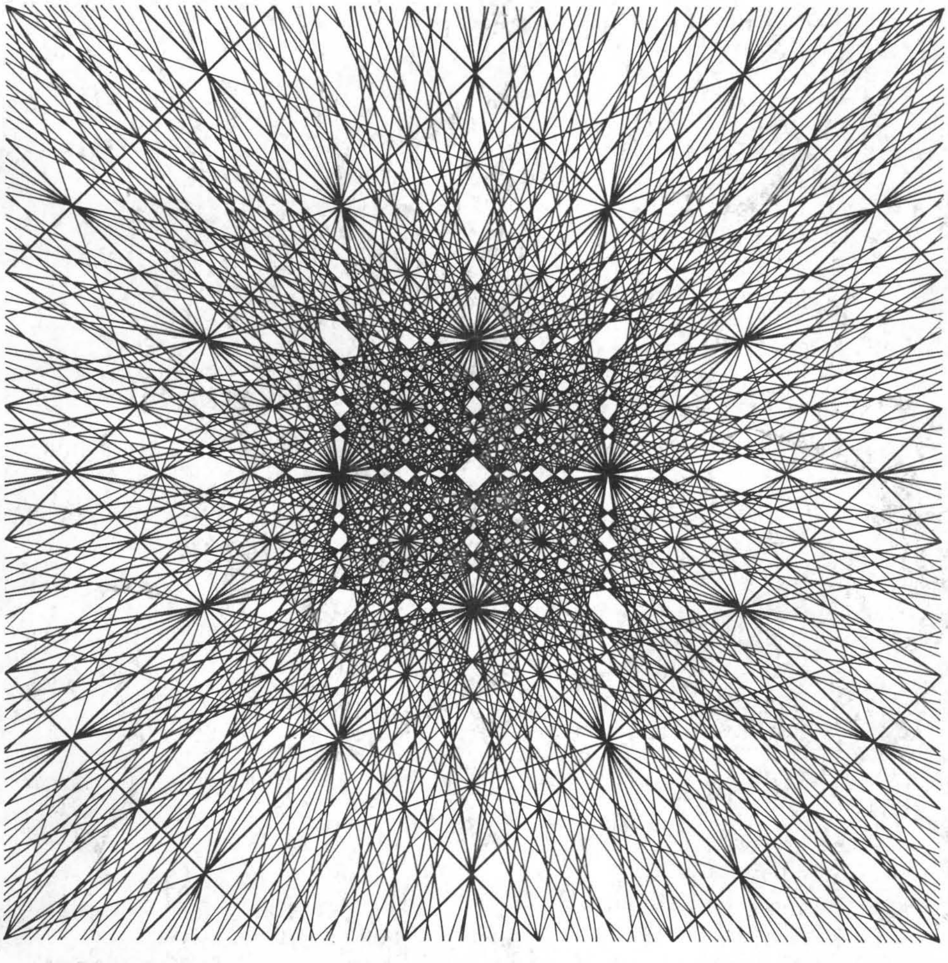
SCIENCE & TECHNOLOGY
January, 1973

computers and automation and people



"PHROPASE"

Vol. 22, No. 1

INVENTORY OF THE 36 ISSUES OF — TITLES AND SUMMARIES

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Vol. 22, No. 1
January, 1973

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computers and automation and people

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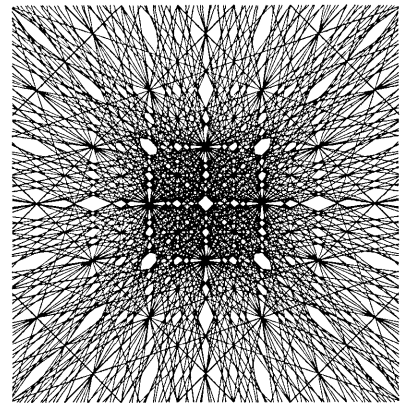

Front Cover Picture

The front cover drawing, called "Phropase", was produced by an Algol 60 program, drawing straight lines $ax + by + c = 0$, where a, b and c were "stepped arithmetically in nested loops". The computer used was an ICL 1904A, driving a Calcomp 1934/6 plotter. The programmer-artist is Nihan Lloyd-Thurston, Kings Mill Lane, South Nutfield, Surrey, England.

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- [A] – Article
- [C] – Monthly Column
- [E] – Editorial
- [F] – Forum
- [G] – The Golden Trumpet
- [NT] – Not Technical
- [T] – Technical

EDITORIAL

From "Computers and Automation" to "Computers and People"

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 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.

The three-syllable term "computers", it seems to me, is still preferable to any of:

- data processing, five syllables, plebeian, more and more out of date because much more is processed than just data;
- information processing, seven syllables, more accurate, but also incomplete because it leaves out "idea processing", "artificial intelligence", and other really important extensions of computer programming;
- "electronic data processing", nine syllables (clumsy), having all the disadvantages of "data processing" plus the disadvantage of "electronic" which implies omission of "optical", "magnetic", etc.;
- "automatic data processing", nine syllables (also clumsy), having all the disadvantages of "data processing" plus the disadvantage of "automatic" which leaves out the essential contributions of human guidance, human adapting to applications, etc.

It is interesting that the persons who tried so hard to name the field using an attitude of "keep your feet on the ground" are the persons left behind – largely by the development of computer programs that express an ever greater degree of reasoning, calculating, and sophistication.

2. Substance

A great many of the important technical computer problems of the last 20 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, 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; widespread deception; 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, we have decided that the time has come when "Computers and Automation" will change its name to "Computers and People", in a gradual process using an intermediate name "Computers and Automation and People" – for short, "CAP" instead of "C&A". To change the name is reasonable and seems necessary and desirable; to change gradually seems much better than to change abruptly.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

The Path to Championship Chess By Computer

Professor Donald Michie, Director
Dept. of Machine Intelligence
Edinburgh University
Edinburgh, Scotland

"If we could program world championship chess, then we could program anything."

Based on an article "Programmer's Gambit" in *The New Scientist* for August 17, 1972, an international weekly review of science and technology, 128 Long Acre, London WC 2, England, and reprinted with permission.

Has something gone wrong with computer chess? If so, what? In a recent New Scientist article (20 July 1972, vol. 55, p. 134) Peter Wason discussed the psychology of the game. He also referred to computer chess programs and, with an element of courteous understatement, observed "they are certainly below master strength."

The first point to remark is that the task is far, far more difficult than some early optimists supposed — so much so that quite radical advances in machine intelligence, not just in programming and hardware technology, are required if chess programs are ever to break through to master play.

