on the big computers many years earlier. We hope we can do a better job the second time around.

Minimum Software

Just recently the mini manufacturers have been supplying the basic modules of software to their customers. Typically they have available:

- A symbolic assembler.
- A cross assembler that will assemble programs for a minicomputer on a big computer.
- A simple real time operating system.
- An elementary FORTRAN compiler.

What is missing, for the usual customer interested in business calculations, is a Report Generator, a COBOL compiler and a Linkage Editor. There is good reason for this of course. A COBOL compiler is difficult to write so that it will execute in the small memory available on some mini's. A linkage editor requires some kind of Mass Storage device and a Report Generator requires a printer.

Many mini's must operate with a minimum of input-output devices, or none.

A mini that is destined for some special application, for example, message forwarding, might be delivered with no peripheral devices. This creates problems in program preparation and debugging.

One Minicomputer Installation

For example, in one installation I worked on, the mini was delivered with only a five level paper tape reader and a typewriter. All of the mini manufacturer's software was available on eight-level paper tape so I had to start from nothing. I designed a loader program that would load from five-level paper tape. Then I punched it out by hand, character by character on a teletype machine, so that it would self-load into the mini computer. Finally I went to a big computer and wrote programs to convert from the eight-level paper tape to the five-level format we had chosen. All of the manufacturer's eight-level paper tapes were thus converted so I could use them.

This brought me face to face with a second problem. A program of any size would result in a roll of paper perhaps 5 inches in diameter. It could take 15 to 20 minutes just to read the paper tape. And the tape might get tangled and tear in the process. Also, debugging a program this size presented problems, primarily because a memory dump on the typewriter could take a half hour or more.

I solved both of these problems by arranging to transmit data over telephone lines to a big computer. Eventually, when we wanted to load a program we transmitted it from the big computer into the minicomputer. And when we wanted a memory dump we transmitted it from the mini to the big computer for printing.

Broader Range of Applications

Until very recently only very basic software has been available on the typical mini. This is because the mini manufacturer, in order to keep costs down, did not want to invest heavily in software. And the typical user in the beginning was scientifically inclined and didn't mind doing his own software. And many of the mini's had almost no peripheral gear anyway so the typical software products would not have worked very well. But this situation is going to change. Mini's now are suitable for a much broader range of applications than before.

In the past minicomputers have been used primarily for fixed applications. That is the computer had only one task to do and it worked at this task 24 hours a day. Typical of these applications are: process and machine control; telemetry and data acquisition; message switching; and front ends for large computers, and laboratory and engineering computations.

Most of these applications could be handled reasonably well with the minimum software.

Use of the Minicomputer in Small Businesses

The mini's capability and economy, however, should make it ideal for the data processing needs of small businesses. In retail stores for example, the mini could handle bookkeeping, inventory, credit inquiry, billing, payroll, etc. The cost would be less than the salary of one employee if it were unnecessary to hire a computer operator or a programmer. Yet we find few minicomputers in business applications.

The problem with mini's in business is a lack of suitable software. Just as with the big computers, programming costs are greater than hardware costs. The lack of a standard programming language makes it impractical to use a program on one mimicomputer that has been developed for another.

A few of the mini builders are coming out with business application packages. Basic Four, for example, is developing a complete family of business applications programs. Burroughs has a family of business machines which are controlled by minicomputers.

Several of the larger mini builders are spending money to develop the needed business software. They see the potential size of the business application market. They are beginning to realize that they cannot have a share of this market unless they invest in software designed for small businesses. DEC, Varian, Data General are all making efforts in this direction. Whether or not they can displace IBM computers in businesses where IBM got there 10 years earlier remains to be seen. But certainly in the smaller businesses that presently are not computerized, or that use outside services, they stand a good chance.

Use of Interconnected Minicomputers

So far, we have been thinking of applications where a single mimicomputer does the job. There are also situations where a bank of interconnected minicomputers should be used. Two situations are solved by this configuration:

- Where one application is to be installed in a number of locations, but the amount of computing work varies from location to location. An example might be credit reporting. In a small city a single mini could handle the work load. The same application in a larger city might use three or four mini's sharing the work load.

— Where high availability is a requirement. An example might be a reservation service. The traditional way to cover for computer outages is to install a duplicate computer. This causes a 100% increase in the cost of hardware. If the normal load is being shared between 3 mini computers, however, only 1 spare is needed, or a 33% increase in cost of hardware.

Where the two situations combine, in a case where the computer operations are vital to the continuation of business, a design with a bank of computers is especially desirable.

The main problem is that there is no standard software available either for the operating system or for the applications. Every application must be developed individually. We at Computer Sciences Corporation have had to reject more than one system design involving multiple minicomputers, merely because the customer required "standard" software.

Available Software

Looking through the list of available minicomputers you will find the following software:

1. A symbolic assembly program. This is the vital piece of software that is available on all minicomputers. Many of the special purpose applications can be developed using only an assembler to create the machine instructions and a loader to get them into the computer. But there was a time when most of the process control computers did not have even assemblers.
2. Real time monitor. The majority of mini's come with a real time monitor. But don't get the idea that this is anything like the batch operating systems you use on the big computers. The function of a real time monitor is to schedule short tasks for execution by programs that are already resident. As a consequence, they may handle I/O interrupts also.
3. Scientific Compiler. FORTRAN, BASIC, and small subsets of these. These are available on 40% of the mini's. While useful to the scientific and engineering users, they present a problem to the software developer. The compiler processing may require more core storage than is available on the smaller mini's. The object code needs floating point arithmetic, which usually must be simulated by subroutines.
4. Interpretive RPG's (Report Program Generators). These are available on about 20% of the mini's. They are easier to develop than a compiler; so they have been made available by the manufacturers that already have customers with Business Applications or those who hope to.
5. COBOL is available from 10% of makers of mini's. A COBOL compiler is a good deal more complex than a FORTRAN compiler; so the makers have even more difficulty fitting into the core storage available. CSC has developed QUIK COBOL as a solution to this problem.
6. Program Maintenance Software. Certain of the manufacturers, DEC for example, have extensive software for storing and updating of source programs, but this is rare. More often than not, all maintenance of programs must be done outside the computer, by hand. With program maintenance software, source programs can be altered on the computer and assembled, rather than requiring handling of cards or reels of paper tape with source code on them.
7. Often the software needed for program creation, assemblers and compilers, will be available on a large computer as a cross assembler or cross compiler. This solution is desirable when the mini is too small or lacks a fast card reader or printer. This arrangement is especially desirable when the mini is somehow a servant to the large computer, either as a front-end or as a remote concentrator.

Bewares . . . . !

Surprising as it may seem, not all programmers can handle the coding of a minicomputer. For some, the problem is training. If it can't be coded in FORTRAN or COBOL and requires coding in assembly language, many programmers are disqualified. And those that have been coding in assembly language need to get used to the more elementary instructions that are on the mini. With others, the problem is psychological. They associate glory and success with big computers and feel demoted when asked to work on a minicomputer. If the problem involves micro-coding, the field of qualified programmers is severely limited.

Speed is another problem. While most minicomputers are very fast, their input/output gear may be slow. Consequently it can take hours to assemble a program if the bottleneck is a paper tape reader or a typewriter. A result of this is that programmers will make patches rather than reassemble. And the result of that is that program listings get out of date and may lack good documentation. Memory dumps can be slow because of the typewriter, so a programmer will attempt to explore memory by keying in addresses at the console. He will form conclusions from the first suspicious data he finds and will be off and running with a new patch without having thoroughly investigated the problem.

A solution to the speed problem is the cross assembler or compiler on a large computer — but this approach is not always available.

Beware the purchase of a minicomputer based on hardware cost alone without considering cost of program development. Lack of adequate software for program development can offset any cost advantages.

Beware packaged application programs such as payroll or accounting. Such packages usually have about 80% of what you need, but you probably will have differences in your own business that require modification of the other 20%. This in turn means that you should have available a coding language, either assembly language or COBOL, to make the change. Even if a package satisfies your needs now, you are likely to have new requirements a year from now. It's like building a house with a slab floor; all wiring and plumbing must be right the first time. Alterations involve tearing the floor apart.

Allow for program modifications after the initial application is up and running. If this is a 24 hour operation it may require a separate computer just for the programmers. A program ceases to need modification only when it is no longer used.

Future Directions

Right now minicomputers are on the threshold of expansion into business-related applications. We have seen large point-of-sale systems installed in the past year, and expect to see more.

(please turn to page 22)

Efficient Application Software for Organizations: Ways To Get It

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Nearly all large and medium-sized organizations — government agencies, universities and profit-making enterprises — are becoming more and more dependent on computerized systems. But the development and maintenance of systems of application software have tended to remain unreasonably costly and frustratingly hard to control.

Only a few organizations can truthfully claim to be satisfied with their application systems activities. Within the others senior managers become more resentful and suspicious as target dates are missed, budgets are overrun, and new systems fall short of expectations.

Centralization vs. Decentralization

From time to time management, its patience exhausted, is driven to changing the organization or the environment in the hope of gaining the level of control over application development and maintenance that exists (or is thought to exist) in other areas of the organization. Judging from the popular actions, the choices are far from clear:

- If programming and systems analysis have been integrated, they can be split apart in an attempt to clarify interfaces and impose discipline; if they have been separated, they can be integrated in the interest of easier communications.

- If programmers and systems analysts are scattered among user departments in various locations, they can be centralized for tighter control and more flexible manpower allocation; if they are already centralized, they can be moved out into the field for the sake of better responsiveness and closer identification with the user's needs.

- If individual programmers have been free within broad limits to solve problems in any way they please, a program of rigid technical standards and project controls can be instituted, in an attempt to eliminate vagueness and impose work standards; if the environment is already highly structured, it can be relaxed in the interest of "getting the job done."

Although claims of success ranging from moderate to sensational are frequently made for various combinations of these and other alternatives, the improvements are less often due to the merits of the choices than to the stimulating effect of change itself. After a period of zealous activity, confident proclamations of success and, if necessary, allocation of blame for any unpleasant problems to a previous, possibly departed regime, the application systems and programming function generally settles back to a comfortable level of mediocrity; and life goes on much as before. We have to conclude that these choices, important as they may be, are somehow not getting at the heart of the problem.

The Fundamental Choice

In the midst of this gloomy picture, we find a few organizations, perhaps several dozen, in which schedules and budgets are met more often than not and management is generally satisfied with the cost and responsiveness of application development and maintenance. Some of these organizations are small software development firms with a dozen programmers; others are major corporations with multi-million dollar data processing budgets. Although the detailed approaches have evolved differently to fit the size and management style of each organization, one common thread runs through all of these success stories — professionalism.

The term "professionalism," as applied to data processing, has been greatly overworked for years and remains somewhat vaguely defined to most people. In this discussion, I shall explain just what this term should mean to the senior manager and why the choice between a professional approach and a nonprofessional approach is the single fundamental decision in establishing an effective application system function.

Before I begin, let me explain that I do not necessarily advocate a professional approach for every organization. Professionalism can be difficult to achieve, and in those organizations that don't really need the results it provides, managers can legitimately adjust their expectations and choose the non-professional approach.

Professionalism in application systems development has two main ingredients: professional people and a professional environment. Neither is obtained, as many companies have discovered, just by paying top salaries, by hiring famous data processing personalities or by having superficial trappings like weekly seminars, journal subscriptions, flexible working hours and bearded programmers. Neither provides much benefit without the other.

Professional People

A professional staff is built by hiring outsiders who are already fully qualified and by training those who have a basic aptitude. The intangible and hard-to-measure nature of programming and system design, combined with inflated statements in resumes and interviews, makes the selection of competent people, especially at the senior level, a formidably

Based on a talk at a conference on "Senior Management and the Data Processing Function", held by the Conference Board, New York, November, 1973.

"A BYPRODUCT OF MODULARITY IS GENERALITY. WHEN PROGRAM FUNCTIONS AND DATA DEFINITIONS ARE PROPERLY ISOLATED, WE FIND THAT MANY PROGRAM MODULES CAN BE USED AGAIN IN OTHER PROGRAMS AND PROJECTS."

difficult task. The most valuable professional you can have on your staff at the beginning is the one who can reliably recognize talent and achievement in others.

Since another session is examining the general area of data processing personnel, I will just list without going into detail some of the qualifications and characteristics we must look for at all levels. A professional engaged in programming, system design or first-level management must:

1. Be precise and logical in thought and in oral and written communication.
2. Be creative and eager to learn new techniques, no matter how much he already knows.
3. Abhor redundant or repetitious activity for himself and others.
4. Be aware of the major historical and current trends and issues in the data processing field.
5. Work effectively with colleagues without jealousy or sensitivity.
6. Exercise sound judgment, consistent with his age and experience, in the true interest of his employer.

The Professional Environment

A professional environment supports the professional staff by maximizing the effect of their special skills and abilities and by minimizing redundant or duplicate activity. Prerequisite to a professional environment is a firm management commitment to disciplined, orderly planning and activity. If we expect our professionals to comply with project control procedures, documentation requirements and technical standards, we cannot constantly be changing the rules and shifting priorities in response to every little problem. Managers and data processing professionals must share a sincere belief that these disciplines have practical benefits even, or especially, during emergency or high-pressure situations. In some organizations management and the professional staff have come to respect each other and to trust each other to perform consistently within the disciplined structure.

Redundant Programming

It has been estimated that at least 80% of the programming being done today is redundant. Within a single typical large company or even a single large application project, a majority of the lines of program code are concerned only with solving problems that have already been solved over and over in that company or project. Eventually such an organization will have a huge inventory of programs containing dozens or hundreds of versions of virtually every program function, written in a variety of styles, with varying efficiency, and documentation ranging from the nonexistent to the overwhelmingly massive. Think of what this means to you as managers:

- You are paying several times too much and wait far too long for every new application. Consequently, you are probably passing up opportunities for more sophisticated uses of computer systems in running your business.
- Seemingly simple maintenance changes you ask for in existing systems sometimes drag on for weeks and months as one programmer attempts to decipher the work of another.
- When a new or modified program is finally installed in production, it is many times more likely to contain residual bugs that were not caught during formal testing than it should be. The consequences of the resulting operational unreliability are varied and sometimes devastating. They sometimes make amusing stories when they happen to other companies.

Modular Programming

Clearly, one of the major objectives of a professional environment must be the reduction of redundancy.

The first element of such an environment is a methodology for program and file design based on modular organization. "Modularity" is another overworked word; most data processing organizations claim to practice it at some level, but only a few know what it really means. A newer term now in vogue, "structured programming," describes true modularity with the addition of a few specialized rules. Modular organization, as practiced in the real professional environment, means that:

1. Every attribute or parameter of the application or of the computer environment is defined in only one place in the program. Such a program is sometimes said to be highly "parameterized".
2. Each module (section. block, subroutine, etc.) of the program performs one well-defined program function, and only one.
3. Modules depend upon each other only through explicitly defined interfaces.

A program that is not modular is called "monolithic".

Generality

A by-product of modularity is generality. When program functions and data definitions are properly isolated, we find that many program modules can be used again in other programs and projects. In order to exploit this we must establish, as the second element of our professional environment, a module library for storing and distributing modules. This library must be carefully controlled and supported to assure that:

1. A programmer can find out if a particular kind of module exists, obtain a copy of it and learn how to set up his interfaces more easily and quickly than he could develop a comparable module himself. This demands thorough indexing, efficient distribution, and clear documentation.
2. Programmers and programming managers throughout the organization must be strongly encouraged to contribute useful new modules.
3. Quality control must assure the accuracy and completeness of contributed programs and documentation.

Occasionally, I hear someone from a nonprofessional, monolithic programming background assert that modular generality applies more to "scientific" or "engineering" applications that it does to "business", or "commercial" applications which are unique and don't lend themselves to generalization. This is utter nonsense that has been totally disproved in actual practice. If anything, business applications provide more opportunities for useful generalization than do scientific ones.

Programming Standards

The third element is a set of programming standards. Professionals will naturally tend toward modular organization, but their contributions to the library, good as they are in themselves, will be useful to others only if the specified interfaces are sufficiently compatible with one another. Among the specific areas these standards should cover are:

- Programming language
- Data representation
- File organization
- Programming techniques (for example, data validation, error handling, table construction).

We now see that the question of whether to adopt a uniform methodology or pluralistic methodologies for software development was answered when the choice was made between a professional and a nonprofessional approach. A highly uniform approach is inevitable in the true professional organization; it is hardly relevant in the nonprofessional one.

The Welcoming of Standards

One might at first worry that the professional staff will resent the "imposition" of standards as inhibiting their creativity and object to a library of pre-written programs as "taking the fun out of programming." This fear is groundless. No true professional finds satisfaction in doing the same sort of thing over and over year after year. There are so many really interesting new problems to solve, that our professionals will welcome these standards as a relief from trivia. I recommend Professor Gerald Weinberg's book, The Psychology of Computer Programming,* for anyone interested in exploring this subject more deeply. It is highly perceptive, short, generally nontechnical and very readable.

When your organization moves from a nonprofessional to a professional environment you must deal with the upgrading of your existing staff to professional status. You must begin by facing the unpleasant fact that there will be some who just don't have the aptitude to survive in the new environment. An inability to organize one's thoughts logically, to recognize abstract patterns in concrete problems and to simplify a messy problem might be inconspicuous in a mediocre, nonprofessional environment, but it is totally exposed in a professional environment that demands teamwork. For the others, you will probably want to set up a series of orientation seminars conducted by a top-notch professional with plenty of examples and required homework. (I'm sorry to report that I know of no completely satisfactory textbook or packaged course in this area.) Out of a dozen people, one or two might turn out to be leaders and innovators under the new methodology: nine will probably learn to apply it effectively, and one or two of them will be only their heads. You will have to face human-relations problems, salary adjustments and organizational disruption, to achieve the transition.

Peripheral to a successful professional environment are the essential support functions. Secretarial services and keypunching must be available and sufficiently responsive so that professionals don't have to spend much time on clerical activity. Computer turnaround time for testing should be given as high a priority as normal production. The physical environment should permit extended concentration. Professor Weinberg's book addresses this area thoroughly.

Conclusions

An organization that adopts a fully professional approach to application software development can expect enormous improvements in productivity and responsiveness of the programming function and a resulting ability either to reduce costs or pursue more advanced application systems. When all the factors are added together and after the module library has been built up, these improvements may be as great as a factor of ten; i.e., five programmers can do the work of 50.

In spite of these seemingly overwhelming advantages, the professional approach to application software development may not be appropriate for your organization. Among the considerations that might lead you to a deliberate commitment to nonprofessionalism are:

1. Your organization cannot afford the initial investment in standards development, library mechanism and training.
2. Your organization is too small to affort the continuing overhead for library management and publication and distribution of standards manuals, etc.
3. The expected variety of applications is too limited to attract and hold a professional staff.
4. You are constrained by inflexible salary policies.
5. You are stuck with a large number of people whom you suspect cannot be upgraded.

I have no rule of thumb on organization size; I know of large and small organizations that have achieved thorough professionalism as well as large and small organizations that wouldn't have a chance.

If you find you can't commit your organization to a professional approach, but are unwilling to accept the level of mediocrity that comes with nonprofessionalism, you may want to consider getting out of the business of developing your own software altogether. The growing availability of packaged application software products and custom programming services offers an attractive alternative.

I hope many organizations will choose the path of professionalism. It's not easy to get there, but the rewards can vastly outweigh the initial cost and trouble. □

*Weinberg, Gerald. *The Psychology of Computer Programming.* New York: Van Nostrand-Reinhold Co., 1971.

A Fountain of Electrical Engineering

Dr. Julius A. Stratton
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"I HAVE UTTER CONFIDENCE THAT WONDERFUL OPPORTUNITIES LIE AHEAD, AND THAT THEY WILL BE PURSUED WITH THE SAME VIGOROUS AND CREATIVE SPIRIT THAT HAS MARKED THE PAST."

The Emergence of Electrical Engineering

In 1882, on another campus across the Charles River in Copley Square, Boston, electrical engineering first emerged at "Boston Tech" as an option in physics. Soon after the turn of the century this field became a department in its own right.

In those early days the field was in rapid transition, moving forward from a preoccupation with theory and esoteric experiments in the laboratory to practical application. The theoretical groundwork had been laid by such pioneers as Faraday, Maxwell, and Thomson. Now the time had come to convert those ideas to a wealth of useful technology.

Dr. Julius A. Stratton was President of Mass. Inst. of Technology from 1959 to 1966, and Chairman of the Board of the Ford Foundation from 1966 to 1971. He joined the MIT Faculty in the Department of Electrical Engineering in 1928, and subsequently became Professor of Physics, Director of the Research Laboratory of Electronics, Provost, Vice President, Chancellor, President, and President Emeritus. He has held numerous governmental offices, is a member of many scientific societies, holds four medals and certificates of merit and distinction, and has many honorary degrees. He is the author of two books, the second one being "Science and the Educated Man," published by The MIT Press in 1966.

Based on a talk at the dedication of the new Sherman Fairchild Building at Massachusetts Institute of Technology, October 5, 1973.

The telegraph had become a practical reality. The Atlantic cable was at last a success. Only in 1879 had Thomas Edison demonstrated his first incandescent lamp. The first long-distance telephone conversation had taken place, and early in 1881 President Rogers approved an expenditure of $150 for the installation of 15 telephones to connect the various rooms within the Institute. Attention was turning increasingly to the design of dynamos, of motors, of railroad signals — and even in that Victorian era, there appears to have been a lively interest in the new outlook for burglar alarms!

Intensely Practical Work

This was an intensely practical period. There was little time at Tech for abstract thought and theory. For looming on the horizon was a vast array of new possibilities for useful engineering — of ways to apply this unique force of nature — electricity — to the generation of heat and light and power, for transportation and communication, and to the material needs of the people of a growing nation. Our instruction, the interests of our faculty, and the careers of our graduates were closely linked with the forward movement of a rapidly expanding industry.

The curricula of those days reveal very clearly the highly pragmatic spirit and approach which dominated much if not all of M.I.T. Undergraduates majoring in physics took mechanical drawing as well as applied mechanics. The electricals added carpentry and metal turning. How well I remember my own introduction, some forty years later, to that course in "Vise and Bench Work," and to the making of molds and the pouring of metal in the foundry over on Vassar Street in Cambridge. This was truly learning by doing — learning to understand the art as well as the science of engineering and the practice of industry, learning how mind and hand and machine can work usefully together. Never have I regretted that experience.

Shortage of Space

Certainly the Department was finely tuned to the needs of the times. It grew and prospered. Inevitably there arose the usual shortage of space, and in May of 1901 the Executive Committee recommended to the Corporation "the construction of a building for Electrical Engineering at a cost not exceeding $170,000 for the building and $100,000 for equipment". From this decision, and with this outlay of funds, there came into being on Trinity Place, in the words of President Pritchett, "one of the most perfect and at the same time one of the most practical electrical laboratories in the world".

Over the two ensuing decades, until well after the First World War, there was but little change in the basic character of this Department. Voltages climbed higher and currents grew heavier, but the focus of interest remained in power station design, power transmission, lighting, railroads, and telephony.

Analog Computers, Feedback, etc.

Not until the twenties did a new era set in. Then a young generation of highly creative innovators — young men of great vision — came onto the scene — Vannevar Bush, Edward Bowles, Ernst Guillemin, Harold Hazen, Harold Edgerton — to name but a few. Through their ideas and efforts — with the encouragement and strong commitment of Dugald C. Jackson — pioneering advances were achieved in the development of analog computers, of feedback circuits and servomechanisms, of new modes and means of communication, and of a diversity of new tools for science and industry. As never before, there was a recognition of the import of research for the advancement of engineering.

Twenty years later, at the outset of World War II, it was this preeminence on the foremost frontiers of electrical engineering that made M.I.T. the logical place for the establishment of the Radiation Laboratory. This massive and highly successful effort was to lead in turn to the creation in 1946 of the Research Laboratory of Electronics. It was my own great good fortune to be deeply involved in the beginnings of R.L.E.

Enlightened Sponsorship

A few days ago I had an opportunity for my first thorough visit to that Laboratory in many years. And I can't begin to report how exciting I found that experience — the tremendous advances that have taken place in a field that I once knew well — the enthusiasm that was apparent on every side. I came away profoundly impressed. Nor can I let this occasion pass without paying tribute to the three sponsors who made R.L.E. possible — the Office of Naval Research, the U.S. Army Signal Corps, and the U.S. Army Air Force. They not only provided the essential initial funds, but assured us also of the complete freedom of action that is imperative for an academic undertaking of this kind.

For like reasons — under the leadership of Gordon Brown — the Servomechanisms Laboratory — now the Electronic Systems Laboratory — came into being. And from these same roots other laboratories and projects — some interdepartmental in character — have grown and flourished.

These few highlights emphasize the enormity of progress, of change, and accomplishment since 1882. Many know this story more intimately than I, for it has been and still is a central part of their lives and professional careers. One day soon I hope we may all have an opportunity to read the whole of this absorbing story. For our colleague Karl Wildes, whom I am proud to claim as my teacher of many years ago, is devoting an immense amount of time and thought to a complete account of the beginnings and the growth of this great Department and the people who have made it so.

The New Domain of Electrical Engineering

The generation of power, the conversion of energy, the transmission of intelligence — all these traditional concerns still challenge the ingenuity of the engineer. But today the domain of electrical engineering is one of the most awesome dimensions — reaching out into countless new fields, penetrating into a multitude of once isolated disciplines. One need only scan the subjects in the catalogue: courses on semi-conductors, on the solid-state technology that has brought about a revolution in circuitry and in the size and weight of so many devices, on digital systems, and the new mathematics that underlies the modern computer. These developments in turn have generated studies in linguistics, as well as research on the synthesis of speech and artificial intelligence. Bioelectronics and bioelectric engineering reveal the growing ties with medicine. And the study of plasma dynamics is taking on even greater importance with the brighter prospects for the controlled release of energy by the process of nuclear fusion.

This is but a bare sampling. Yet surely it is evidence of tremendous vitality and power of innovation — a record in which our Department and the associated laboratories have every reason to take pride.

The Philosophy of Engineering Education

But beyond these tangible achievements — and indeed at their very source — it is this Department's philosophy of engineering education and the practice of it in the setting of this institution that merit the highest distinction.

I speak first of the special relation of teacher to student. As long as I can remember, the Department of Electrical Engineering at M.I.T. has shown an overriding concern for the interests and progress of its students. This concern is manifest in the extent to which the senior members of the faculty participate in both the teaching of basic subjects and the counseling of undergraduates — manifest, too, in all that one hears about the seriousness with which teaching responsibilities are pursued. It is even more striking in the degree to which teaching and research are intermixed. These great laboratories are by no means isolated sanctuaries for the sole benefit of a few of our most gifted faculty. The students are there — both undergraduate and graduate — learning and experimenting, in close association with their teachers — encouraged to initiate investigations of their own choosing. Indeed, many of the technological breakthroughs to which I referred earlier were the product of the collaborative efforts of professors and students.

The graduate of M.I.T. may choose among a wide variety of careers — some continuing in academic life, a few turning to professions only marginally related to science and engineering, the majority moving on to industry, business, or government.

The Environment of a Working Laboratory

But wherever the career of a graduate may lead, an experience of research in the environment of a working laboratory contributes an invaluable element of preparation and background — the more so at a time when so much of formal learning tends to become increasingly abstract and mathematical. It constitutes our modern version of learning by doing — the opportunity to observe a physical process at first hand, the reality beyond the text. And hopefully it is an experience that sets in motion an enduring spirit of questioning, the habit of constantly asking, "How can we do this better?"

(please turn to page 22)

NAYMANDIJ: A Game for Computers and People

Edmund C. Berkeley, Editor
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"If, in an array of 200 digits, any one of the digits 0 to 9 appears less than 10 times or more than 30 times, there is a good chance that Nature's 'monkeying' had something to do with the anomaly."

1. Letter from Karen Hansen

Not long ago we received the following letter from Karen Hansen, Alfred University, Alfred, N.Y.:

> I am currently taking a computer course. One of our assignments is to find a game that can be put into a computer.
>
> I found your Zoonayman Game in the September issue of "Computers and Automation". I really enjoyed it very much.
>
> Would it be possible for our school to have a copy of the program for your game? We would greatly appreciate it and enjoy it!!
>
> If it is possible, please send a copy of the program to me.
>
> Thank you very much.

2. The Game Zoonayman with Dice: Puzzle 1

First, a word of explanation for those readers who did not see the September article, or whose recollection of it is not vivid.

To play Zoonayman, 60 dice are thrown at random. Then one player, called Nature, makes a modification of the throw (a modification that is permitted by the "Rules of the Game" — see pages 39 to 43 of the September 1973 issue of "Computers and Automation"). During this modification the other player (called Man) has to keep his eyes shut so that he does not see how Nature modifies the throw.

Edmund C. Berkeley, editor of "Computers and People," formerly "Computers and Automation," took part in building and operating the first automatic computers, the Mark I and II at Harvard University in 1944-45; in 1965-67 he implemented the programming language LISP for the DEC PDP-9 computer. He is: a founder of the Association for Computing Machinery; its secretary 1947-53; the author of fourteen books on computers and other subjects; a Fellow of the Society of Actuaries; and an invited lecturer on computers in the United States, Canada, England, Japan, the Soviet Union, and Australia. He graduated from Harvard College in 1930, A.B. summa cum laude.

Then Man opens his eyes, and is faced with the puzzle:

> What did Nature do? what is Nature's rule?

The rule for Nature's modification must be expressible in not more than four English words.

For example, look at Zoonayman Puzzle 1. Examine the throw of dice and see if you can figure out the rule that Nature used for making a systematic departure from the randomness resulting from the throw. (For the solution, see the end of this article.)

3. Response from the Editor: Puzzle 741-1

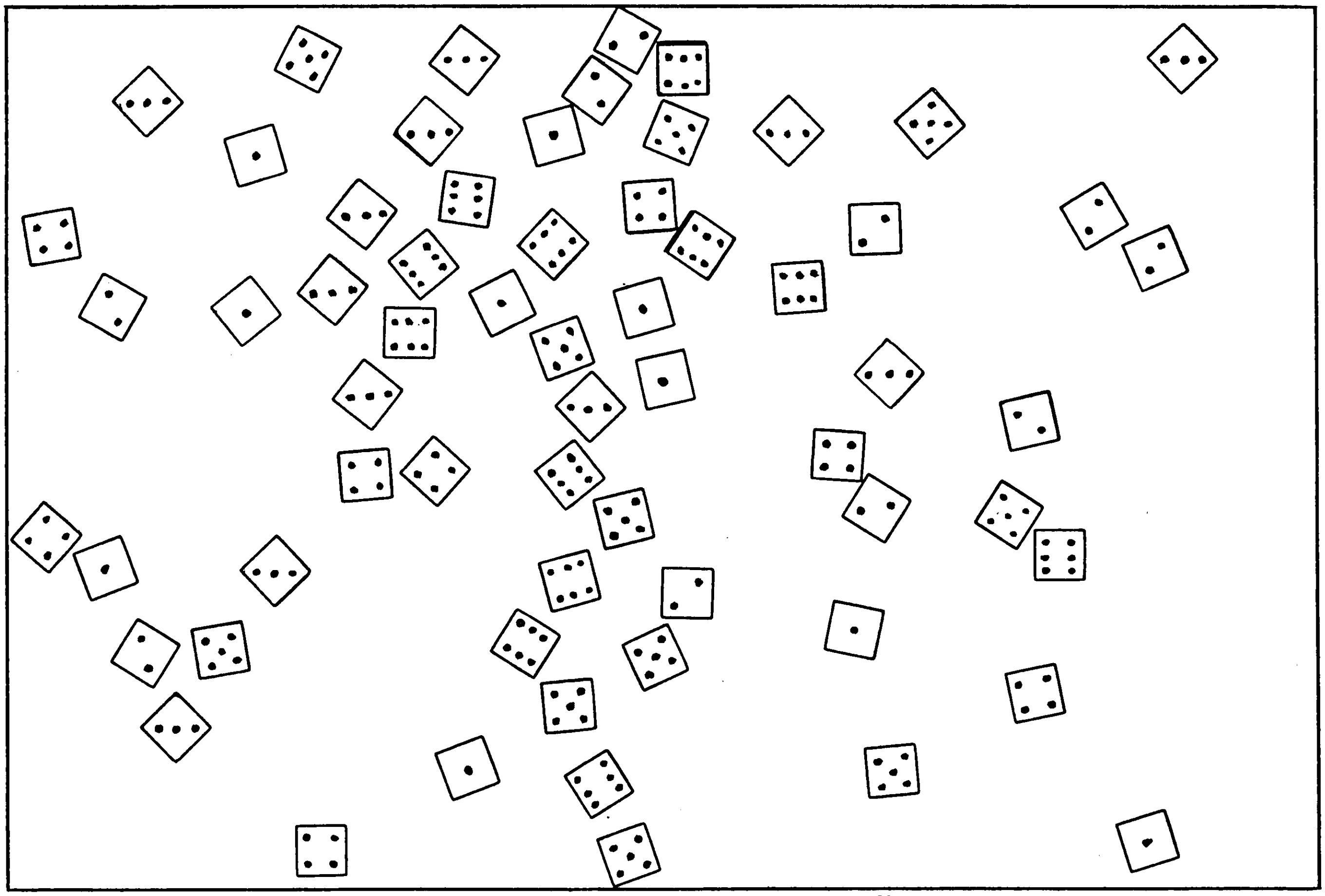
We replied to Karen Hansen as follows:

Thank you for your letter. We are glad you enjoyed Zoonayman.