The "Grandmaster Barrier"

The reasons for what may be called the "grandmaster barrier" are connected with powers of abstraction, generalisation and learning, all of which are still absent from today's chess programs. Chess at master level makes such searching demands on these abilities that it offers a life-time's dedication for outstanding intellects. Hence, although it has been one of the earliest task domains to be chosen for machine intelligence studies, chess remains one of the most illustrative and one of the most elusive. The distinguished applied mathematician, I. J. Good, himself an expert chess player, believes that when a chess program has been developed capable of defeating the world champion, we shall be no more than five years away from the appearance of the "ultra-intelligent machine", intellectually superior to man in all departments of thought. While supporting Good's evaluation, I would prefer to phrase it in other terms and to say that if we could program world championship chess then we could program anything!

It is possible to take up two exaggerated and opposite positions concerning contemporary chess programmes. Both are mistaken.

Position 1: The attempt to match human intellectual skill across the chessboard has failed.

The Current Strength of Computer Chess

Hubert Dreyfus, the Rand Corporation mathematician, pronounced a few years ago that no computer could play even amateur chess. He was challenged to play against the Greenblatt chess program and was ignominiously defeated. This program is one of those which regularly take part in American tournaments, including tournaments restricted to computer programs. Two other programs of similar playing strength are those of Atkins and Slate and of Gillogly, currently rated around 1400 to 1500 on the US Chess Federation scale which is calculated on the basis of past tournament performance. Table 1 may be of help in calibrating this scale. Bobby Fischer's last USCF rating was 2824, the highest ever awarded.

Position 2: Computer programs will attain grandmaster rating in the near future.

Those who hold this position usually believe that it is simply a matter of developing and extending present-day principles of chess programming, aided by the continued rapid growth of hardware speeds and storage capacities of computers. This second position is wrong for more subtle reasons than the first, and cannot be dismissed so cursorily.

Chess Knowledge

Consider the following two apparently unrelated facts:

1. Not one of the three leading chess programs occupies more than 20,000 locations of computer memory (by this I mean "fixed" memory, not the working space occupied for transient periods by the intermediate products of calculation). Stanford Research Institute's program for planning a robot's movements occupies more than five times this number.

2. Although for the past century or more chess games at grandmaster level have usually ended in draws, Bobby Fischer recently won 19 consecutive games against grandmasters.

The interpretation which some chess experts place on the second fact is that Fischer has discovered new areas of knowledge about chess, and in some sense has a deeper understanding of the game than his opponents. I have put emphasis upon "knowledge" and "understanding" because these words give a clue to the extraordinarily small machine memory space occupied by all the above-mentioned chess programs. When we look inside these programs we find virtually nothing there which corresponds to "knowledge" or "understanding". What we do find can best be described as a finely tuned mechanism for making the best possible job of playing chess without knowing anything about the game or understanding what one is doing.

Table 1

THE PERFORMANCE OF THE BEST CONTEMPORARY CHESS PROGRAM

Bobby Fischer	28
International grandmasters	26 to 28
International masters	23 to 26
American masters	21 to 23
Expert players	19 to 21
Strong amateurs	16 to 18
Best chess program	15
Most amateurs	up to 14

The figures are the U.S. Chess Federation rating scale with 00 omitted. This scale is calculated on the basis of past tournament performance.

Look-Ahead

This mechanism is essentially that of looking ahead along a tree of possibilities, evaluating the terminal nodes of the look-ahead tree according to some "evaluation function", and then "backing up" these values to the root of the tree by a process known as "minimaxing". The various branches at the root correspond to the immediately available moves; the backed-up values associated with these branches are used as the basis for selecting the next move. The only chess "knowledge" is that contained in the legal move generator (i.e. knowledge of the rules of chess), in the evaluation function itself, and in stored "book" openings (where these are employed). Such knowledge is a grain of sand beside the mountains amassed even by amateur players, and it is a tribute to what can be accomplished by the look-ahead process, and by sheer brute-force calculation, that these chess programs can hold their own at all. Of course, if their authors knew how to program some of the missing knowledge into the machine they would do so.

Machine Intelligence

Chess is like any other highly developed intellectual skill in that it can be subdivided into two categories:

1. What the player knows, and
2. What he can do with this knowledge.

These two subdivisions mirror very clearly two areas of machine intelligence research in which progress has and has not been made. Virtually all the progress before 1970 was concerned with category (2), i.e. with the mechanisation of processes of search and deduction whereby the direct implications of category (1) may be efficiently extracted. Category (1) itself, in the machine intelligence context, is concerned with finding principles whereby large bodies of knowledge may be represented in the machine in forms suitable: for indirect and analogical reasoning; for the formation of new generalisations; and for the automatic modification and extension of the "knowledge base" via learning processes.

In the 1950s and 1960s little progress was made with category (1). Hence experimental programs, for chess as for everything else, necessarily took the form of "toy systems" in which all the program's ingenuity went to extracting the most out of a minimal repertoire of stored facts. We have seen that in the case of chess such facts might be (a) the rules of chess, (b) evaluation rules which can say of any two board positions "this one is probably stronger than that", and (c) stored "book" openings.

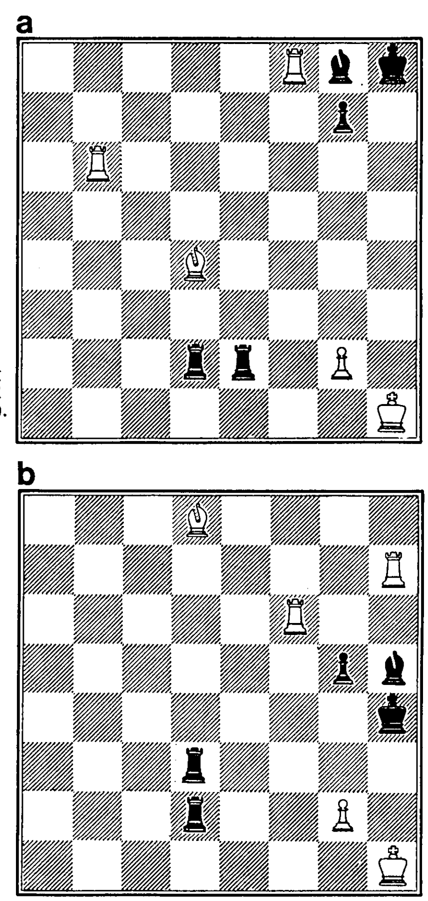

Figure 1 Two chess positions conforming to a single relational description (see text). White has the move

Chess Theorems

Why should we not add to this bare cupboard the good things which make a chess master what he is, starting with the vast mass of trite chess theorems, such as:

"Bishops cannot attack squares of opposite colour."