The paragraph that occurs in the article about putting this game on a computer is:

> This kind of game can easily be programmed on a computer using a pseudo-random number generator. The program should determine the location, the orientation, and the outcome of the die. Then a computer program or a person or both together can make Nature's move. There appear to be some 30 to 40 interesting operations that can be expressed with one English verb; then the remaining three words of Nature's rule can express arguments or modifications for the operation.

We have not so far tried to program this game for any computer at this time. All we said is that it should be easy to program it for a computer using a pseudorandom number generator.



Zoonayman Puzzle 1 — A throw of dice plus a move by Nature

The program would greatly depend on what kind of output you have from your computer. If you have a graphic display, you would have to make a program that: (1) would show the square outline of a die; (2) insert into the square outline the positions of the dots.

It would be much easier to have a different but equivalent random number output on a teletype, and to tell Nature what particular kind of nonrandom behavior to insert.

For example, I enclose a copy of 200 random digits, except that I have given effect to a modification by a rule of "Nature" which can be expressed in four English words. See Naymandij Puzzle 741-1. Can you discover my rule of Nature?

Naymandij Puzzle 741-1

9	0	1	3	4	5	7	3	5	8	3	4	7	3	0	1	8	8	8	0
1	4	0	9	6	3	2	8	3	4	3	7	3	7	3	5	4	1	9	5
7	3	7	3	0	2	4	3	1	4	1	2	6	9	9	0	7	3	6	6
4	7	3	2	4	5	5	5	6	5	3	8	2	4	9	5	4	0	0	7
9	7	3	7	3	3	3	0	4	3	6	9	2	2	5	9	9	5	8	2
6	5	2	3	6	3	9	8	4	8	5	6	7	3	2	6	3	3	0	3
2	2	8	3	0	0	6	8	2	1	0	7	3	7	3	1	7	3	6	4
1	9	0	5	8	1	3	2	5	0	9	0	0	3	5	4	8	7	3	2
5	3	5	7	3	8	7	3	3	4	0	3	6	4	3	3	8	5	8	8
0	3	8	1	2	7	3	4	4	3	4	5	7	3	2	6	1	9	2	5

Question: How did "Nature" modify the set of 200 random digits?

At time of going to press, no reply had yet come.

4. The Game Zoonayman with Random Digits: NAYMANDIJ

Let's call the game Zoonayman when played with random digits instead of dice, "Naymandij" ("nay" from "Nature"; "man" from "Man"; and "dij" from "digits").

Now when playing with random digits instead of randomly thrown dice, we do not have position, or orientation, or several other factors, to maneuver. We have instead a scarcity of information with these mental objects as compared with a set of physical objects. So let us increase the number of items to be examined from 60 (a useful number of dice) to 200 (a useful number of random digits). Then each digit from 0 to 9 will on the average appear 20 times. Using a statistical rule which here applies, there is a 95% chance that the actual number of appearances of any digit will range from 11 to 29. And if in an array of 200 digits any digit appears less than 10 times or 30 or more times, there is a good chance that Nature's "monkeying" had something to do with the anomaly.

5. Rules for Naymandij Played by Two Persons

What would the game Zoonayman — now named "Naymandij" — become if it were played with random digits instead of a throw of dice?

There are two cases: (A) the game between two persons; and (B) the game between a person and a computer.

The rules for Case A would be as follows:

Rule 1. There are two players, whom we shall call Nature and Man. The game consists of a number of rounds, each of which results in a score for the two players.

Rule 2. In each round Nature plays first. Nature gathers and presents 200 random digits from 0 to 9, in an array 20 across and 10 down. (A person cannot "think up" 200 random digits; instead, they have to be obtained from a table of random digits or from some other source of random or pseudo-random digits.)

Rule 3. With Man's eyes still shut, Nature then performs what is called a Definite Systematic Operation which has the following properties:

a. The operation must be performed on all the digits of a definite class which can be designated; for example, "all central 6's".
b. The entire operation has to be expressible in not more than four English words. For example, "Replace 1's by 7's".
c. The operation must produce a result that displays some kind of evident, systematic, rational order and completely removes some kind of randomness.
d. The operation must change at least 6 digits from their original random value.
e. The value and the position of all digits not in that definite class must remain unchanged.

Rule 4. Nature writes the expression of this operation on a slip of paper and folds it up so that what Nature wrote cannot be seen.

There is now a cross-classification of interesting possibilities:

(a) The operation that Nature chose may be allowed or not allowed according to the rules.
(b) Nature's description of the operation in words may be correct or not.
(c) Nature's carrying out of the operation may be correct or not.

Rule 5. It is now Man's turn, and Man can open his eyes. Man must figure out what Nature did.

Man studies what he sees in front of him, and asks himself questions, such as: "What is the number of 1's? Is this number usual? Where are they located? Are the locations apparently random? How are they arranged? Is the arrangement apparently random? What is the number of 2's?" and so on.

Finally, Man notices, we suppose, that something is not usual, something is not random, and so he describes what he notices, what appears to be Nature's operation. He writes his rule on a slip of paper; but he does not have to express Nature's operation in four words or less — only Nature has to.

If after a reasonable time, like three to five minutes, depending on agreement, Man cannot decide what Nature did, then he says he gives up — but he does not necessarily score zero because Nature may be penalized for making mistakes.

Rule 6. Now the two players, Nature and Man, compare the rules which they have written down on slips of paper. There are several cases:

a. If Man figures out what Nature actually did, he scores 2 points.
b. If Man did not figure out what Nature actually did, but he figures out Nature's rule, he scores 2 points.
c. If Nature did not actually do what Nature's rule required, Man scores 1 point as penalty.
d. If what Nature actually did was a disallowed operation, Man scores 1 point as penalty.
e. If Nature's rule described an allowed operation, and what Nature did is in agreement with Nature's rule, and if Man did not figure it out, then Nature scores 2 points, and Man scores 0.

6. Naymandij Played by a Person with a Computer

Case B is the same game played between a person and a computer.

Here the role of Nature is carried out by a computer program, and Man interacts with a terminal. What Nature does is:

— compute 200 pseudo-random digits;
— store them in a buffer;
— internally select (maybe at random) some subprogram for an operation expressible in not more than four English words;
— perform that operation correctly on the digits stored in the buffer; and then
— print out at the terminal the resulting 200 digits.

Man no longer needs to keep his eyes shut during part of a round. And since the probability of Nature making a mistake is now negligible, the rules simplify in obvious ways.

The puzzle, printed on paper by the computer terminal, is now in final complete form. In the next section of the article are 5 sample puzzles of Naymandij.

A programmer in the role of Nature can apply his ingenuity in making neat little subprograms that can be called and will perform various "definite systematic operations" on certain parts of the set of 200 random numbers. Of course, they ought to be operations such that most human beings can guess the rule that Nature used without too much trouble. Too difficult is no fun.

In addition, a programmer in the role of Man, can apply his ingenuity in making neat little subprograms that will enable him to quickly analyze the puzzle without doing much hard work. For example, he should be able to ask the computer for a report on the frequency distribution of digits in the puzzle as a whole, by row, by column, and by other arrangements, etc., such as a knight's move in chess traveling in a line through the array.

With this kind of analytical tool available for the player Man, then the player Nature can go up to a higher level of complexity and difficulty. In fact, the computerized game should be fun and interesting.

"Computers and People" (formerly "Computers and Automation") from now on expects to publish a Naymandij puzzle each month.

We will also publish the solutions in the following month and the names of solvers, as we do with Numbles.

Answer: The solution to Zoonayman Puzzle 1 using 60 dice, is "Make threes horizontal".

(please turn to page 38)

STRATTON — *Continued from page 18*

Electrical science has a wide and expanding range. It reaches out and ties into a multitude of other fields and disciplines. Here, too, the associated laboratories serve a vital purpose. They are in large measure interdisciplinary in character, with a participation by both faculty and students from a number of departments. The Research Laboratory of Electronics set that example in 1946. Now there are many more.

Blending of Related Disciplines

Each laboratory is designed in its own way to encourage the interchange of ideas and information. The resources of these laboratories, both material and intellectual, make it possible to study in their larger context, rather than in isolated bits and pieces, some of the more complex problems of modern science and technology — bringing together and applying to their solution the means and methods of relevant disciplines.

Ties with Industry and Business: Applications

But no matter how close the relation between a student and his teacher, no matter how extensive his exposure to the laboratory, no matter how complete his appreciation of the interlocking of disciplines — one with another — the education of an engineer will be deficient if it fails to impart an adequate degree of understanding of the industrial process. He must learn well that the ultimate objective of engineering is to apply the fruits of research, the products of pure science, and the lessons of practical experience to useful purpose.

Throughout its entire history this Department of Electrical Engineering has been known and respected for its close ties with the world beyond the campus, both industry and government. There have always been, and there are today, many members of its faculty who from direct association have learned the needs and goals and methods of industrial enterprise. And the lessons of that experience have been shared with their students. There is no shadow of doubt in my own mind that these relations over the years have been of inestimable value. They have enlivened and strengthened the curriculum and have given focus to research. I need only cite the significant part they have played in the development of modern communications, of modern industrial processes, and of engineering systems.

Engineering Training

I have touched upon those elements in the training of an engineer which seem to me most important and which require special attention in our time. Their roots can be traced to the original objects and plan of M.I.T. The Electrical Engineering Department has held effectively to these essentials for nearly a century. The new Sherman Fairchild Building will have a meaning and a purpose going far beyond the simple addition of space. This building will be looked upon as a challenge for the future — as the means of furthering the interplay of teaching and research, of continuing the search for knowledge and the understanding of the physical world about us, of turning that understanding to useful purpose — all as a part of the process of education itself.

I have utter confidence that wonderful opportunities lie ahead and that they will be pursued with the same vigorous and creative spirit that has marked the past. □

HANKS — *Continued from page 13*

Minicomputers are becoming cheap enough to replace the older one-purpose business machines. Small businesses will want to take advantage of the flexibility that ought to be available in a minicomputer, instead of loading the mini with only one canned application program.

To provide this flexibility we need software that is standard across the industry. We can borrow ideas that were developed for the large computers where software development preceded by 10 years.

COBOL

One idea that is worth copying is the use of COBOL as a common business language. The COBOL can be elementary and still fulfill this requirement. In that way, with programming techniques that have been developed at CSC for example, it can be fit into the small minicomputer memory size and still be a useful compiler. One essential requirement for the compiler is good diagnostic information to help the programmer when he debugs his program. Unfortunately most COBOL's, even on the big computers, fall down here. As a minimum, the COBOL should produce cross-reference listings of the program's data names. It should produce English language error messages. It should allow debug commands in the code. Efficiency of the object code does not yet seem to be a problem.

Operating Systems

Another area that needs to be developed is operating systems for minicomputers, especially for banks of minicomputers. Here we can go back 20 years and see the same situation in the large computers. At first they had no operating systems. Each program was loaded individually and provided all its' own services such as card reading or printing programs. Then someone saw that efficiency could be improved if programs were loaded in batches and an operating system effected a smooth flow from one job to the next.

Competition with Big Computers

Minicomputers are becoming serious competition for the large computers. Several minicomputers put together can outperform the large computer at a fraction of the hardware cost. But to do so they need an operating system designed to make the computers work together. There is no good precedent in the large computers for this requirement.

Therefore, this is an area that needs development by those rare persons who have extensive experience in developing operating systems.

Conclusions

Minicomputers have developed to the point where they can open up new fields of application. Their low cost makes them economical even in very small businesses where a large computer would be too costly. But their success depends on standard software. The small businesses cannot afford large programming costs, just as they cannot afford high computer costs. The success of the minicomputer manufacturers in expanding into new applications depends primarily on their willingness to supply standard software to customers, and to make these computers easy to program. □

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THE SIX BLIND MEN FROM NEPAL

by Edmund C. Berkeley

Once upon a time in the highlands of Nepal, there lived six blind men who had heard many conflicting stories about a great beast called the elephant. And this led to many heated arguments among them.

So they agreed they would go down to the jungle in the lowlands of Nepal, and investigate the elephant at first hand. They would observe for themselves. With the help of a rather casual and careless guide who could see, they found in the jungle a sleeping elephant, and they touched him for a minute or two – until the elephant waked up and trumpeted, whereupon they all fled.

Later, the six blind men, having returned to the highlands of Nepal, gathered together once more, and sought to fit their observations together. However, this resulted in even more arguments than before – for the six reports of the six blind men were these:

The elephant is like a tree trunk (this blind man felt the elephant's leg).
The elephant is like string (this one felt the tail).
The elephant is like paper (this one felt the ear).
The elephant is like a bone (this one felt the tusk).
The elephant is like a pig (this one felt the body).
The elephant is like a snake (this one felt the elephant's trunk).

At last after many days of heated discussion, the six blind men did agree unanimously on six propositions:

(1) By straining their imagination, they could imagine an animal that had two, or perhaps three of these properties;

(2) But they could not possibly conceive of an animal that had all six of these properties;

(3) Therefore, as a beast, the elephant was impossible;

(4) Certainly, it was as legendary as the unicorn or the griffin;

(5) The trumpeting they had all heard was undoubtedly a jungle illusion, that happened from time to time in the jungles of the lowlands of Nepal;

(6) Henceforth, they would forbid all discussion of the elephant – to avoid the arguments, the friction, and the waste of time.

A Bouquet of Morals and Quotations

Truth is hidden at the bottom of a well.
– *Democritus, c. 400 B.C.*

Truth often hides in an ugly pool.
– *Chinese proverb*

Truth lurks in deep hiding and is wrapped in mystery.
– *Seneca, A.D. 64*

There are stranger things in reality than can be found in romances.
– *T. C. Haliburton, 1843*

At times truth may not seem probable.
– *Boileau, 1674*

There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy.
– *Shakespeare, 1597*

Falsehood is so near to truth that a wise man would do well not to trust himself on such a narrow edge.
– *Cicero, c. 45 B.C.*

Truth always lags behind falsehood, limping along on the arm of time.
– *Baltasar Gracian, 1647*

The most mischievous liars are those who keep sliding on the very verge of truth.
– *J. C. and A. W. Hare, 1827*

The most curious aspect of truth seems to be that nobody will believe it. We can swallow any number of falsehoods and fancies but not the truth.
– *J. S. Strange, 1943*

Truth is stranger than fiction.

The world is more complicated than most of our theories and metaphors declare it to be.

The COMPUTER DIRECTORY and BUYERS' GUIDE

1973

MIDYEAR DIRECTORY ISSUE
July 30, 1973
Vol. 22 No. 7B

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19th Annual Edition of the

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the midyear directory issue of *Computers and Automation* (new name, *Computers and People)*

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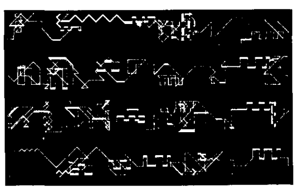

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Computers and Data Processing: Organizations and Products

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Data About People Can Be Used for Good or Evil

Congressman Jack Brooks
Chairman, Govt. Activities Subcommittee
House of Representatives
Washington, DC 20515

"IT IS THE COMPUTER THAT ENABLES US TO BE KNOWN AS MR. JOHN DOE INSTEAD OF OCCUPANT."