"A piece blocking an enemy isolated pawn is safe from pawn attack."

"King and Rook against King is a won game."

and going on to deeper theorems and postulates which separate the expert's knowledge from the club player's, the master's from the expert's, and the grandmaster's from the master's? After all, a great deal even of this last and highest body of knowledge is explicitly recorded in the published chess literature. Why not just put it all into the machine?

The short answer is that the problem of how to represent knowledge (whether of chess or of any other complex and ill-structured domain) in machine-oriented form is the focal question for machine intelligence research in the 1970s; although intensive studies are now under way, and preliminary gains have been reported, we must expect to wait awhile before the front decisively cracks.

Computer Language for Salient Features

The heart of the problem is concerned with description — with the development of computer languages and notations with powerful facilities for describing the salient and significant features of any situation. Let us try an impressionistic sketch, using both chess and non-chess examples, of some of the issues involved.

Figure 1 (a) shows a chess position, and we wish to describe it. The exhaustive specification of where every piece is has no use beyond the calculation of the tree of possibilities for look-ahead purposes. If we want to think in a broader style about the position we need a broader style of description. The use of a few relations between pieces with a more or less conventional notation might give us something like Table 2. (Pieces belonging to the side with the move — white — are shown in italics, black in bold)

Table 2

PINS, ATTACKS, DEFENSES, POSSIBLE CHECKS

KR pins **QB**
QB pins **KKtP**
QB defends *QR*
QR can check **K**
QR attacks *QB*
KR attacks *KKtP*
K defends *KKtP*
K defends **QB**
K defends **KKtP**
QR defends **KR**
KR defends **QR**
QR can check *K*
KR can check *K*

We might or might not wish to add, for some purpose or other, information concerning certain key pieces, such as "WK on KR1".

The important thing is that a schematic description of this kind defines a large class of positions the members of which are hopefully (if the descriptors have been well chosen) "essentially" similar to each other. The chess master reasons about schemas and sequences of schemas ("themes", "main variations"), resorting to detailed look-ahead, for which the human brain is ill-equipped, only when he has to.

Relational Descriptions

A compact notation for descriptions of the kind shown is given by the use of "relational structures" illustrated graphically in Figure 2. Note that such a description typically covers many positions, and a second position is shown, Figure 1 (b), which also conforms to the scheme of Figure 2. In the case chosen for illustration they do indeed have much in common; in both cases white can mate taking advantage of two pins. Moreover, this notation extends in a natural and easy way to all the usual basic concepts — "forks", "blocks", "discovered checks" and so forth.

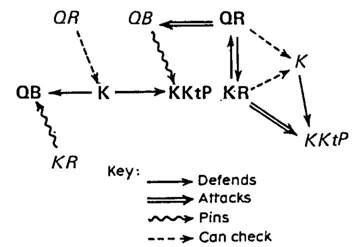

Figure 2 A relational description of the chess positions of Figure 1 drawn as a labelled directed graph (White in italics; black in bold type)

Not only do descriptive schemes of this kind correspond intuitively to the way in which chess positions are grouped for purposes of recall or for the specification of sub-goals. They are beginning to play a prominent part in mechanisation techniques in areas of machine intelligence superficially unrelated to chess.

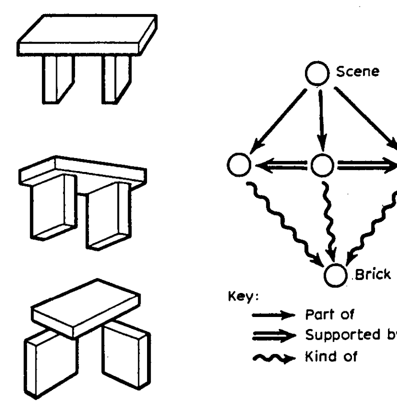

Figure 3 Graphic notation analogous to that in Figure 2, applied to a visual object

Figure 3 depicts relational descriptions, using essentially the same graphic notation, not of chess positions but of visual scenes. These structures are manipulated by a computer program written by Pat Winston and others at MIT. Its task is to construct descriptions of scenes inspected through the television camera. The figure shows a number of objects all conforming to the description for ARCH. The program can be "taught" to improve its descriptions by being shown examples and counter-examples.

The entire program occupies many times more computer memory (again, we are speaking of program space, not workspace) than the chess programs. Winston's task is an intrinsically easier one than theirs, but his program approaches it in a much deeper fashion. What are the prospects of introducing a similar degree of depth into the approach to computer chess, and what are the likely consequences of doing so?

(please turn to page 36)

Computer-Assisted Instruction Activities in Naval Research

Dr. Marshall J. Farr
Office of Naval Research
800 No. Quincy St.
Arlington, Va. 22217

"The computer is infinitely patient, and its programs can represent the teaching approaches and knowledge of the best minds in pedagogy."

Computer-Assisted Instruction (CAI) refers to the use of the computer for instruction, i.e., as a means of presenting material to, and interacting with, a student. Navy activity in this domain is directed toward utilization of the computer to provide adaptive, individualized instruction of the highest quality. Because computer technology and its programming arts are already so advanced, and are continuing to progress so rapidly, on-line interactive, man-computer communication need not be stilted and impersonal.

Advantages and Limitations

Research in CAI indicates that some students relate better to an interactive computer than to a human instructor. And, of course, a computer is not subject to human frailties. Modern time-sharing computers are highly reliable, work overtime without complaint, and never go on strike. Moreover, the computer is infinitely patient, and its programs can represent the teaching approaches and knowledge of the best minds in pedagogy as well as in diverse subject areas.

Despite the many advantages of CAI it should be recognized that the computer's tutorial effectiveness is limited by what we still do not know about basic learning processes, about why we learn, how we learn, how we remember, and how we integrate bits of knowledge into a coherent whole.

These kinds of questions have been the subjects of investigations sponsored by the Office of Naval Research and directed toward the advancement of CAI technology. These studies shed light on such aspects as individual differences in learning and means for identifying and taking advantage of an individual's unique aptitudes and abilities, while maintaining his desire to learn. In other words, CAI research is as much concerned with exploring the learning process as with controlling it.

Mixed-Initiative Dialogue

Under ONR sponsorship, Dr. Jaime Carbonell of Bolt, Beranek and Newman is pursuing research with a system called "SCHOLAR," which is characterized by a mixed-initiative dialogue between learner and computer. The term mixed-initiative indicates a man-computer relationship in which either party can take the initiative, i.e., ask and answer questions and engage in discussion. The Bolt, Beranek and Newman approach with SCHOLAR generates the computer dialogue out of a data base that is a complex but well-defined structure in the form of a semantic network of facts, concepts and procedures. A semantic information structure or network is an organization of units of information in terms of their meaning and mutual relationships. In contrast, when a network is based on how words are organized sequentially or grammatically within a sentence, it is serving as a syntactic structure.

SCHOLAR is different from the traditional approach to CAI, which may be considered to be frame-oriented. In such a system, a frame (each single display presented to the trainee) is constructed out of specific pieces of text, specific questions with their predicted answers, errors and anticipated branching. All frames in this kind of system are entered in advance by the teacher or programmer. In such a system, the student is capable of little or no initiative, and must communicate with the computer in a relatively restricted form of language. And the teacher has the burden of preparing questions, answers, and branching strategies. Here, the system controls the student; but it is incapable of real initiative or decision power of its own.

Information-Structure Oriented

In contrast to a frame-oriented system, SCHOLAR's semantic network system represents what Carbonell calls an Information-Structure-Oriented (ISO) approach. The network allows SCHOLAR to generate the material to be presented to the student in reasonably natural conversational English. In its present implementation, the experimental program, which uses

Dr. Marshall J. Farr is Director of the Personnel and Training Research Program in the Psychological Sciences Division of ONR. He also has served as Assistant Director of ONR's Engineering Psychology Program. From 1960-1964, he was a Research Psychologist at the U.S. Naval Training Device Center, then located at Port Washington, New York. Dr. Farr has taught in the Psychology Departments of Fairleigh Dickinson University and the New School (formerly the New School for Social Research) in New York City.

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South American geography as its subject, is aimed at reviewing the student's knowledge in this field. But it is being designed with a good degree of modularity in both program and data base, in order to assure ready generalization to many other examples and fields of application. A good description, with illustrations of the way SCHOLAR works, is contained in Carbonell's article in the October 1971 issue of Naval Research Reviews. Carbonell will shortly begin to evaluate the instructional merit of the full mixed-initiative capability as compared to a reduced, less interactive, version of SCHOLAR. Both versions will operate on the data base.

Performance Training

Dr. Joseph Rigney, who directs the Behavioral Technology Laboratories at the University of Southern California, has been working on a method for computer-assisted performance training, using a computer time-sharing system to help trainees to learn serial tasks, from operating equipment to electronic troubleshooting.

TASKTEACH is the generic name of two large computer programs for this tutorial system. TASKTEACH provides the student with variable amounts of learning support, as he requests it, to help him organize the material and the processes which lead to mastery. During each learning session, TASKTEACH continuously updates the history of the student's progress and the state of the equipment or task structure that it is simulating. Thus it can generate responses to the student from this updated information. TASKTEACH logic is made specific to a particular equipment or task structure by relatively short lists which describe elements and relationships among them in sufficient detail for the simulation. These lists replace the conventional, frame-by-frame description of the typical CAI instructional sequence.

Troubleshooting

To use TASKTEACH to learn to troubleshoot electronic devices from front-panel controls and indicators, the student selects a course, e.g., on the AN/SPA-66 radar repeater, and enters a problem number. This directs the program to simulate a failure in a particular circuit of the equipment. The computer then describes to the student, during its interaction with him, those front-panel indicator symptoms that the malfunction would produce. The student proceeds to collect symptoms from indicators by manipulating the front-panel controls in patterns that will (1) make particular kinds of information visible on each indicator when the equipment is functioning normally, and (2) uncover all possible symptoms of abnormal functioning. The student can do this symptom-collecting in any order he chooses. He is not constrained to a fixed procedural sequence. Furthermore, he can either ask for only one type of information at a time, or he can make a whole series of front-panel tests by entering a list of indicators and control settings in one input message. By using some of the commands in TASKTEACH that give him detailed knowledge of results, and that allow him to "look ahead" and test hypotheses about the malfunction, the student can learn about the effectiveness of each test he makes, and can increase his knowledge of possible causes of symptoms. In this way, he can learn to improve his troubleshooting strategy.

"Backwards Troubleshooting"

The student can also ask the program to "insert" a known malfunction in the equipment. He can then test his knowledge of the symptoms it would produce by attempting to predict the indicators and the types of information displayed by each, as they would be affected by this known malfunction. The program will, in this "backwards troubleshooting" mode, evaluate the student's predictions and correct those that are wrong.

Since equipment like the AN/SPA-66 radar repeater and the AN/URC-32 radio transceiver have from 20 to 40 front panel controls that have to be set in the right patterns before symptom information is visible on an indicator, the student must, of course, learn these patterns. The troubleshooting section of TASKTEACH not only corrects the student's incorrect patterns, but also includes a provision for drill in making these settings. The student can select the particular information he wants made known by some indicator. He then instructs the computer to set the controls in the correct pattern, and is given error-correcting knowledge of results by the program. The student can run through a series of these drills any time he chooses, in conjunction with a troubleshooting session.

Goal-Action Hierarchies

In addition to the troubleshooting program, TASKTEACH includes a program to help students learn other types of task structures. Radio operators, for example, could learn how to tune the transmitter in the AN/URC-32, or how to set it up in a particular one-of-five "receive modes." Similarly, a mechanic could learn how to disassemble, repair, and reassemble a mechanical device such as a carburetor. As indicated earlier, this program is made specific to a particular task by list-structures which describe goals, subgoals, actions, and constraints that specify the ways these elements are organized sequentially. Since almost all human work can be described in terms of goal-action hierarchies, this part of TASKTEACH is potentially widely applicable.

The TASKTEACH programs were designed to be used with a variety of terminals, including on-line front-panel simulators analogous to those currently being used by IBM for their in-house computer maintenance training. However, these programs currently are used with teletypes or alphanumeric CRTs and random-access slide projectors under program control. The projectors are used to display color photographs of controls and indicators on the particular equipment that is the subject of the training.

In summary of TASKTEACH, it represents a capability which provides a number of learner options, and which can be used in a number of different ways or modes. The student need not have control over the learning-support functions. They can be made automatic, left to the instructor to control, or, with a little additional programming, they can be made part of an adaptive scheme. In a similar way different kinds of troubleshooting strategies could be included as models for the student to learn.