Changes Flowing Through the History of Civilization

Throughout history, individuals have had to contend with forces of society that tend to restrict freedom and compel conformity. Those forces are occasionally the result of the sinister desires of power-hungry and greedy men; but, more often, they are simply brought about in conjunction with changes flowing through the history of civilization.

The sweeping changes of modern society — the growth in our population, the disappearance of the frontier, the poverty and decay in our large metropolitan areas, the specialization of our economy, the technological explosion — these and many other developments are placing ever greater pressures upon the individual — pressures that can destroy one's identity, personal dignity, and privacy. If the erosion of individuality continues unchecked, the very structure of our society will be undermined.

The Computer Revolution

The ever-expanding role of the computer in our daily life probably epitomizes more than any other single instrument the impact of the technological explosion upon man's individuality and privacy. Computers permit us to amass large deposits of easily retrievable information about millions of individuals. Providing access to that data through remote terminals has clearly magnified the problem beyond anything which we have previously experienced.

But, this is only the threshold. The threat that lies ahead is much more awesome. We are facing life in a world in which every aspect of our daily lives will be recorded in various and sundry data banks controlled by persons over whom we as individuals have little control — our medical files, our financial affairs, our social habits, our political views, even our thought processes — will find their way into the information stored in some of these data banks.

750 Data Banks in the Federal Government Alone

I cannot overemphasize the magnitude of the issue. Seven hundred and fifty data banks have been counted in the federal government alone, and that count is believed to be rather low. We really have no idea as to how many non-federal data repositories exist, nor much conception as to what to expect in the future, except to predict that they will proliferate.

The average citizen's fear of the computer's impact on his daily life, on his privacy, on his individuality, cannot be underestimated. It is a problem that must be faced.

But the computer is here to stay. We cannot resolve the privacy problem by destroying the computer in the way that farmers early in this century attempted to shoot the automobile to remove it as a threat to their way of life. The answer lies in finding ways to use the computer to its utmost benefit, by controlling the adverse side effects that do accompany it. If the benefits of computers are to be fully exploited, we must remove from them the image that they are in some way an enemy to our individuality.

Identity and Privacy

You will note that each time I have mentioned privacy, I have also mentioned individuality or identity. These are two basic human characteristics that in many ways complement each other, but in more ways conflict. One of the greatest problems we must contend with is how to preserve a person's identity and at the same time protect his privacy.

Interestingly enough, it is the computer that may enable us to do both. It is the computer that permits us to handle sufficient quantities of data so that we can record, not only basic information, but also the individual characteristics pertinent to any given person. It is the computer that enables us to be known as "Mr. John Doe" rather than "Occupant". However, computers also have the capability of destroying an individual's privacy if not properly safeguarded.

Parameters of Privacy

Control over the dissemination of information involves two distinct concepts. One of these is the concept of parameters of privacy in a social or political sense. In other words, who should have access to what information and for what purposes, and what checks on accuracy and security should be instituted.

This is an area toward which Congress must direct an increasing amount of attention. The proliferation of vast amounts of data that can be used for good or evil, depending on the intentions of the persons having access to such data, demands that some basic national policy be delineated.

Congress has made some moves in this direction with the enactment of the Fair Credit Reporting Act, the amendments to the Crime Control Act of 1973, and by establishing restrictions on the dissemination of data held in many of the federal government's data processing systems. I would anticipate more of this type of legislation in the future with more concern being voiced by members of Congress for developing some national policy on individual privacy.

The Enforcing of a National Policy on Individual Privacy

We may soon face the need to develop some mechanism to enforce that policy. Some type of national system may have to be developed to require the registration of all non-federal data banks, some supervision of the scope and dissemination of the information stored, and some provision for penalty for the abuse of individual rights. I am not advocating the establishment of a vast regulatory process to control the use of computers. I am saying that Congress should evaluate the various alternatives available for protecting the rights of an individual as they may be threatened or compromised by forces with which they cannot realistically contend on an individual basis.

The Physical Security of the Data Stored

The second aspect of computer security deals not with the social and political decisions, but with the physical security of the data stored. This is an area more technical in nature in which Congress can have some role, but toward which the computer industry and computer users must direct more energy. The directives of Congress and state legislatures as to constitutional and social restrictions to protect the rights of individuals will be of little consequence if the data itself is readily available to ill-willed persons using surreptitious and unlawful means.

Locks

In his more primitive state, when man used cash to transact financial affairs, we developed locks, chains, safes, and safe deposit boxes for protection. Today, when most financial transactions are handled by computers — checking accounts, business accounts receivable, credit cards, etc. — these demand that some equally sophisticated means of protection be developed. The lock on the safe is no longer sufficient.

Physical security will become an increasingly difficult problem for all data processing users. More and more people throughout this nation now have access to the knowledge of how these systems work and how they can be manipulated.

Man's Control Over Man's Destiny

It is appropriate that you representing government, the computer industry, computer users and, hopefully, the individual citizen, direct your attention toward these problems. We in the Congress will be looking to you for advice and suggestions as we face the related issues that will come before us.

In conclusion, let me stress that advances in computer technology are not viewed in Congress as a sinister force working against us. They are a manifestation of man at his best, striving to unlock the mysteries of the universe. We do not want to interfere with or delay that mission. But, we do want to safeguard man's control over his own destiny. We must find the means in the years ahead of safeguarding the privacy, the identity, the dignity, and the freedom of the individual, while at the same time unleashing the extended intellectual tools that computers provide us in searching for solutions to poverty, ignorance, disease, and the other problems that confront us. □

Statement at the Conference on Privacy and Security in Computer Systems, held at the National Bureau of Standards, Gathersberg, Md., November 19, 1973.

NUMBLES

Neil Macdonald
Assistant Editor

NUMBER PUZZLES FOR NIMBLE MINDS — AND COMPUTERS

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

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

We invite our readers to send us solutions, together with human programs or computer programs which will produce the solutions.

NUMBLE 741

```
        T H E
    x B E S T
    ---------
      S A P H
    I B E I
  I A S P
S B H F
-------------
= R A F B E F H
```

46396 83125 464639

Solution to Numble 7312

In Numble 7312 in the December issue, the digits 0 through 9 are represented by letters as follows:

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

The message is: A bold heart is half the battle.

Our thanks to the following individuals for submitting their solutions – to **Numble 7312:** Mrs. Harvey T. Blankenship, Ft. Worth, Texas; Ed Bruno, North Bergen, N.J.; T. P. Finn, Indianapolis, Ind.; Ann Leveton, New Haven, Conn.; Edward D. Napier, Falls Church, Va.; Abraham Schwartz, Jamaica, N.Y.; – to **Numble 7311:** Edward A. Bruno, North Bergen, N.J.; T. P. Finn, Indianapolis, Ind.; Abraham Schwartz, Jamaica, N.Y.; – to **Numble 7310:** Werner W. Ruettener, Bronschhofen, Switzerland; – to **Numble 739:** Abraham Schwartz, Jamaica, N.Y.

CORRECTION: Numble 7311, printed on page 35 of the November issue of *Computers and Automation*, should have been printed with the following "rest of message":

49136 28284 59716 36876 260082

We regret the garble of the "rest of message". The entire message is "If you give, forget it; if you receive, tell it."

The Framing of Jim Garrison -- Part 3

Ivan Dryer
Los Angeles, Calif.

Editorial Note: In the December 1973 issue of "Computers and Automation" appeared two parts of "The Attempted Framing of Jim Garrison," District Attorney of New Orleans. These parts reported how the U.S. Department of Justice falsely brought charges against Jim Garrison of "accepting bribes to permit continuing illegal operation of pinball machines in New Orleans". On September 27, 1973, the jury, on the first ballot, found Garrison innocent — even though the information in the confession of Pershing Gervais reported below was kept out of the trial completely.

This part, Part 3, contains some supplementary information as follows:

1. Excerpts from the text of a television interview (broadcast May 23 and 24, 1972) by Rosemary James, a New Orleans reporter, with Pershing Gervais, government informer and agent provocateur who was used by the U.S. Department of Justice to try to frame Garrison. This information was published in "The Los Angeles Star" in an article by Ivan Dryer.

2. Some information about an interview with Gervais on May 24, 1972, in Oregon.

3. A report from the "Wall Street Journal" on May 30, 1972.

4. A report from the "New Orleans Times Picayune" of May 24, 1972.

5. Another report from the "New Orleans Times Picayune" of May 26, 1972.

This information helps document the charges of illegal persecution by the U.S. Department of Justice. These charges were presented in Part 2 of this article, published in the December issue.

"I WAS FORCED TO LIE FOR THEM. . . . I KNEW HE WAS NOT GUILTY. . . . THEY THREATENED ME WITH JAIL."

– Pershing Gervais

New Orleans District Attorney Jim Garrison has just furnished the "Star" with the complete manuscript of a television interview with Pershing Gervais. Gervais, a former investigator for Garrison, was the government informant who provided the key testimony against Garrison in an alleged bribery case initiated by the Justice Department and involving illegal pinball machine operations. Garrison and nine others, including two New Orleans policemen, were arrested a year ago. As stated in an exclusive interview with the "Star" (August 1, 1971), Garrison has continually asserted he was framed because of his persistent efforts to uncover the truth in the assassination of President John F. Kennedy.

The interview was conducted in Canada where Gervais and his family had been living under an assumed name. The interviewer was Rosemary James of WWL-TV, New Orleans, and the interview was broadcast on that station May 22 and 23, 1972. Following are excerpts from the 30-page transcript.

Based on an article that appeared in the *Los Angeles Star*

(Beginning of excerpts)

Rosemary James: Today Paul Mason and family are once again Gervais. They are giving up the peaceful life of Canada. They are packing to come home to New Orleans. In an exclusive interview with WWL conducted here in British Columbia over a four-day period, inside and out, on camera and off, Pershing Gervais and his family have insisted to us that not only has their life here been a lie but that the case built by Gervais against Garrison and crowd for the government was and is a deliberate fraud.

Q. What are you doing here in Canada instead of the United States?
A. Well, I guess it could be described as I'm here at the convenience of the government — whatever

that really means. I'm not really sure now.
Q. Can you give me a clue?
A. Well, of course, it started off their attitude was it was to protect me and my family.
Q. Protect you and your family from what?
A. From bodily harm. But what we really needed was protection from the Justice Department.
Q. Let's start from the beginning. How did you get involved with the government?
A. Well, you know, my mind's a little muddled about it. It started with constant, calculated harassment.
Q. Are you saying that you were harassed into working for the government?
A. That's a mild term — harassment.
Q. Well, then what are you saying?
A. I would rather say I was forced into working for them.
Q. You were forced to work for the government.
A. But more than that, I was forced to lie for them. That's a better description.
Q. What were you forced to do?
A. Well, it became clear — in the beginning it was obscure, it was always hints, 'you know what we want, you know what we're doing.' Midway through this thing.
Q. Midway through what thing?
A. Through the beginning of the harassment until that time where I — for want of a better description — was seduced by the Justice Department, you know, if I could be seduced. Somewhere in there, then it became clear that they were really interested in but one man, Jim Garrison, and in their minds they knew that I was the guy who could get him.
Q. Are you saying that you got him?
A. Oh, yeah, no question about that, sure, sure.
Q. Now when you say that you went to work for the government what sort of work did you do?
A. Well, it was, you see, it's entrapping people.
Q. What people?
A. Pinball operators.
Q. And who else?
A. And Jim Garrison.
Q. Are you saying that you participated in a deliberate frame of Jim Garrison and a whole bunch of pinball executives at the direction of the Federal government?
A. Without a doubt, I'm saying that unequivocably. Now I have no chance to really prove that because, you know, I don't have to tell you what my reputation is, my background, as opposed to these austere, very proper, well-reputationed gentlemen of the government. They are the Justice Department. But I have one out. I insist that I take the polygraph and I insist that people like Mr. Gerald Shore, Cathy Kimbrey, a fellow named McDonald and a few others names ...
Q. These are all federal agents?
A. Yes, out of Washington. That they take the polygraph. That they were part and parcel of the entire farce.
Q. Now, the government wanted you to leave New Orleans.
A. Yes, they did. Of course, you see, it has to do with the mechanics of the case because when I first became involved with the government it was never, ever supposed to come to this point.
Q. Now, when you say when you first became involved with the government, what do you mean by that? Let's
A. Okay. It's common knowledge, of course, everybody knows how the government operates, particularly the Justice Department. They so love to refer to themselves as Justice. Never the Justice Department. It was a long program of harassment.
Q. What do you mean by harassment?
A. Oh, Jesus, they sent agents to every human being I ever did business with, all over the United States — my insurance company, my bank, a little fellow I bought a little piece of property from, just everywhere. They sent agents to the hotel, no matter where I turned I was bumping into agents.
Q. Why? What were they looking for?
A. What they were looking for, they were investigating me they said. But as it turns out, it's clear they only really wanted one guy and that was Jim Garrison.
Q. Well, now, did they find anything on you?
A. No.
Q. Nothing?
A. Not a thing.
Q. They had nothing to hold over your head?
A. Nothing.
Q. What do you mean they wanted Jim Garrison?
A. They wanted to silence Jim Garrison. That's their primary objective because if that were not true, I would still be in New Orleans.
Q. Now, are you saying that you participated in a deliberate frame-up?
A. A total complete, political frame-up, absolutely.
Q. Why did you do it
A. That's a good question, why did I do it.
Q. In other words they did have something on you, something to make you do this.
A. Did they have something — they always have something, you see. They start tomorrow on you, you can bet your sweet little bunny they're going to find something.
Q. Why, because I'm interviewing you?
A. Oh, I don't know for that reason, but if they pick your name out, if they decided you were a problem, you know, make a case of it, you understand, or they wanted to get you out of the way, they'll drive you out of your mind. They could get you to court. They can find something — it's very easy to make things legal for them, I've heard — not quite so easy to make them right.
Q. Do you consider yourself a friend of Jim Garrison's today?
A. Do I consider myself his friend — no, I haven't been his friend. I can't say I have — I have not been his friend. I guess, listen, I've done some wrong things.
Q. Do you think he's done some wrong things?
A. Listen, who hasn't? Of course, he's done wrong things. He's done some things I don't approve of. He's done a lot of things I don't approve of.
Q. Well, what I'm trying to get at is do you think that ...
A. Was he a national threat?
Q. No, I'm not talking about the possibility of Garrison being a national threat, what I mean is do you think that Garrison was guilty of any of the things that the government has charged him with being guilty of?
A. No, I do not believe he was guilty of them. I know he wasn't guilty of them. You see, but you have to be so careful when you make statements like this because I had enough exposure with the Justice Department to know they are going to take my very words today — now they walk into the courtroom with the credentials of the Justice Department. This awes people, you see. And nobody was willing to believe that they lie and there are a lot of good agents that wouldn't lie, you know. I know them. I know a couple of them that I would bet are never in on the lies you see. Listen, either they've taken a page out of the Russian way of doing things, you know, or vice-versa, but the Justice Department as it is today, I consider a menace beyond words. I can't, I just can't do justice to it.
Q. Federal agents testified that you were offered nothing, promised nothing, in return for your cooperation with the government. During interviews con-

ducted last week in Vancouver, you said that they — the Justice Department — not only offered you a lot but also threatened you with jail if you did not cooperate. You said that after you became convinced that you would go to jail if you did not work for the government, you decided to become the government's undercover man. Did the government offer you anything, did they promise you anything?
A. How many years do you know me, darling?
Q. Ten.
A. Ten. Do you think that I would do everything that I did for nothing, for absolutely nothing? I never did anything for nothing in my whole life.
Q. Now, you said when you left New Orleans ...
A. That's why I was such a darling to the government, because I always knew what to say. I know what they want me to say. Mind you, remember, the agents that threatened me, the agents that lied to me, the agents that promised, were never, ever, a part of the agents who did the work. These poor fellows really believe they did a sincere, honest job. It's a pretty good system.
Q. Well, let's take John Wall, head of the strike force (which had indicted Garrison). He got up in open court and said under oath that the federal government had offered you nothing, promised you nothing, given you nothing. Are you saying he perjured himself?
A. How in the hell did I get to Canada?
Q. I don't know. Tell me how you got here.
A. They paid every goddamn nickel of it. That's how I got here. Do you think I would have paid for it? I've got the most ridiculous, the softest job in America.
Q. What kind of job do you have?
A. That's hard to describe.
Q. Who do you work for?
A. General Motors.
Q. Of Canada?
A. Yeah.
Q. How did you get the job?
A. The Justice Department got it. And that is the most interesting story. I get $18,000 from General Motors. The government makes it up with four more thousand.
Q. They, the government, directly gives you $4,000 a month?
A. A year.
Q. I mean, a year, I'm sorry.
A. Yeah, and not only that, but tax free. But that's not so good. Before I left New Orleans they guaranteed me unequivocally, unequivocally, $22,000 a year, tax free. That's a whole lot of ...
Q. Now what is your situation ...
A. Well, now I gotta pay money on, listen, like everything about the Justice Department, it was a lie. You see, I pay more tax here on this $18,000 than I would pay on $22,000 stateside. But everything, there is not a single thing that the Justice Department said to me, not one, that was true. Now, again, I can't win against the Justice Department and the courts, I know that, my family knows it. Let me say something, this morning my family was — I've never seen them so happy.
Q. Why?
A. Because I'm doing what I'm doing. They know what I'm doing. Not only that, corny as it might be, I've never seen my daughter look at me with the kind of pride that she did this morning. You know, this is corny and it's not in my character, but I saw it. Because she knows about the lies. Listen, they brought a lady from Washington down to lie to my daughter.
Q. What did they promise your daughter and your wife?
A. Awww, they promised them Utopia.