CAI Course in Computer Programming

Professor Richard Atkinson, Chairman of the Psychology Department at Stanford University, has been in charge of administering a CAI course in computer programming at Di Anza College (a junior college near Stanford) and at UCLA. Students receive college credit for this course, which was originally developed with support from NASA Ames. For this ONR contract, Atkinson and his staff have been designing data-collection routines to measure student performance at frequent intervals during the course. In addition, the program has been constructed so as to analyze a student-written program to see if it will run on the computer. If not, the instructional program assists the student in debugging his own material.

The computer program for this course allows the learner to control what material is displayed to him, as well as his rate of learning. As the student goes through the course, his response history is recorded automatically in terms of how frequently he requests reviews, how long he devotes to various items and modules, how rapidly he responds, and so on. The Stanford group will analyze the dominant patterns of learner behavior, and correlate each individual's response-history with his course achievement. The findings will be examined to determine such things as the best time to branch, to repeat material, and to provide feedback to the student.

In the next phase of this research, two additional CAI modes will be tried. Their structure will be based on the recommendations for optimal patterns of presentation, review, feedback, etc., toward which the research on the ongoing learner-controlled CAI will lead.

Best Instruction Strategies?

Why is the mode of learner-controlled instruction a model from which optimal instructional strategies can be derived? When the student performs at his own rate, he is not constrained by a program. In a sense, he automatically selects what is most motivating to him, what he feels he needs and wants to learn. Learning might really turn out to be fun. Good students can tackle complex problems and can concentrate on conceptual rather than computational matters. But most of all, who knows better than the pupil himself what he is ready to learn next, and when he is ready? After all, learning takes place, in the final analysis, between the ears.

Now, returning to Atkinson's work: The first additional mode, a response-insensitive one, will be a straight-line, completely canned course. This means that what is presented to the learner will be inflexible, and completely independent of his responses.

The second additional mode involves a response-sensitive program, which contains the necessary logic to branch (e.g., for enrichment or remedial purposes) based on the student's ongoing course achievement and his pre-course knowledge base. Here, although the computer program tailor-makes the instruction provided to each student, based on continually-updated course-achievement information, the learner has no option to tell the program how he would like it to interact with him, or what he would like it to offer.

After these three different modes of CAI have been implemented, they will be compared with each other in terms of learning speed and quality. Each student's performance will also be examined in relation to certain personality characteristics: for example, to see whether certain types of individuals habitually do better in a highly structured, non-permissive learning environment.

Assessment of Intelligence

A Florida State University (FSU) investigation in CAI was established as part of the THEMIS program. Because of this heritage, it deals with a broad range of research efforts. Hedl, in his doctoral research under the contract, has demonstrated the feasibility and validity of an interactive approach to the individualized assessment of intelligence. Test items from the Slosson Intelligence Test, developed in 1963, were individually presented on a CRT. Students typed in their answers for immediate computer evaluation. The answer-analysis algorithm was based upon a key word/phrase dictionary for each item, which was developed from previous test-item protocols. The computer in this case, for the first time, was used for automatically administering an intelligence test, and for real-time response-evaluation. If a student's answer was either correct or incorrect, the program moved to the next item. If the answer was interpreted as partially correct, the computer instructed the student to explain more fully his response. If time limits for a given item were exceeded, the computer asked the learner to "please answer the question or type pass," and then gave him another chance at the question. If time ran out again, the item was scored as wrong, and the program went on to the next item. The computer-based version of the Slosson Intelligence Test was experimentally compared with the oral administration of the traditional Slosson Test, as well as with the Wechsler Adult Intelligence Scale (WAIS). The computer-based Slosson Intelligence Test correlated .75 with its traditional version. Equivalent concurrent validity relationships with the WAIS, for a college population were: a .54 correlation between the WASI and CB-SIT; and a .52 correlation between the WASI and the traditional SIT.

Anxieties

In other studies under this FSU contract, measures of both "trait anxiety" and "state anxiety" were taken of students engaged in learning mathematical material in a CAI mode. According to Dr. Charles Speilberger of FSU, who first conceptually differentiated these two anxiety conditions, "trait" anxiety represents the anxiety potential or proneness of an individual, or in other words, how likely he is to develop anxiety in situations commonly thought to provoke it. On the other hand, "state" anxiety is a temporary, transitory condition of actual apprehension and heightened autonomic nervous system activity. The common psychological test for measuring anxiety, the Taylor Manifest Anxiety Scale, seems to measure trait anxiety, even though Taylor, its author, propounded a theory based on state anxiety. Taylor never conceptualized two different dimensions of anxiety.

The CAI math learning investigations showed that high state-anxiety students make more errors on the difficult learning material than do low state-anxiety learners. On the easier material, both state-anxiety levels did equally well. The trait-anxiety level was not found to be related to performance.

Further FSU work on the effects of trait and state anxiety on CAI performance is more complicated, combining the types of anxiety with types of material (non-technical vs. technical) and various types of responses the subjects are called upon to make. Results here have been difficult to interpret because of interaction effects. More research is planned in this area.

Curiosity?

The FSU researchers conceptualized curiosity as also being either trait curiosity or state curiosity. A "State Curiosity Scale" (SCS) was developed to measure this type. Since curiosity is a motivational construct, it can aid in stimulating the acquisition of knowledge or skills (which is, after all, the aim of all training). The particular type of curiosity studied by FSU, that most relevant to the learning process, was given the fancy name of epistemic curiosity, which merely referred to knowledge-seeking curiosity behavior. Research by FSU indicated that, when levels of curiosity are high, levels of anxiety are low. Given the debilitating effect of high-anxiety on performance and mental functioning, it can readily be seen that maximizing curiosity to minimize anxiety has definite implications for an optimal learning environment.

Computer-Managed Instruction

Project ENRICH, another major FSU research director, refers to a CAI/CMI effort undertaken by the Naval Reserve Training Facility (NRTF) in Tallahassee with the very close support of the FSU CAI Center. What is CMI? It stands for Computer-Managed Instruction, and, in contrast to CAI, refers to the off-line use of the digital computer to collect and analyze data about a student's cumulative performance and session-to-session learning progress, and then to diagnose his learning problems and make individualized decisions with regard to the optimum next learning step for the trainee. In CMI, then, the computer is not in the loop with the learner; rather, it serves as a record keeper, test scorer, decision-maker, and selector of appropriate remedial material.