Rosemary James: Throughout the interviews with Gervais he referred to a man named Gerald Shore, a man he described as a Justice Department agent working out of Washington and his prime contact with the government. According to Gervais, Shore had promised his family they could move to the Caribbean, Europe, or preferably Australia and that it ended up Vancouver. Gervais said Shore arranged interviews with him with executives of a major American oil company and that after some negotiating it was decided that he would go to work for this oil company in Canada in the capacity that amounted to spying on the Canadian government. Gervais said that all of a sudden, shortly before Garrison's arrest, the government wanted him out of the country pronto and when he actually got to Vancouver things were not the way they were supposed to be.

Pershing Gervais: And Shore said go up into the Marinas of Nova Scotia and then casually take your time and drive all across Canada, see Canada.

Q. Who was paying for all this?
A. They paid for it. They paid for it at the rate of $73 a day.
Q. I mean they were giving you the cash?
A. Oh yeah, cash money.
Q. All right, so you got to Vancouver and what happened?
A. Well, of course, in between somewhere I learned what my job was to be.
Q. For this oil company?
A. For the oil company. It's a strange thing. My job was to in effect investigate, or spy on or determine why it was that this oil company was not accorded certain privileges in Canada by the Canadian government that other oil companies ...
Q. Like drilling privileges?
A. Drilling privileges, precisely, was one of them. For some reason.
Q. This company was denied these privileges?
A. By the Canadian government and ...
Q. They wanted you to spy on ...
A. On the Canadian ... whoever that part of the Canadian government that determines these things. I never did learn because it ultimately ...
Q. They actually wanted you to spy on the Canadian government in the employ of an American oil company?
A. Right. Along with the connivance of the Justice Department.
Q. In other words ...
A. They will deny this, you can bet. But they won't get on a polygraph and deny it. But let me just point something to you. So with the connivance of the Justice Department, this American oil company, they sent me into Canada to investigate in effect the Canadian government, to spy on them if I could. They thought I could do it. Once I arrived in Vancouver in September, I was trying to get my furniture and, of course, they stalled me. The Justice Department stalled.
Q. What do you mean they stalled?
A. They didn't — they stalled getting my furniture to me, I wanted my furniture. See. And they stalled me so bad and began to tell me so many lies — they had been telling me lies, little by little it became apparent ...
Q. What did it boil down to, that you didn't have a job?
A. That's, well ...
Q. That you didn't have a job with this oil company?

A. They said the oil company changed their mind, that they were afraid to hire me because they were afraid that in spite of the assurances to the contrary by the Justice Department that perhaps I may be forced to testify in the upcoming trials of the pinball people and Jim Garrison and there it would come out what my function was. And they couldn't afford this. Now this was Shore's, Gerry Shore's, message to me.

Rosemary James: It was later Gervais said that the government got him the job with General Motors in Canada, after Gervais refused to move his family another mile.

Q. Now you get $18,000 a year from General Motors. Do you get any side benefits?
A. Well, you know, I get the $4,000 a year from the government, tax free. I also get a new car every 3,000 miles.
Q. Do they pay for the upkeep of the car?
A. Oh, yeah, they pay for the insurance, the oil, the gas, which comes out to roughly another $50.00 a month in expenses.
Q. Precisely what do you do for General Motors of Canada to warrant this $18,000 a year and benefits?
A. I don't do anything to warrant $18,000.
Q. Well what do you do?
A. You couldn't dignify it as work but I simply pick up a couple of pieces of paper in one hand, transfer it to the other, and mail it to the factory. I am sure it has absolutely no meaning. I am sure this is not the function of Field Traffic Manager, a real one.
Q. That's what you are?
A. Yes, I'm a Field Traffic Manager for this area.
Q. How long does it take you to do this work every week?
A. Oh, I'd give them a total of about three hours, I would say. Maximum, on the outside.
Q. Now, do all Field Traffic Managers have this kind of bed of roses?
A. Absolutely not. The man that has the next territory over covers an area of about 2,500 miles, gets $14,000 a year, been with General Motors for about ten years, really works, works hard.
Q. Why would they want to do all this for you?
A. They're not doing it for me. They're doing that for the Justice Department, the government, certain parts of the government. Certainly not for me. I'm quite sure that General Motors never heard of me before, could care less about me, and are certainly not impressed with any great ability that I have.
Q. Why do you think they do it?
A. There can only be one reason and that is that they are a part of the industrial war complex.
Q. You sound like you're quoting Jim Garrison there.
A. Yeah, I am quoting him but listen, you got to remember he didn't invent the phrase, or the concept, or the idea or the truth or whatever you call it.
Q. You used to be a friend of Jim Garrison's?
A. Not a very good friend.
Q. Well, do you consider yourself back on Garrison's side now?
A. Well, back on his side is not a fair description. I was recently in New Orleans and I asked to see him.
Q. Did you see him?
A. Yes, I did. He came to see me but, however, he wouldn't unless I had an attorney to represent me present.
Q. Did he offer you any money?
A. Mr. Garrison couldn't — Mr. Garrison ain't got thirty cents, I'm sure.
Q. Did he offer you anything?
A. Not a thing. Not a thing.
Q. Did any member of the pinball industry offer you any money or any promises?
A. Not at all. That would be absurd.
Q. Why?
A. They wouldn't be that dumb. They'd have to be insane, they'd have to be frightened to death.
Q. Are you saying that no one got to you?
A. Absolutely nobody.
Q. This is totally your decision?
A. Totally my decision, yes.
Q. Why should I believe you now?
A. Well, why should anybody believe me? That's the reason I had to say over and over and over. Bring these bums from Washington. Let's take a polygraph test. Let's all take it. And don't let them tell you that it's not legal, it's not valid. The Justice Department has many polygraph machines, you know. They subject people — are they going to say that the people who sit on those are second or third rate citizens? That they're immune to this? The Police Department in New Orleans, if a policeman refuses to take the polygraph test, he's fired. It's been upheld in the courts.
Q. And you think that ought to be the case in the Justice Department?
A. Especially there.

Rosemary James: Possibly the thing puzzling most people in this strange case is the question of motivation. As he tells you in no uncertain terms himself, he's never done anything for nothing. Seeing how unhappy his family was in Canada tells you a lot about why he wants to come home. Why he left in the first place, he insists, is an answer for the polygraph machine since it's his word against the government's.

Pershing Gervais: No one, in the history of my lifetime, ever heard of me doing anything for anybody (without a) motivation. I'm just not that kind of cat.

Q. Now Jim Garrison used to be a friend of yours. Are you saying that you deliberately set out to frame him for a profit motive?
A. Well, depending on what you're going to define as profit.
Q. Well, just what did the federal government do?
A. Not just profit because this has made me very uncomfortable.
Q. Well, personal profit whether money or otherwise.
A. Yeah, correct, right, right ... because I was convinced I was going to jail. This I can prove without a polygraph.
Q. You were convinced that they were going to send you to jail?
A. They were going to send me to jail and I was convinced, no uncertain terms, that they were going to ...
Q. On what charge?
A. I was never told. I have no idea of what kind of charge.
Q. You have any tax problem?
A. None, zero, zonk.
Q. Didn't have any Swiss back accounts or anything like that?
A. I wish I did, darling. I wish I did. Only government people get those things, you know, and their friends — I mean high level government.
Q. Well, what did the government give you in return for helping them in their investigation?
A. Well, we would become friends.

Q. You and the government?
A. After you've been harassed with direct threats, no baloney about it, you become friends. That's considerable consideration.
Q. There was, of course, the alleged promise of $22,000 a year, tax free, and that, of course, is once again a matter of (your) word against the U.S. Department of Justice's word. And there are other questions for the lie detector, too.
A. When polygraph time comes, if it comes, a question I'm quite willing to submit to is Jim Garrison has never, ever, ever fixed a case for me. Not ever.
Q. How about some of his assistants?
A. That's another question.
Q. Are you willing to submit to that?
A. I ain't willing to submit to too many things but those are things I'm willing to submit (to).
Q. Obviously you're packing. Obviously you're leaving Vancouver. To a lot of people this is a beautiful city and would be a marvelous place to live. But I take it you're going home.
A. I'm going back to New Orleans, right. I'm getting my family back to home where they belong.
Q. You're tired of being away from home?
A. I'm tired, I'm tired of living a lie but I'm mostly tired of watching them day in and day out live a lie and being coached to lie. You know, it's been confusing to my little boy. Of course, I'm sure the Justice Department could care less.
Q. So you're going home.
A. Yes, absolutely.
Q. Whether the federal government likes it or not?
A. You can be sure they don't like it but you can be equally sure I could care less. My family's going home where they belong and I don't care what happens after that.

Rosemary James: The thing that will continue to puzzle most people of course is: Was Pershing Gervais telling the truth then? Is he telling the truth now? The problem that confronts Gervais is will anyone ever believe him again, will anyone ever be his friend again? From British Columbia, this is Rosemary James, Channel Four News.

While enroute back to New Orleans, Gervais was interviewed in Oregon on May 24. In this second interview, as reported in the New Orleans "Times-Picayune" (May 25), Gervais claimed the Justice Department got him a Canadian "ministers permit" to remain in Canada and sent a Royal Canadian Mounted Policeman to "sell him on Canada"; "The whole deal was set up by the two governments working together. I'm sure if you ask your (Canadian) government about it they'll have some glib answer ready," he charged.

About his job with G.M., Gervais said the Justice Department official, Shore, introduced him to a man named "Winters" in a Fordmo Hotel room and told him he was meeting the President of G.M. (Ronald S. Withers was G.M. President). "Why he wanted to see me I don't know. I guess he just wanted to see what this guy looked like who he'd been told to hire. They took me out to the plant ... and put me through a three-week course. I learned nothing in that. I know as much about traffic management as I know about operating a linotype machine."

Gervais continued, "But it was all part of the payoff for the affidavit (which he signed for the prosecution against Garrison) ... they got the Canadian government and G.M. to cooperate down the line .... They dictated to G.M. in Detroit and Detroit dictated to Oshawa (G.M.'s Canadian headquarters)."

"The Wall Street Journal" for May 30 reported the following:

"General Motors Corp. confirmed that it hired briefly, at the request of the Justice Department, a former New Orleans policeman who helped the government in its case against Jim Garrison, former New Orleans district attorney.

"The GM hiring disclosure also has brought to light a fairly widespread, but previously unpublicized practice of some big American multinational corporations finding jobs for U.S. government informers and secret witnesses in out-of-the-way corners of their operations here or abroad.

"Washington sources said the Justice Department has arranged similar jobs for key informers and witnesses in 'some dozens' of cases, perhaps as many as 50. Disclosures of the practice came as a surprise in Washington, as well as in Canada.

"A representative of the Justice Department asked G.M. whether we had a job opening in Canada for a man in whom the Department of Justice was interested. We found a position in our traffic department that was available. It was offered to him and he accepted it."

And the "Times-Picayune" of May 24 included a report saying:

"Less Slimon, zone manager for GM in Vancouver, said there had been a 'Mason,' the name Gervais says he assumed in Canada, working with the company.

"All I know is that Mr. R. F. Baker, director of traffic in Oshawa, brought him out here, introduced him around and said he was going to be traffic field manager," Slimon said.

"He reported in occasionally," he said. "He hasn't done us a real lot of good here."

The same story also contained:

"Tom Kennelly Tuesday denied that the Justice Department harassed its informer, Pershing Gervais, into trapping New Orleans District Attorney Jim Garrison.

"Kennelly, former deputy chief of the department's organized crime and racketeering division, supervised the case against Garrison. He told WDSU-TV that the government did not need Gervais as a witness to prosecute Garrison.

"Kennelly is now in private law practice. He was quoted on WDSU-TV as saying Gervais became a government informer with no strings attached.

"The IRS had been auditing Gervais' tax returns, Kennelly said, but was unable to make a case, so Gervais told the IRS, 'You've had your best shot at me, now I'm going to tell you what's really going on in this city.'

"Kennelly went on to say that Gervais described widespread pinball payoffs. The Justice Department said nobody would believe it unless you help prove it.

"Kennelly continued:

"'Gervais was grieving over a son missing in action in Vietnam and said he wanted to make amends to the child. So he became a government informer with no strings attached. Later Gervais said he feared for his life. He said there was a contract out on him, but the Justice Department has reason to believe it was true.'"

The "Times-Picayune" for May 26 reported a new death threat against Gervais:

"Local and federal authorities are investigating reports that a 'contract,' or an order to kill, is out on Pershing Gervais, a prime figure in federal bribery charges filed against Dist. Atty. Jim Garrison and others, it was learned Thursday.

"Asked about reports of a 'contract' on Gervais, U.S. Atty. Gerald J. Gallinghouse said he couldn't comment directly on the case but said, 'We would be very concerned about any threat to the safety of any potential witness in a federal case whether he was friendly to the government or hostile.'

"Police Supt. Clarence Giarrusso would neither deny or confirm that his office was investigating reports of a 'contract' or 'mark' being out on Gervais. But he did say, 'We will do whatever is necessary to protect Mr. Gervais.'

"It was learned that efforts to find a 'hit' man to murder Gervais were made this week. The sum offered for the job is reportedly in five figures." □

Unsettling, Disturbing, Critical . . .

Computers and People (formerly Computers and Automation), established 1951 and therefore the oldest magazine in the field of computers and data processing, believes that the profession of information engineer includes not only competence in handling information using computers and other means, but also a broad responsibility, in a professional and engineering sense, for:

— The reliability and social significance of pertinent input data;

— The social value and truth of the output results.

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

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

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

BERKELEY — *Continued from page 21*

7. Examples: Puzzles 741-2 to 741-6

Following are five puzzles in Naymandij. The solutions to these puzzles will be published in the next issue of "Computers and People".