Although CMI can play a valuable role in the instructional domain, the technology behind using a computer mainly to store information and process data is not really central to instructional psychology or the tutorial side of education. The FSU research involved both CAI and CMI, in that it focused on using the computer to manage the training of, and do some instruction for, Seaman Recruit Reserves in the subject of Basic Military Requirements (BMR). The material programmed on the computer by the NRTF was taken from the Test Manual of the BMR Correspondence Course for advancement to pay grade E-2. Part of the material was taught on a CRT display under computer control. Part was monitored self study, assigned by the computer, and part was homework to read selected BMR chapters or to complete Correspondence Course assignments. The effectiveness of the program was determined by comparing the performance of the Seaman Recruits trained with CMI procedures to that of recruits of comparable ability who were conventionally trained at NRTF, Tallahassee, during previous years. The main measure of performance achieved was the Standard Navy Advancement Examination for Seaman Apprentice. Unfortunately, although 30 Seaman Recruits were requested, only six were made available. Although their average score on the final exam was no better than the average of the Seaman Recruits in the comparison group, they reached this level of achievement in about 33% less time.

Project ENRICH has demonstrated the potential value of computer-aided instruction and management in training Naval Reserve personnel. The results suggest that it would be worthwhile to carry out more definitive studies to determine the range of useful application of computer-assisted procedures in various types of Navy training programs.

Assessing Effectiveness

There are several directions in CAI that could usefully be emphasized in the future. To permit optimum utilization of the computer for instruction (rather than merely use it as an automated textbook), it is desirable to develop improved methods for assessing learning progress and adjusting the pace of the computer teaching process accordingly. Learner control of the tutorial process would take into account the fact that the student himself may very well know better than anyone else when he is prepared to tackle the next task. Research is also required to show what types of information and skills can best be taught by computer, and to determine to what extent the costs involved can be amortized through many additional uses of the computer both ashore and onboard ship. Examples are record keeping, job aids, instant technical manual update, and the like. The possibility of using satellites for remote-source instructional input to the computer on a ship should also be investigated.

Another effort which could be pursued with advantage would explore the use of the visual-display capabilities of computers in CAI. Computer graphics might allow evaluation of the extent to which "one picture is worth a thousand words" in a particular pedagogical process. The computer can, among other things, show three-dimensional representations, move complex figures through space, and depict the flow of electricity in electronic circuits.

Finally, there is need to evaluate the instructional effectiveness of CAI relative to conventional approaches. CAI, used in its most flexible way — interactively, with learner control — calls for a continual restructuring of content to adapt in real time to a students' needs and abilities. In comparisons of this approach to older methods, new kinds of base-line criteria may be required. Obviously, cost, although not an instructional criterion, will ultimately be a significant consideration. □

Unsettling, Disturbing, Critical . . .

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 Automation 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.

The Social Responsibility of Computer Specialists

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

"We must recognize that the computer specialist that develops a system used by the public will certainly affect the public. ... The unfortunate thing about technology is that the adverse effects tend to show up too late."

I would like to begin this article by asking a question: Can you, the reader, identify any connections or similarities among the following items?

Item 1. The New Yorker magazine in its issue of November 21, 1970[1] bemoaned the fact that the wondrous diversity of strange names in a big, broad and once generous country like the United States was being squashed by the computer. It refers to ominous signs that people with long names now face censorship by truncation — at least, in New Jersey. The magazine describes a letter received by an individual from the Assistant Director of the New Jersey Division of Motor Vehicles. Part of the letter states that "...because of space limitations, our electronic equipment cannot produce your name on your license in the exact manner you have requested. Only one first name of not more than nine letters, one middle initial and a surname of no more than thirteen letters can be printed on the driver license or registration certificate.

"...there are lengthy names which cannot be printed in their entirety. In these cases, the last letters will be abandoned."

Item 2. A few years ago, I went to the Toronto Airport to meet my son who was returning from New York. When he was not among the arriving passengers on his scheduled flight, I went to the airline agent to find out whether he was booked on the next flight. The airline agent was able to press a few buttons on the keyboard of the computer terminal and within seconds was able to tell me that my son was on the next flight and would be arriving within the hour. I found that computer service useful and impressive.

Item 3. About two years ago a Federal Government department in Ottawa hired a new employee to fill an important engineering position. This man refused to apply for a Social Insurance Number because he felt that it would reduce his worth as a human being. The man's boss tried to help him achieve his objective, only to learn that if a Social Insurance Number was not issued, the man could not participate in the Federal Government's pension plan. After a lengthy exchange of correspondence and noble efforts, the boss finally decided to issue a special number on behalf of the man (without the man's knowledge) to prevent the loss of pension benefits.

Item 4. The Apollo space missions would not have been feasible without computers.

Item 5. About a year ago, a newspaper account[2] told of a man who never had an oil company credit card, but kept receiving bills from the company. He wrote several letters to the company, but his letters to the credit department went unanswered and the newspaper quoted his as saying, "It is as if I were not writing to anyone at all."

Similarities or Connections?

Now, let me repeat the question I asked at the beginning. Can you identify any connections or similarities among the items I have just described? Are there any common threads that link them? You will probably be able to spot several common threads, but I would like to select two:

- First, computers can have profound effects on people; and these effects can be beneficial or harmful.
- Second, excessive emphasis on a systematic approach and a careless use of computers can erode our humanity.

My objectives in this article are:

- to discuss some effects of computers;
- to show that computer specialists play a dominant role in determining how computers affect people; and
- to discuss the computer specialist's responsibility to society.

Because of the computer's awesome speed and power, many people are beginning to realize that huge files containing information about people can be assembled, and they can influence us in profound ways. For example, we are not too far away from being able to

Harvey Gellman is President of DCF Systems Ltd., a company of management consultants that specializes in computer information systems. He holds a Ph.D. in Applied Mathematics from the University of Toronto. DCF Systems is the Consulting Division of AGT Data Systems Ltd., of which Dr. Gellman is a Vice-President and Director. Dr. Gellman has served on many national and provincial government commissions, and held positions of leadership in the management consultant field. In 1966 he was named winner of the International System Award of the Association for Systems Management, the first Canadian to be so honored.

Based on a talk before the Toronto Section of the Canadian Information Processing Society, November 1972

have a credit card computer system that could know when Mr. Smith entered a highway, where he got off, what he bought at the liquor store, who paid the rent for the girl in apartment 4B, and the hotel at which Mrs. Smith spent the rainy afternoon last Sunday. Does this sound farfetched? It is not!

Stolen Credit Cards

Mr. Milton Lipson, the vice-president in charge of corporate security at American Express, is proud of his computers and especially proud of their ability to track people who use stolen or invalid cards. He claims and can demonstrate that his system can track a person using a 'flagged' credit card with a time delay of less than twenty-four hours.[3]

Some of you may recall the news reports last year when Yves Geoffroy asked for and was granted Christmas leave from a Canadian Federal penitentiary to marry. Geoffroy decided not to return to prison but his use of an American Express credit card led police to his hideaway in Spain.[4] My reason for telling you this is not to steer those of you who want to steal with credit cards away from American Express and towards another credit card. I merely want to demonstrate that today's computers are capable of keeping track of our actions.