1	1	3	0	9	8	6	3	5	3	3	0	0	6	6	6	3	0	4	5
4	7	2	9	3	6	3	0	1	9	5	8	8	3	7	2	4	3	2	8
4	4	6	2	1	5	6	7	4	1	1	4	2	0	4	3	7	9	9	9
2	2	2	5	4	0	5	9	6	8	7	1	4	7	5	8	8	9	5	8
2	9	0	7	0	9	6	4	5	0	4	9	2	7	9	5	8	7	7	4
0	0	9	7	5	0	8	6	4	4	3	2	8	4	7	8	2	8	8	6
1	3	4	2	4	2	4	8	0	7	8	1	4	3	8	9	2	1	1	9
9	1	1	3	4	4	6	0	6	8	5	5	4	7	3	4	6	5	9	2
6	5	4	3	8	4	9	2	8	7	3	6	2	5	5	0	2	8	8	0
4	7	5	7	8	8	9	0	5	8	0	5	2	0	0	4	6	8	5	4

Naymandij Puzzle 741-2

1	6	9	8	8	0	1	4	0	2	2	1	4	9	1	5	4	9	0	8
7	8	6	4	3	1	1	9	0	8	6	1	1	2	2	2	5	2	3	4
7	8	5	7	4	6	8	5	1	1	8	4	1	7	6	2	0	2	0	4
9	6	6	0	5	6	7	8	8	5	8	2	4	2	2	4	6	6	2	5
0	6	4	9	5	9	7	1	3	1	3	2	4	3	3	8	1	4	2	7
9	9	6	0	5	2	4	6	3	9	7	1	0	1	3	7	7	0	7	0
3	1	0	2	7	2	3	9	5	8	1	6	2	8	5	6	5	5	8	8
5	9	4	2	9	4	5	1	7	7	6	9	2	4	0	9	4	3	7	5
7	6	4	3	5	0	2	2	6	6	2	0	5	9	8	2	8	4	2	2
5	5	8	9	4	4	6	5	7	9	2	7	0	9	3	2	1	7	7	8

Naymandij Puzzle 741-3

5	8	0	8	4	1	0	5	1	6	5	5	7	4	0	6	3	3	5	9
5	2	0	0	5	8	3	2	7	1	4	8	9	3	6	1	6	9	4	6
0	1	2	0	8	3	3	0	1	5	3	7	4	7	0	3	0	4	5	0
1	2	2	9	7	9	7	3	1	8	1	6	7	6	6	7	2	7	0	0
6	3	9	6	8	4	0	4	5	3	1	8	4	6	3	9	6	4	5	4
8	3	2	1	4	8	7	8	3	9	6	3	1	4	4	4	0	9	6	5
7	5	3	1	6	5	9	1	7	9	4	3	9	6	3	5	5	4	8	5
8	7	7	4	1	8	6	5	0	5	0	6	0	9	9	8	6	2	8	3
4	5	1	9	1	9	3	2	8	1	7	2	5	8	8	7	3	5	8	5
7	0	6	4	2	5	5	2	2	3	5	6	8	1	1	6	7	8	8	9

Naymandij Puzzle 741-4

0	2	0	0	2	2	4	0	2	4	2	8	8	2	6	0	2	0	8	0
9	7	5	4	9	6	9	2	6	0	3	5	2	5	5	8	4	3	0	4
5	5	8	8	2	7	5	5	3	6	8	3	3	7	8	9	0	0	7	3
7	9	0	0	5	9	5	9	0	3	3	3	1	8	4	6	2	8	5	6
2	7	2	9	0	3	4	6	5	0	1	8	0	3	2	4	0	6	5	2
4	4	7	7	9	4	2	7	2	1	4	2	3	0	3	1	8	2	3	7
3	5	9	5	8	0	0	4	6	3	4	9	0	2	8	4	2	2	8	7
5	3	0	4	7	9	7	9	7	2	5	1	9	2	1	1	4	8	4	9
5	4	1	6	6	0	0	1	4	6	9	5	3	2	4	5	2	8	6	2
6	2	7	2	5	7	0	4	4	6	1	8	4	7	1	8	8	3	7	5

Naymandij Puzzle 741-5

3	9	9	5	5	5	2	5	9	5	5	4	7	5	8	9	2	9	3	0
6	5	5	1	7	8	7	4	4	5	1	9	0	1	9	9	0	7	3	3
4	5	7	2	4	9	8	5	6	5	8	9	9	1	4	8	5	0	8	1
2	9	1	8	8	4	7	5	0	1	9	1	5	2	2	6	8	9	6	8
8	9	7	2	6	1	1	8	5	6	5	7	6	4	5	5	6	7	6	4
2	2	4	1	7	4	2	4	2	8	7	8	0	1	7	5	0	9	6	5
3	7	5	9	4	1	4	3	8	4	2	1	6	2	3	4	8	0	3	6
6	9	7	4	2	0	0	9	2	6	1	8	4	9	4	3	9	4	2	0
9	8	3	4	9	0	0	2	0	7	5	9	3	8	3	3	7	6	6	3
3	2	5	3	8	6	3	9	0	5	6	4	3	9	3	1	4	6	9	8

Naymandij Puzzle 741-6 □

CALENDAR OF COMING EVENTS

Jan. 29-Feb. 1, 1974: **Assoc. for Development of Computer-Based Instructional Systems,** Statler Hilton Hotel, Washington, D.C. / contact: Ruann Pengov, Ohio State Univ., College of Medicine, 076 Health Sciences Lib., 376 W. 10th Ave., Columbus, OH 43210

Feb. 12-14, 1974: **Computer Science Conference,** Detroit Hilton, Detroit, Mich. / contact: Seymour J. Wolfson, Computer Science Section, Wayne State Univ., Detroit, MI 48202

Feb. 13-15, 1974: **International Solid State Circuits Conference,** Univ. of Penna., Marriott Hotel, Philadelphia, Pa. / contact: Virgil Johannes, Bell Labs., Room 3E331, Holmdel, NJ 07733

Feb. 19-22, 1974: **3rd Annual National Communications Week Convention,** Chase-Park Plaza Hotel, St. Louis, Mo. / contact: David C. Brotemarkle, Communications Systems Management Assoc., 1102 West St., Suite 1003, Wilmington, DE 19801

Feb. 22, 1974: **Minicomputer Instructional Systems Conference,** St. Louis, Mo. / contact: Ralph E. Lee, Computer Center, University of Missouri-Rolla, Rolla, MO 65401

Feb. 26-28, 1974: **Computer Conference (COMPCON),** Jack Tar Hotel, San Francisco, Calif. / contact: Jack Kuehler, IBM Corp., P 35, Bldg. 025, Monterey & Cottle Rds., San Jose, CA 95114

Mar. 4-8, 1974: **Numerical Control Conference and Exhibition,** Milan, Italy / contact: CEU—UCIMU's Exhibition Centre, Via Monte Rosa 21, 20149 Milano, Italy

Mar. 25-29, 1974: **IEEE International Convention (INTERCON),** Coliseum & Statler Hilton Hotel, New York, N.Y. / contact: J. H. Schumacher, IEEE, 345 E. 47th St., New York, NY 10017

April 3, 1974: **Minicomputers — Trends and Applications,** Nat'l Bureau of Standards, Gaithersburg, Md. / contact: Harry Hayman, 738 Whitaker Ter., Silver Spring, MD 20901

April 8-11, 1974: **Computer Aided Design, Int'l Conference & Exhibition,** Univ. of Southampton, Southampton, England / contact: Inst. of Civil Engrs., Great George St., Westminster, London SW1, England

April 9-11, 1974: **Optical Computing Symposium,** Zurich, Switzerland / contact: Samuel Horvitz, Box 274, Waterford, CT 06385

April 21-24, 1974: **International Circuits & Systems Symposium,** Sir Francis Drake Hotel, San Francisco, Calif. / contact: L. O. Chua, Dept. of EE, Univ. of Calif., Berkeley, CA 94720

April 21-24, 1974: **1974 Annual Assoc. for Systems Management Conf.,** Dallas Convention Center, Dallas, Tex. / contact: R. B. McCaffrey, ASM, 24587 Bagley Rd., Cleveland, OH 44138

May 5-8, 1974: **Offshore Technology Conference,** Astrohall, Houston, Tex. / contact: Offshore Tech. Conf., 6200 N. Central Expressway, Dallas, TX 75206

May 6-10, 1974: **1974 National Computer Conference & Exposition,** McCormick Place, Chicago, Ill. / contact: Dr. Stephen S. Yau, Computer Sciences Dept., Northwestern University, Evanston, IL 60201

May 7-10, 1974: **12th Annual Assoc. for Educational Data Systems Convention,** New York Hilton Hotel, New York, N.Y. / contact: Thomas A. Corr, Nassau Community College, Stewart Ave., Garden City, NY 11530

May 13-17, 1974: **European Computing Congress (EUROCOMP),** Brunel Univ., Uxbridge, Middlesex, England / contact: Online, Brunel Univ., Uxbridge, Middlesex, England

May 13-17, 1974: **International Instruments, Electronic and Automation Exhibition,** Olympia, London, England / contact: Industrial Exhibitions Ltd., Commonwealth House, New Oxford St., London, WC1A 1PB, England

May 14-17, 1974: **6th Annual APL International Users Conference,** Sheraton Hotel, Anaheim, Calif. / contact: John R. Clark, Orange Coast College, 2701 Fairview Rd., Costa Mesa, CA 92626

June 11-13, 1974: **1st Annual Automotive Electronics Conference and Exposition,** Cobo Hall, Detroit, Mich. / contact: Robert D. Rankin, Rankin Exposition Management, 5544 E. La Palma Ave., Anaheim, CA 92807

June 24-26, 1974: **Design Automation Workshop,** Brown Palace Hotel, Denver, Colo. / contact: ACM, 1133 Ave. of the Americas, New York, NY 10036

June 24-26, 1974: **5th Conference on Computers in the Undergraduate Curricula,** Washington State Univ., Pullman, Wash. / contact: Dr. Ottis W. Rechard, Computer Science Dept., Washington State Univ., Pullman, WA 99163

June 25-28, 1974: **1974 Annual International Conference & Business Exposition,** Minneapolis, Minn. / contact: Data Processing Management Assoc., 505 Busse Highway, Park Ridge, IL 60068

July 9-11, 1974: **Summer Computer Simulation Conference,** Hyatt Regency Hotel, Houston, Tex. / contact: M. E. McCoy, Martin Marietta Data Systems, Mail MP-198, P.O. Box 5837, Orlando, FL 32805

July 15-19, 1974: **1974 Conference on Frontiers in Education,** City University, London, England / contact: Conf. Dept., Institution of Electrical Engineers, Savoy Place, London, England WC2R 0BL

July 23-26, 1974: **Circuit Theory & Design,** IEE, London, England / contact: IEE, Savoy Pl., London WC2R 0BL, England

July 23-26, 1974: **International Computer Exposition for Latin America,** Maria Isabel-Sheraton Hotel, Mexico City, Mexico / contact: Seymour A. Robbins, National Expositions Co., Inc., 14 W. 40th St., New York, NY 10018

Aug. 5-10, 1974: **IFIP Congress 74,** St. Erik's Fairgrounds, Stockholm, Sweden / contact: U.S. Committee for IFIP Congress 74, Box 426, New Canaan, CT 06840

Aug. 5-10, 1974: **Medinfo 74,** St. Erik's Fairgrounds, Stockholm, Sweden / contact: Frank E. Heart, Bolt Beranek and Newman, Inc., 50 Moulton St., Cambridge, MA 02138

Aug. 21-23, 1974: **Engineering in the Ocean Environment International Conf.,** Nova Scotian Hotel, Halifax, Nova Scotia / contact: O. K. Gashus, EE Dept., Nova Scotia Tech. Coll., POB 100, Halifax, N.S., Canada

Sept., 1974: **2nd Symposium IFAC/IFIP/IFORS,** Cote d'Azur, France / contact: AFCET, Secretariat des Congres, Universite Paris IX, Dauphine 75775 Paris Cedex 16, France

Sept. 9-12, 1974: **INFO 74,** Coliseum, New York, N.Y. / contact: Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017

Oct. 31-Nov. 1, 1974: **Canadian Symposium on Communications,** Queen Elizabeth Hotel, Montreal, Quebec / contact: George Armitage, IEEE Canadian Region Office, 7061 Yonge St., Thornhill, Ontario L3T 2A6, Canada

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"RIDE THE EAST WIND: Parables of Yesterday and Today"

Table of Contents

The Fox of Mt. Etna and the Grapes

Once there was a Fox who lived on the lower slopes of Mt. Etna, the great volcano in Sicily. These slopes are extremely fertile; the grapes that grow there may well be the most delicious in the world; and of all the farmers there, Farmer Mario was probably the best. And this Fox longed and longed for some of Farmer Mario's grapes. But they grew very high on arbors, and all the arbors were inside a vineyard with high walls, and the Fox had a problem. Of course, the Fox of Mt Etna had utterly no use for his famous ancestor, who leaping for grapes that he could not reach, called them sour, and went away.

The Fox decided that what he needed was Engineering Technology. So he went to a retired Engineer who lived on the slopes of Mt. Etna, because he liked the balmy climate and the view of the Mediterranean Sea and the excitement of watching his instruments that measured the degree of sleeping or waking of Mt. Etna. The Fox put his problem before the Engineer. . . .

To be published in January 1974 by Quadrangle / The New York Times Book Co., hard cover, $6.95

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815 Washington St., Dept. R21 Newtonville, Mass. 02160

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My name and address are attached.

ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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APPLICATIONS

PARK 'N SHOP GOING ELECTRONIC WITH NEW IBM GROCERY CHECKSTAND SYSTEM

John M. Dunnagan
Park 'N Shop
4744 South Blvd.
Charlotte, N.C. 28210

Park'N Shop supermarkets have revealed plans for a "revolutionary" grocery system that will speed shoppers through checkout lanes. Charles N. Reid, president, told a press conference at the South Boulevard store the IBM 3660 supermarket system is one of the "most revolutionary advances in grocery shopping and management" he has seen in nearly 30 years of business in Charlotte.

The new system includes a high-speed scanner and computer-linked electronic cash register at the checkout stand to: virtually eliminate the long waiting lines most shoppers have grown accustomed to; increase accuracy of prices charged; provide price-and-item identification for each customer order, and increase efficiency and economy of store operation.

By "reading" the food industry's new University Product Code (UPC) symbol — a series of small, verticle black bars printed on grocery products — the IBM system makes checkout faster and easier for grocery checkers. The scanner, for example, is located at the end of a checkstand to enable a single clerk to both check and bag a product in one easy motion. For added customer convenience, as a product is scanned the system's point of sale terminal displays its name and price on a lighted panel, and prints a receipt. The receipt lists the name or a description of each item, it's price, whether it is taxable or not, the total charge and any special price modifications such as the food stamp credits available, the time of the sale and the date. In addition to helping shoppers keep track of their purchases, the same information is used by a computer to improve store management information.

"Because the price of each item is stored in the computer rather than on the product itself, this system virtually eliminates mispricing or unreadable prices," said Reid. "We also expect sizable labor savings because a sale or other price change can be made by changing the price on a shelf label and in the computer rather than by remarking each item."

The store's control unit stores price information on each item marked with UPC. Adopted earlier this year to standardize product identification in the grocery industry, the UPC symbol will be printed on the container or wrapping of most items sold in the supermarket.

The IBM checkout scanner uses a laser to beam light up through a narrow window at the end of a checkstand. The checker merely places the symbol face down and pulls the package across the window. No other alignment is required since the scanner can read the symbol from any angle. Using a fast, two-handed motion, the checker can scan and bag groceries simultaneously, significantly speeding the checkout process.

The store control unit keeps a record of all sales by item, department, checkout clerk, and a wide range of other measurements. This information, through a communications unit, periodically transfers this data to a centrally located virtual storage IBM System/370.

COMPUTER PROGRAM TO ADD "TRUE RANDOMNESS" INTO POLICE PATROL SCHEDULES

Gil Aberg
Dept. of Public Information
Pennsylvania State University
312 Old Main Bldg.
University Park, Pa. 16802

"You can never find a cop when you need one," runs the saying. The reason, says a Penn State industrial engineer, may lie in a certain unwitting efficiency of the men in blue rather than in their tendency to goof off. They pound the beat too regularly.

"That very term 'beat'," says Dr. Matthew Rosenshine, "suggests something regular and predictable. And police beats are often just that: so regular and predictable as to be a considerable factor in our inability to combat certain types of crime, especially crime in the street." Rosenshine would like to attempt to reduce such crime by using a computer to inject "true randomness" into police patrol schedules.

It can't stop crime altogether, he admits, but it would doubtless act as a deterrent to some potential criminals. "And it will make the citizen feel a lot better," he says, "because the random, unexpected appearance of a policeman — especially when he is not needed — is reassuring to an individual who is constantly concerned over being mugged, raped, or the victim of some other street crime."