Valid Credit Cards

In passing, I might ask, isn't it ironical that the American Express Company has a more effective computer system to handle its stolen credit cards than to handle its valid credit cards? In fairness, I should add that the American Express billing system is much better today than it was two years ago and appears to be improving steadily.

Some people say that an honest person does not need to worry about a computer's ability to track him, or about the existence of massive computer files containing information about him. But who is to say what constitutes honest or proper behaviour? The things we do today may be considered acceptable today, but will they also be acceptable ten or twenty years from now?

Blacklists

For example, there were many talented and creative people in the United States during the depression years who were attracted to communist organizations because their failure to find employment led them to become disillusioned with the free enterprise system. In the early 1950's, some of these people found themselves "blacklisted" and unable to find work because of their earlier political affiliations. And yet in 1972, the President of the United States visited Communist China and all the writers and actors who were formerly "blacklisted" are now absolved of their old "crimes".

Unique Personal Identification Number

Some computer specialists I have spoken with are not concerned about the introduction of a universal personal identification number and many are advocating that the Social Insurance Number should be used in Canada for this purpose. They argue that if a unique personal identification number were available and used widely in Canada, there could be economic benefits from using these numbers to exchange data among various governmental and commercial organizations, such as credit bureaus, chartered banks, etc. I expect to see increasing pressure from commercial organizations for the adoption of such a number.

But I believe that it is important to insure that a personal identification number is not adopted in Canada either wilfully or by default, without a full examination and public debate of its merits and potential adverse consequences.

Some Canadian History

In the Canadian House of Commons on April 8, 1964, Mr. Diefenbaker, the leader of the Opposition, asked Mr. Pearson, the Prime Minister, whether the Social Insurance Number would be used for income tax records. Mr. Pearson replied, "Certainly not". On December 20, 1967, Mr. J. E. Pascoe, the Member from Moose Jaw-Lake Centre, asked Mr. Pearson, the Prime Minister, "Is it now Government policy to make it mandatory for all Canadians to obtain social security numbers before filing this year's income tax returns, as indicated in a recent notice sent out by the Department of National Revenue?" Mr. Pearson replied, "I would like to look into this matter, Mr. Speaker, but my impression is that this is the law now."

The revised Statutes of Canada of 1970 dealing with income tax state clearly that, "Every person who has filed a return of his income for a taxation year after 1966 and has failed to show therein the Social Insurance Number that has been assigned to him or for which he is required by this section to apply shall be deemed to have failed to complete the information on a prescribed form as required by or pursuant to section 49. 1966-67, c.91, s.21."

So you see, when some people argue that we have nothing to worry about as long as we have a benevolent government, I would ask, "Do you consider Mr. Pearson to be malevolent?" And yet, this development, in which Pearson played a role, could prove harmful in the future. I submit that every citizen has a responsibility to speak out against the politicians and bureaucrats who think nothing of infringing on a person's freedom, liberty or privacy.

Potential Effects of Technology

We need to be concerned about the potential effects of technology on our society. We can see examples of the effects produced by such technological developments as the automobile and television. When we look at computer technology we must admit that it tends to make people depend on machines instead of people. It can therefore drive people apart and make our society less humane.

Some people argue that computer specialists do not have any significant effects on society. They equate the computer specialist with the mathematician. But we must recognize that the computer specialist who develops a system used by the public will certainly affect the public. A responsible computer specialist will say, "Computers are tools like bridges. The bridges we build must carry people and we do not want them to crash." The quality of the systems produced by computer specialists, and the use to which these systems are put, will determine whether they have good or bad effects on society.

Adverse Effects are Late to Appear

The unfortunate thing about technology is that the adverse effects tend to show up too late. They are rarely visible in the early stages. So, if we let our information systems develop haphazardly we run the risk of losing control of our computer systems.

If the computer specialist does not exercise social responsibility, he may find himself suffering both as a computer specialist and as a human being. As a computer specialist, he may find himself coming under government regulation. As a human being, he should never forget that bad systems can affect him adversely as a citizen. The growth of consumerism is not a passing fad and we may get government regulation if we do not improve our computer systems.

Dehumanizing

A recent survey conducted by the American Federation of Information Processing Societies and Time magazine[5] showed that 54% of the respondents believe computers are dehumanizing people and turning them into numbers. Sixty-two percent are concerned that some large organizations keep information about millions of people. In addition, 53% believe computerized information files might be used to destroy individual freedom; 58% feel computers will be used in the future to keep people under surveillance.

About a year ago, there was a news report[6] of a lady who received a bill from a department store for $369.78. She had made no purchases. The store threatened to sue her. The matter was finally settled, but the lady believes that her credit record has been damaged with other stores.

Ralph Nader's Suggestion

Ralph Nader has commented on this problem[7] and has suggested that it is not a computer problem, but a department store problem. He suggests that we need to have complaint centres manned by citizens. Many people respect Ralph Nader. I wonder what computer specialists will do when he decides to tackle the computer community? I believe it would be a pity if the computer community behaves irresponsibly and brings on itself government regulation.

If the picture I have painted so far appears unduly gloomy, let me make a few comments to balance the perspective. I am basically quite optimistic about the future and firmly believe that most computer specialists do and will continue to behave responsibly towards society. I do not agree with the prophets of doom who see nothing but chaos and destruction in our world. These prophets of doom tend to ignore man's ability to adapt to change. For example, the New York Times book review of The Limits to Growth, a gloomy report on the predicament of mankind, stated:[8] "If the telephone company were restricted to turn-of-the-century technology, 20 million operators would be needed to handle today's volume of calls. Or, as British editor Norman Macrae has observed, an extrapolation of the trends of the 1880's would show today's cities buried under horse manure."

Kind-Hearted AND Competent

Most computer specialists whom I know are kind-hearted. But it is not enough for them to have good hearts, they must also have competence. I do not see how we can have effective systems that produce beneficial results unless the computer specialists working on those systems are competent. In fact, if I had my choice, I would prefer them to be excellent rather than merely competent.

To be excellent in something, a person must have several essential characteristics. First, he must have talent for the work he is doing. Second, he must enjoy what he is doing. Third, and perhaps most important, he must be a fanatic. A fanatic is someone who has excessive enthusiasm.