Getting people to behave randomly is not easy. "There seems to be a distinct tendency in all of us to behave with a certain regularity even when we are trying to behave otherwise." Policemen frequently believe they are conferring security on a neighborhood by passing it a certain number of times daily. This, says Rosenshine, breeds regularity. The police are actually conferring insecurity when they behave this way, and leaving wide gaps that even the inexperienced criminal learns to take advantage of.

"How many times has any of us seen two patrol cars cruise the same street, minutes apart? A completely random system would make such behavior, which would tend to confound a potential criminal, more likely — though not, of course, predictably likely."

Rosenshine's system, which he has researched and developed over the past several years, would employ a central computer deliberately to "mess up" the patrol schedule of an entire police force. "Our system would give rise to the 'cop-on-the-offbeat': an officer whose peregrinations are unpredictable in the sense that they cannot be deduced from past behavior."

Rosenshine has made use of so-called Monte Carlo procedures to "load" a computer so it will deliver a random patrol schedule that nevertheless favors neighborhoods that are known to need heavy police surveillance. The system is yet to be tested online, but its use has been simulated with the computer itself. Once installed, Rosenshine feels, his system will make the offbeat cop unbeatable — at least when it comes to second-guessing his moves.

One big-city mugging victim is convinced his experience occurred under precisely the circumstances outlined by Dr. Rosenshine.

"I saw a patrol car pass. Moments later, I was attacked. I had the distinct feeling my attackers knew the police car would not return in the 60 seconds or less it took them to slash my wrist and grab my watch.

"The policeman who took me to the hospital even said: 'I can't understand it. I pass that corner every twelve minutes.'

"If a randomization system would diminish the security with which such thugs operate, I'd be for it."

EDUCATION NEWS

MONSANTO GRANTS USE OF FLOWTRAN TO UNIVERSITIES

A. Bryan Marvin
Public Relations Dept.
Monsanto Company
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

In an unusual form of aid to education, Monsanto Company will cooperate with a committee of chemical engineering educators to bring industrial computer developments within reach of American campuses.

Monsanto will make available for use at universities its proprietary computer program system called FLOWTRAN which permits the steady state simulation of a large number of industrial processes. Monsanto will also aid in implementation of the system for university use by loaning specialists from its Corporate Engineering Department and making a cash grant to help in start-up of the computer programs.

The alliance of chemical engineering educators who will coordinate the effort at the university level, was established in 1969 by the National Academy of Engineering's Commission on Education as the CACHE (Computer Aids for Chemical Engineering Education) Committee. The chairman is Prof. Lawrence B. Evans, Department of Chemical Engineering, Massachusetts Institute of Technology. The CACHE Committee was established to promote interuniversity cooperation in the development and distribution of computer-related educational aids, and it has received significant financial support from the National Science Foundation.

The FLOWTRAN computer program system is designed to be installed at a large central computer utility and accessed from remote locations either through typewriter-like terminals or through satellite information processing units. The computer network which will handle the educational application of the system has not yet been selected.

Monte C. Throdahl, group vice president-technology, of Monsanto Company, said "As use of the FLOWTRAN system spreads, it will bring to American campuses a sophisticated industrial computer system, one which a student can employ to work out his own assignments and one which an entire class can use to calculate a series of complex process alternates. ... we are pleased that the CACHE Committee feels the system can contribute to the educational process," Mr. Throdahl added. "It is, after all, from the campus that the engineering leaders of the next generation will come and they should test during their present education the tools which modern industrial engineering is using."

HIGH SCHOOL COMPUTER SCIENCE FAIR TO BE FEATURED AT 1974 NATIONAL COMPUTER CONFERENCE IN CHICAGO

American Federation of Information Processing Societies, Inc.
210 Summit Ave.
Montvale, N.J. 07645

A High School Computer Science Fair will be held during the 1974 National Computer Conference & Exposition, May 6-10, McCormick Place, Chicago. The fair is open to all high school students, including

1974 graduates. Projects may be submitted by individuals or by small groups. However, stricter criteria will be applied to the selections of group projects.

According to Professor Benjamin Mittman, Chairman of the Computer Science Fair, "For today's students there is very little mystery surrounding the computer, as they have been exposed to it as a science and a tool, frequently in the classroom. Recognizing that a great deal of important work is being done in the field today by young men and women, we feel it is very important to give recognition and encouragement to students who have already begun to get involved in new technology at the high school level."

A grand prize will be awarded for the most significant project displayed. In addition, prizes will be awarded in four specific areas — new applications of computers, programming, design and construction of computers or components, and mathematics of computation. All projects must be suitable for display. Both hardware and software projects are solicited and any programming language or computing equipment may be used. In the case of software projects, graphical or poster displays highlighting key ideas should be used.

All entry forms must be submitted by March 1 to Professor Mittman. The submission form includes details of the proposed project and must be signed by a teacher familiar with the student's work. Those invited to exhibit their projects will be notified by April 1, 1974.

For additional information and submission forms contact: Professor Benjamin Mittman, Vogelback Computing Center, Northwestern University, Evanston, Ill. 60201. Information can also be obtained from the vice chairman, Professor Charles Bauer, Computer Science Dept., Illinois Institute of Technology, Chicago, Ill. 60616.

The 1974 National Computer Conference and Exposition is sponsored by the American Federation of Information Processing Societies, Inc. (AFIPS), a non-profit organization of thirteen professional societies.

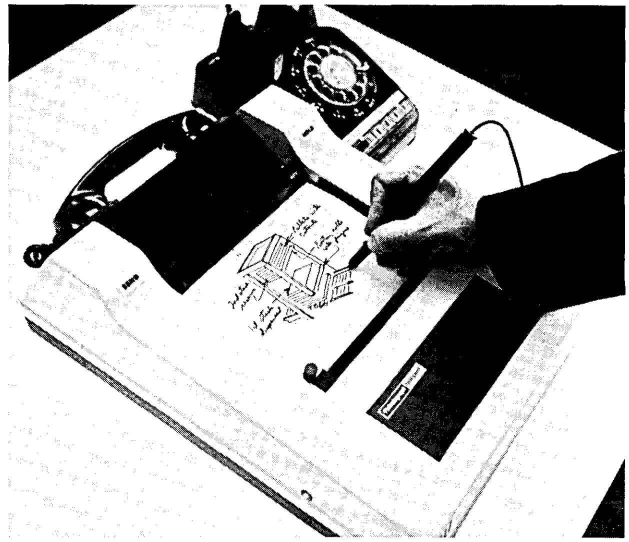
NEW PRODUCTS

THE TELEPHONE THAT WRITES

Telautograph Corporation
8700 Bellanca Ave.
Los Angeles, Calif. 90045

A unique, portable "telephone that writes" — designed for instant, handwritten transmission of chemical, scientific, office, aviation, aerospace, educational and control work data — expands the utility of telephone communications by allowing you to write, as well as talk, over standard telephones. The new, portable transceiver, known as Telepen, instantaneously reproduces handwritten drawings, diagrams, messages and all types of work orders at any other location equipped with a similar unit.

The Telepen allows field and office personnel to send instant, written verification of details over any distance. Verbal errors, postal and telegram delays and other communication gaps are eliminated with Telepen systems. The system also eliminates the need for personnel at receiving stations since messages can be received without an operator in attendance.



To operate, the Telepen is simply plugged into an electrical outlet; the party is dialed on a telephone; the handset is placed in the back of the Telepen; and the message is written on the Telepen form — appearing instantly on the Telepen unit dialed, exactly as written. The other party can add to the original graphics or initiate his own reply. Permanent Telepen systems can also be installed utilizing internal wires or telephone leased voice grade channels where traffic volume is large and portability not a requirement.

The Telepen sends up to 340 pages of graphics on roll paper before refilling. Preprinted forms, designed to the customer's system requirements, are also available. The unit weighs only 19 lbs., and measures 12.3 inches in width; 16.4 inches in length.

GRAND SLAM PRINTER — NEW 1500 LPM IMPACT PRINTER REDUCES PAPER COSTS BY ONE-THIRD

R. J. Campbell, Director
Sales and Service Planning
Potter Data Systems, Inc.
532 Broad Hollow Road
Melville, N.Y. 11746

The new Potter patented impact printer, known as the GRANT SLAM printer, prints computer output at 1500 lines a minute and at 15 characters per horizontal inch, rather than the conventional 10 characters per inch. Additionally, it prints either 8 or 10 lines per vertical inch instead of the conventional 6 lines. Substantial savings in paper costs, handling and storage are obtained by using letter size (10-5/8" x 8-1/2") forms and paper.

The GRAND SLAM printer is 360/370 compatible and prints up to 6-part forms. The 10-5/8" x 8-1/2" size printout eliminates the need for photo or xerographic reduction of copies. A patented belt chain and free-flight high energy hammers give clean sharp copy printout. Character sets are easily changed by the operator by merely changing chain modules.

The company claims that the new GRAND SLAM printer will virtually pay its own rent from the savings through reducing paper costs. Additional savings can be obtained by using standard file cabinets and smaller floor space requirements. Measuring 37" wide x 48" high x 30" deep, the new GRAND SLAM printer requires only 7.7 sq. ft. of floor space.

The 360/370 interface and the control unit, equivalent to the IBM 2821 Mods 2 and 3, are built into the printer. This eliminates a costly separate unit.

In addition to the on-line version, the GRAND SLAM printer may also be used in the Potter off-line printer system which can operate on information derived from any IBM compatible computer system. GRAND SLAM printers are available on either lease, or purchase plans.

COMPUTERIZED CARPOOL SYSTEM

Ms. Barbara Price, Vice President
AutoPool, Inc.
Box 580
Seabrook, Md. 20801

AutoPool, Inc. has introduced a computerized carpooling system which matches drivers and riders throughout a large metropolitan area with departure and arrival accuracy within half-a-mile. The system was developed for city and country government use to cover large geographic areas, although it can also be used by individual organizations such as universities and business firms.

While the energy crisis precipitated development of the system at this time, a computerized carpooling system does far more than simply conserve gas. It's a direct and frontal attack on the serious transportation problem of one-car, one-driver commuting that typifies most major population centers. AutoPool spokesmen feel strongly that a government sponsored car pooling system involving widespread participation will work best. Costs would be reduced to pennies per participant; each person would have more alternatives.

The AutoPool system is designed to collect departure and destination data from individuals interested in carpooling; then, via computer, to prepare a directory coded by geographic points and by time of departure on individuals leaving and arriving in the same areas.

Recent national polls indicate that the vast majority of drivers are anxious to cooperate in solving the energy crisis and AutoPool feels that computerized data collection and dissemination of commuter information could have a significant impact on driving habits.

MISCELLANEOUS

COMPETITION IN THE TELEPHONE COMMUNICATIONS INDUSTRY

Thomas F. Carter, President
North American Telephone Assoc.
P.O. Box 31001
Dallas, Texas 75231

A strong unified front of telephone interconnect firms is building behind a $1 million-plus campaign to tell the public that competition is growing in the telephone communications industry and that telecommunications equipment is available today that was never dreamed of before.

In the three years that NATA has been in existance, it has proven to the public that the telephone interconnect industry offers more and better telecommunications equipment than does the monopolistic common carriers and, at the same time, saves the telephone user more money. However, the North American Telephone Association is stepping up its activities to make the public more aware that they will benefit from competition created by the telephone interconnect industry.

At NATA's recent national convention in Miami, Fla., Consumer Advocate Ralph Nader predicted that rising costs of telephone installation will create a "public revolt" if independent telephone installation companies, such as interconnect contractors, are stifled from competing with AT&T's manufacturing company, Western Electric Co. Nader explained that "because of monopolies like the telephone company, the average telephone customer pays his bills not knowing how much they are being overcharged or how cheaper it would cost them to have another company install their telephones".

Now, that the common carriers have competition from the interconnect industry, scientists and engineers are devoting more time to developing new telephone equipment. This is equipment that was never dreamed of before and it is equipment that these inventors know has a market today.

Shortly after the interconnect industry was created by the landmark "Carterfone Decision" of the Federal Communications Commission in mid-1968, several interconnect contractors formed the North American Telephone Association. Today, it has more than 200 member firms and is considered "The Voice of the Telephone Interconnect Industry."

NATA members have put their money where their faith is. They have pledged more than $1 million for the coming year to present a strong unified front to promote competition for the common carriers and carry on a public awareness program concerning the advantages that competition offers the public. This program will entail substantial representation before federal and state agencies and before the Congress, plus national advertising and public relations efforts.

NATA recently moved its national headquarters from Dallas to Washington, D.C., and hired a full time professional staff and legal counsel to represent the association and its members on a regular basis.

TELENET FILES FOR NATIONAL DATA COMMUNICATIONS NETWORK

Stuart L. Mathison, Vice President
Telenet Communications Corporation
1666 K Street, N.W.
Washington, D.C. 20006

An application has been filed by Telenet Communications Corporation with the Federal Communications Commission for authority to establish and operate a nationwide common carrier network for data communications. The network is expected to serve 18 cities throughout the United States by the end of 1975, and to serve 62 cities by the end of 1977.

Telenet's president, Dr. Lawrence G. Roberts, stated that the company's system is based on the "packet switching" technology utilized in the data

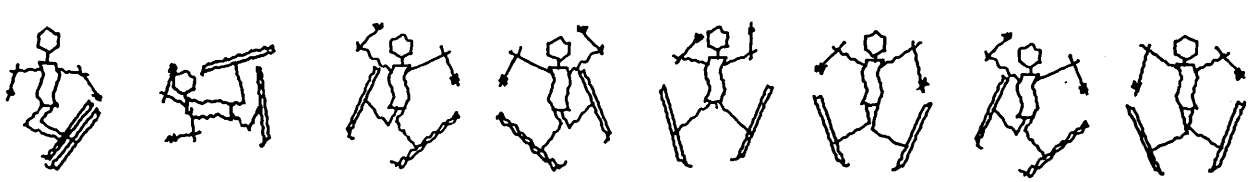
(please turn to page 50

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
GTE Sylvania Inc., General Telephone & Electronics Corp., Mountain View, Calif.	U.S. Army	Fabrication of control and processing center of system providing computer-controlled electronic processing, data storage, and retrieval	$9 million
Lockheed Electronics Co., Inc., Plainfield, N.J.	Western Electric Co.	1565 microfilm retrieval systems called RADRU (Rapid Access Data Retrieval Unit); systems to be used for directory assistance by Southern Bell and South Central Bell Telephone Co. Directory Assistance Bureaus	$7.5 million
GTE Information Systems Inc., Stamford, Conn.	Paine, Webber, Jackson & Curtis, Inc., New York, N.Y.	Five-year lease agreement for stock-quotation terminals and related equipment, and development of nationwide brokerage data communications network	$5 million
Univac Div. of Sperry Rand Corp., Blue Bell, Pa.	Italian Ministry of the Treasury, Rome, Italy	Two UNIVAC 90/70 Computer Systems for issuing, recording, analyzing, and assessing about 29-million state employee pension checks per year	$3.3 million
Ampex Corp., Redwood City, Calif.	U. S. Government	A second trillion bit capacity on-line mass storage system, the TBM* Memory System	$3 million (approximate)
Logicon, Inc., Torrance, Calif.	Air Force Space and Missile Systems Organization (SAMSCO)	Two software development and analysis on the Minuteman III Intercontinental Ballistic Missile Command Data Buffer system	$2.84 million
Interdata of Canada Ltd., Mississauga, Ontario, Canada	CAE Electronics Ltd., Montreal, Canada	Over 200 minicomputer systems during next 3 years for Joint/Enroute Terminal System (JETS) air traffic control program, which will modernize air traffic control procedures at 7 major airports in Canada; CAE is prime contractor	$2.5+ million
System Development Corp., Santa Monica, Calif.	Electronics Systems Div., Air Force Systems Command	Design, development, and testing of all software for new phased array radar system (COBRA DANE) for use on Shemya Island, Alaska	$2.5 million
Digital Equipment Corp., Maynard, Mass.	Abbott Laboratories, North Chicago, Ill.	Integrated nine-computer laboratory network which will automate special equipment used in drug research, measuring drug effectiveness, and safety	$2.4 million
MSI Data Corp., Costa Mesa, Calif.	Economost Div., McKesson & Robbins Drug Co., San Francisco, Calif.	900 Model 2001 and Model 1108 MSI order entry terminals to be incorporated into an McK & R order service	$1.82 million
INCOTERM Corp., Natick, Mass.	Burlington Northern Railroad	Installation and maintenance of 68 INCOTERM SPD 904 Remote Batch Terminal Systems which will interface with Burlington Northern COMPASS data system	$1.8 million (approximate)
Electronics Division of Northrop Corp., Los Angeles	U.S. Naval Air Systems Command	First phase of $8 million modification program for U.S. Army In-Flight Data Transmission System (AIDATS)	$938,000
Computer Sciences Corp. (CSC), El Segundo, Calif.	Naval Electronics Laboratory Center, San Diego, Calif.	Providing operations research and systems analysis services	$727,000
Wyle Computer Products, Inc., El Segundo, Calif.	New York City Off-Track Betting Corp. (OTBC), New York, N.Y.	Providing 800 Optical Mark Sense Readers to be installed in off-track betting offices and will interface with Wyle CRT Display Terminals already being utilized	$700,000 (approximate)
Teleprocessing Industries, Inc., Mahwah, N.J.	ITT World Communications, Inc.	An undisclosed number of automatic calling and answering units as part of communications interface between the TWX network and ITT Worldcom's overseas Telex users	$470,000+
Electronics Research Div., Rockwell International Corp., Anaheim, Calif.	Industrial Management Div., U.S. Army Electronics Command (ECOM)	Developing producibility techniques and quality control for bubble memory devices, and concluding with a pilot run	$210,000
Ampex Corp., Redwood City, Calif.	Ra-Nav Laboratories, Oklahoma City, Okla.	Supplying more than 50 TMA model tape drives as replacements to existing systems at U.S. Air Force facilities around the country	$200,000
Informatics Inc. Information Systems Co., Canoga Park, Calif.	George Washington University, Washington, D.C.	Providing on-line computer based retrieval services utilizing STIMS/RECON IV system for the Population Information Program	$150,000+
Control Data Corp., Minneapolis, Minn.	Totalizator Administration Board (TAB), Queensland, Australia	An off-track wagering system with the work load being spread over ten System 17 computers	—
National Semiconductor Corp., Santa Clara, Calif.	Foodarama Supermarkets, Inc., Freehold, N.J.	A volume order for Datachecker (TM) electronic checkout system; the first terminals will be at Freehold, N.J. with installation in all new stores to follow	—
Raytheon Data Systems, Norwood, Mass.	Continental Airlines	Programmable terminal systems to be installed at Los Angeles, Honolulu, and Dallas/Ft. Worth, for use in reservations, ticket printing and passenger check-in	—
Westinghouse Electric Corp. Pittsburgh, Pa.	Caterpillar Tractor Co., Mossville, Ill.	Providing the receiving, inspection and high-rise storage system for one of the world's largest automated warehouses	—

NEW INSTALLATIONS

OF	AT	FOR
Burroughs L 2000 system	Department of Health and Social Security of Britain, United Kingdom	Preparing payment drafts for sickness, maternity and injury benefits, death grants and other social security benefits at 35 DHSS offices throughout the United Kingdom (system valued at approximately $500,000)
Burroughs B 4700 system B 2700 system (2) B 1700 systems	South London, England; Amsterdam, Netherlands; Glasgow, Scotland; Brussels, Belgium	General applications; B 4700 system installed at South London, England center; B 2700 system installed at Amsterdam, Netherlands office, and the two B 1700 systems installed at Glasgow, Scotland and Brussels, Belgium offices
Burroughs B 6700 system	First Computer Corp., First Bank System, Inc., Minneapolis, Minn.	Batch posting for demand deposits, savings accounts, savings certificates and installment loans; also for stock transfer transactions and a dividend reinvestment program (system valued at approximately $2 million)
	University of Washington, Seattle, Wash.	Medical, instructional, administrative data processing (system valued at $2.3 million)
Digital Equipment DECsystem-10	Computility, Inc., Boston, Mass.	Complementing an existing DECsystem-10 for use in timesharing applications) (system valued at $600,000)
	Stone & Webster Management Consultants, Inc., New York, N.Y.	Handling on-site client problems, long-range financial forecasting, fuel dispatching, rate case work, load forecasting and many other functions (system valued at $500,000)
Honeywell Model G120 system	Customs Office, Milan, Italy (2 systems)	Handling increased customs work, simplify information procedures needed for Central Taxpayer File, Central Institute of Statistics, Ministry of Foreign Trade and other agencies (total systems valued at $7.5 million)
Honeywell Model 6060 system	Jones & Laughlin Steel Corp., Pittsburgh, Pa.	Extending centralization program; effort has already eliminated nine computer systems; plan to replace additional seven computer systems with 6060 (system valued at $5.3 million)
IBM System/3 Model 10	Dickey-Grabler Company, Cleveland, Ohio	Automotive parts production and tracking; also production schedules and labor and cost accounting
	Economy Furniture Industries, Austin, Texas	Inventory control; categorizing purchases by retailer, geographic location, style type, color and salesman; future use includes continuous inventory of supplies ranging from lumber to mattress buttons
IBM System/7	Lufkin Telephone Exchange, Lufkin, Texas	Speeding long distance calls; improved customer and billing services
IBM System/370 Model 168	Datacrown Limited, Toronto, Canada (2 systems)	The first of two systems which will more than double batch processing capacity and increase capability to provide for transaction-oriented terminals, systems will replace Model 165 (systems valued at $12 million)
NCR Century 251 system	Sisters of the Sorrowful Mother, Mother of Sorrows Convent, Milwaukee, Wisc.	Computerizing, more fully, the nine general hospitals operated between New Jersey and New Mexico
Univac 1110 system	Swedish Telecommunications Authority, Stockholm, Sweden	Installation and moving of telephones, work orders, location of faults, operation of information service, and preparing statistical information; initially system will be used in Stockholm and Vasteras; future use includes other areas of the country (system valued at $2.5 million)
Xerox Sigma 9 system	Bell System Center for Technical Education, Lisle, Ill.	Computer-aided instruction, student testing, and problem-solving; also on-line registration; will use the Xerox test processing system (TEXT) for standard, high-volume correspondence (system valued at $1.2 million)



MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND PEOPLE

The following is a summary made by COMPUTERS AND PEOPLE of reports and estimates of the number of general purpose digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers quarterly 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. A few manufacturers refuse to give out, confirm, or comment on any figures.

Part 1 of the Monthly Computer Census contains reports for United States manufacturers, A to H, and is published in January, April, July, and October. Part 2 contains reports for United States manufacturers, I to Z, and is published in February, May, August, and November. Part 3 contains reports for manufacturers outside of the United States and is published in March, June, September, and December.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit infor- that would help make these figures as accurate and complete as possible.

The following abbreviations apply:

(A) -- authoritative figures, derived essentially from information sent by the manufacturer directly to COMPUTERS AND PEOPLE
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 PEOPLE
(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 and/or not released by manufacturer

SUMMARY AS OF DECEMBER 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 A-H							
Adage, Inc.	AGT 10 Series	4/68	X	32	3	35	X
Boston, Mass.	AGT 100 Series	1/72	100-300 (S)	16	12	28	2
(A) (Nov. 1973)	Adage 300	3/74	100-300 (S)	0	0	0	1
	Adage 400	1/74	30-50 (S)	0	0	0	1
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
(R) (Aug. 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	3
	Bailey 855/25	4/68	100-1000 (S)	16	0	16	0
	Bailey 855/50	3/72	100-1000	1	0	0	X
Bunker-Ramo Corp.	BR-130	10/61	X	160	-	-	X
Westlake Village, Calif.	BR-133	5/64	X	79	-	-	X
(A) (June 1973)	BA-230	8/63	X	15	-	-	X
	BR-300	3/59	X	18	-	-	X
	BR-330	12/60	X	19		-	-
	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) (Dec. 1973)	B205	1/54	X	19	2	21	X
	B220	10/58	X	23	2	25	X
	B300	7/65	7.0	-	-	600	-
	B700	-	-	-	-	-	-
	B1700	8/72	-	2	-	-	-
	B2500	2/67	4.0	277	123	400	30
	B2700	8/72	-	-	-	-	-
	B3500	5/67	12-14	570	285	857	110
	B3700	11/72	-	-	-	-	-
	B4700	10/71	-	6	1	7	-
	B5500	3/63	23.5	152	47	199	-
	B5700	12/70	32.0	27	8	35	22
	B6500	2/68	33.0	-	-	60	2
	B6700	8/72	30.0	12	4	16	60
	B7500	4/69	44.0	-	-	-	13
	B7700	2/72	85.0	1	-	1	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
(R) (April 1971)							
Consultronics, Inc.	DCT-132	5/69	0.7	75	65	135	-
Dallas, Texas							
(A) (April 1973)							
Control Data Corp.	G15	7/55	X	-	-	295	X
Minneapolis, Minn.	G20	4/61	X	-	-	20	X
(R) (Dec. 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	X
	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	-	-	429-479	0
	3100/3150/3170	5/64	10-16	-	-	94-121	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	5	-	20	C
	3600	6/63	52.0	-	-	40	C
	3800	2/66	53.0	-	-	20	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.	NUMBER OF INSTALLATIONS Outside U.S.A.	NUMBER OF INSTALLATIONS In World	NUMBER OF UNFILLED ORDERS
Control Data (cont'd)	6200/6400/6500	8/64	58.0	-	-	117	C
	6600	8/64	115.0	1	-	89	C
	6700	6/67	130.9	-	-	5	C
	7600	12/68	235.0	-	-	12	C
	Cyber 70/72	-	-	3	9	12	-
	Cyber 70/73	-	-	3	5	8	-
	Cyber 70/74	-	-	-	2	2	-
Data General Corp. Southboro, Mass. (A) (Dec. 1973)	Nova	2/69	9.2 (S)	-	-	C	-
	Supernova	5/70	9.6 (S)	-	-	C	-
	Nova 1200	12/71	5.4 (S)	-	-	C	-
	Nova 800	3/71	6.9 (S)	-	-	C	-
	Nova 820	4/72	6.4 (S)	-	-	C	-
	Nova 1210/1220	2/72	4.2;5.2 (S)	-	-	C	-
					Total:	8255	
Datacraft Corp. Ft. Lauderdale, Fla. (A) (Sept. 1973)	6024/1	5/69	52-300 (S)	18	0	18	0
	6024/3	2/70	33-200 (S)	100	26	126	6
	6024/4	8/73	19.9 (S)	2	0	2	2
	6024/5	5/72	11-80 (S)	101	2	103	35
	6024/5R	2/73	30-60 (S)	3	0	3	1
Datapoint Corp. San Antonio, Texas (A) (June 1973)	Datapoint 2200	2/71	151-292	-	-	2000	-
Digiac Corp. Plainview, N.Y. (A) (Feb. 1973)	Digiac 3060	1/70	9.0 (S)	78	0	78	8
	Digiac CT-10	-	9.0	20	0	20	1
Digital Computer Controls, Inc. Fairfield, N.J. (A) (Dec. 1973)	D-112	8/70	10.0 (S)	840	184	1024	-
	D-116	1/72	10.0 (S)	1306	119	1425	-
Digital Equipment Corp. Maynard, Mass. (A) (Sept. 1973)	PDP-1	11/60	X	48	2	50	X
	PDP-4	8/62	X	40	5	45	X
	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,8/M,8/F	5/72	3.9-4.9 (S)	-	-	9150	-
	PDP-9	12/66	X	-	-	436	X
	PDP-9L	11/68	X	-	-	40	X
	DECSystem-10	12/67	700-3000 (S)	-	-	300	-
	PDP-11/10,11/20/11R20, 11/40	-	10.8-13.8 (S)	-	-	3280	-
	PDP-11/05,11/15	-	10.8 (S)	0	0	3170	-
	PDP-11/45	-	-	0	0	650	-
	PDP-12	9/69	-	-	-	725	-
	PDP-15	2/61	17.0 (S)	-	-	625	-
	LINC-8	9/66	X	-	-	200	X
Electronic Associates Inc. West Long Branch, N.J. (A) (Sept. 1973)	640	4/67	1.2	110	61	171	0
	8400	7/67	12.0	21	8	29	0
	PACER 100	7/72	1.0	50	45	95	25
General Automation, Inc. Anaheim, Calif. (A) (Sept. 1973)	SPC-12	1/68	-	-	-	2000	-
	SPC-16	5/70	-	-	-	1500	-
	System 18/30	7/69	-	-	-	400	-
General Electric West Lynn, Mass. (Process Control Computers) (A) (June 1973)	GE-PAC 3010	5/70	X	25	1	26	X
	GE-PAC 4010	10/70	6.0	30	4	34	32
	GE-PAC 4020	2/67	X	200	60	260	X
	GE-PAC 4040	8/64	X	45	20	65	X
	GE-PAC 4050	12/66	X	23	2	25	X
	GE-PAC 4060	6/65	X	18	2	20	X
Hewlett Packard Cupertino, Calif. (A) (Oct. 1973)	2114A, 2114B	10/68	X	-	-	1210	-
	2115A	11/67	X	-	-	342	-
	2116A, 2116B, 2116C	11/66	X	-	-	1446	-
	2100A, 2100S	9/71	0.47	-	-	3253	-
	3000	-	-	-	-	-	-
Honeywell Information Systems Wellesley Hills, Mass. (R) (Dec. 1973)	G58	5/70	1.0	6	1	7	-
	G105A	6/69	1.3	6	-	6	-
	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	-	2	-	-
	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
	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	-

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)	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-600	12/60	30.0	57	15	72	X
	H-1200	2/66	9.8	230	90	320	-
	H-1250	7/68	12.0	129	55	184	-
	H-1400	1/64	14.0	4	6	10	X
	H-1800	1/64	50.0	15	5	20	X
	H-2015	-	-	4	-	4	-
	H-2020	-	-	1	-	1	-
	H-2040	-	-	6	-	6	-
	H-2050	-	-	1	1	2	-
	H-2060	-	-	2	-	2	-
	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	-	-	-	5	5	-
	H-6040	-	-	-	5	5	-
	H-6050	-	-	2	1	3	-
	H-6060	-	-	2	7	9	-
	H-6080	-	-	-	1	1	-
	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	-	44	452	-
	DDP-416	-	X	-	-	350	X
	DDP-516	9/66	1.2	-	-	900	-
	DDP-716	-	-	2	-	2	-
	H112	10/69	-	-	-	75	-
	H632	12/68	3.2	-	-	12	-
	H1602	-	-	-	-	-	-
	H1642	-	-	-	-	-	-
	H1644	-	-	-	-	-	-
	H1646	-	-	-	-	-	-
	H1648	11/68	12.0	-	-	20	-
	H1648A	-	-	-	-	-	-

ACROSS THE EDITOR'S DESK – *Continued from page 45*

communications network now being operated by the U.S. Defense Department's Advanced Research Projects Agency (ARPA).

Telenet will offer data communication services specifically designed for computer-to-computer and computer-to-terminal communication. The company plans to use very high-capacity terrestrial and satellite communication channels, leased from established carriers, in combination with its own computer-based switching systems. Once connected to the Telenet system, subscribers will have substantially enhanced communications capabilities at their disposal.

The new "value-added carrier" will utilize an advanced but proven approach to data communications. Customer computers and terminals will be connected to Telenet switching centers, and minicomputers at these switching centers will divide the subscriber's data into small segments called packets. Each packet will contain the address of its destination and will be dynamically routed along one of several alternate paths.

Dr. Roberts stated that all of Telenet's features have been incorporated in the ARPA network and have proven to be extremely valuable to users. In fact, traffic on the ARPA net has grown at a rate of approximately 18 percent per month during the past few years. "The wide variety of applications for which the network is used gives us confidence that Telenet will become an important factor in the data communications market of the future. This market has been projected by AT&T to exceed $5 billion by 1980."

Dr. Roberts conceived the ARPA network while he was Director of ARPA's Information Processing Techniques Office. In addition, he supervised the implementation of the network by Telenet's parent corporation, Bolt Beranek and Newman Inc. (BBN). BBN is a publicly-held (AMEX) consulting, research, and development organization based in Cambridge, Mass.

ADVERTISING INDEX

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