There appears to be a trend today for people to strive for jobs which are enjoyable. But you cannot have excellence if you insist that your work must be completely enjoyable. An excellent athlete has to go through a lot of hard work and painful conditioning exercises in order to equip himself to perform excellently.

The Pianist Gieseking

I understand that the wonderful pianist, the late Walter Gieseking, used to practice diligently. He was not satisfied that he had mastered a piece of music until he could play it twenty consecutive times without a single error. Much as Gieseking probably enjoyed playing the piano, I am sure that these practice sessions could not have been pure joy for him. And yet, in my opinion, the effort was worthwhile because some of his recordings are rare examples of excellence that have given pleasure to many listeners. The point is that there is no such thing as a perfect job — a job that has only pleasure and no pain. And yet, many people today are looking for jobs that are constantly challenging, interesting and enjoyable.

I know some computer specialists who are good performers as long as they are working on the interesting parts of a project, but they lose interest and perform badly when the time comes to complete the necessary detailed work. They are not interested in the details because working on details is not challenging enough for them.

Achieving Excellence

Fortunately, I have met many computer specialists, both young and old, who have a realistic recognition of the necessary joys and pains of their work and who perform with great competence.

I mentioned earlier that to achieve excellence a person must be a fanatic. I believe this is true, but unfortunately most fanatics are not easy to live with; so I would be willing to settle for a high level of competence and would not insist on excellence. But it is important to emphasize that without a high level of competence, the computer specialist cannot fulfill his duty to society because the results he produces will be deficient.

Competence is essential, but it is not enough. The computer specialist should also have a high level of integrity and ethical standards.

The Aircraft Brake Scandal

In April, 1972, Harper's magazine published an article entitled "The Aircraft Brake Scandal".[9] A major American corporation received a contract from an aircraft manufacturer to build brake assemblies for a new Air Force plane. The brake was designed by one of the company's most capable engineers, and he in turn assigned the task of producing the final production design to a newcomer in the company.

The new engineer conducted some tests of the prototype in accordance with the design and after three prototype models of the brake system had burned out, he realized that the fault lay not in defective parts or unsuitable lining material but in the basic design of the brake itself. The brake design should have included five disks instead of four in order to provide enough surface area to stop the aircraft without generating the excessive heat that caused the linings to fail.

The new engineer took his problem to his boss who had designed the brake, but his boss was too proud to admit that he had made a mistake.

During the next several months, many people in the corporation knew of the problems but kept hiding them from the customer, trying to rationalize test data to make things look good. Finally, after several near airplane crashes, the young engineer and another member of the project team told the customer what was happening. Both men resigned from the company. The young man was hired by the customer. The other man did not have a university degree and found it more difficult to find employment. He turned to journalism and is the author of the article in Harper's.

Lack of Integrity

Now you might ask, what is the connection between the Aircraft Brake Scandal and the integrity of computer specialists? I suggest that the Aircraft Brake Scandal was caused by a lack of integrity in the design engineer. I have seen several cases where computer specialists have been too proud or afraid to admit their mistakes and this has created severe difficulties for their employers. For example, in one case, a computer systems manager refused to admit to his employer that he and his team were not ready to begin operations on a newly installed computer. As a result, the company found itself operating with a deficient system. It lost control of its warehouse shipments and its accounts receivables and it took a considerable amount of time and money to regain control.

Integrity implies that the computer specialist should be more service-centred and less self-centred. He should be more willing to let his customers become involved in specifying what they want in their systems. Some computer specialists behave like some medical doctors. When a friend of mine was an army rookie, he had a cold and went to the army doctor. The doctor asked him what was wrong and my friend said, "I have a cold." The doctor barked, "Just tell me your symptoms. I'll decide whether you have a cold." In a similar way, some computer specialists try to keep their customers in a subordinate position. I find it hard to see how the computer specialist's employer can achieve full benefits from his computer systems if the computer specialist is not interested in serving the users of the systems.

I think it is fair to say that most computer specialists are intelligent and industrious. Moreover, most of them cherish their freedom. This is shown by their hatred of standards and rules for documentation. If computer specialists cherish their own freedom, then they should be willing to protect the freedom of computer users and citizens who might be adversely affected by computer systems.

Specialist vs. Professional

You may have noticed that I have kept referring to the computer specialist and have not used the term computer professional. We hear a lot of talk about professionalism. Every person working for a living wants to be called a professional. We have professional writers, golfers, salesmen, nurses, hockey players, musicians, doctors, lawyers and soldiers. It is therefore difficult to produce a good definition of the word professional. The definition which I prefer is: "A professional is someone who can do something better than most other people, even under adverse conditions."

Computer specialists should be less concerned with the forms of professionalism and more with its substance. The computer specialist can only become a professional when he demonstrates the abilities of a professional. Professionals are known as professionals because of their performance records.

I believe that the various associations of systems and computer specialists can play useful roles by helping their members earn professional status in the eyes of their customers. They can do this through education, through development of performance measures and codes of ethics. The associations could provide guidance to their members on what is right and wrong, and I believe that such guidance could have a pervasive influence on the members' employers.

Performance Measurement and Social Responsibility

I know that it is not easy to measure the performance of systems people, but it can be done. There are ways of separating the competent people from the incompetent people, and I believe that the "professional associations" should play leading roles in maintaining some kind of current record about a person's performance.

I would like to conclude with a brief summary of my main points:

- Computers can have profound effects on our lives, either beneficial or harmful.
- Computer specialists can play a dominant role in determining what these effects will be.
- If the computer specialist does not fulfill his responsibility to society he will suffer as a human being and as a computer specialist.
- The essential requirements for computer specialists are competence and integrity.
- "Professional associations" can help their members in both of these areas.

I still believe that most Canadians retain a steadfast respect for the rights of the individual. I also believe that most computer specialists are good people. They know they should pay more attention to the goals of their systems and less attention to their tools; otherwise they may become the tool of their tools.

We computer specialists know that in the long run, what is good for computer users will also be good for us. We know that we need to preserve our competence and integrity, and we know how to do it. All we need is the will to do it.

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DATABANKS IN A FREE SOCIETY:

A Summary of the Project on Computer Databanks

Professor Alan F. Westin
Department of Political Science
Columbia University
420 West 118th Street
New York, N.Y. 10027

and many associates

"Our task is to see that appropriate safeguards for the individual's rights to privacy, confidentiality, and due process, are embedded in every major record system in the nation."

Based on a summary of the Project on Computer Databanks and of its report "Databanks in a Free Society" published 1972 by Quadrangle Books, a New York Times Company, 330 Madison Ave., New York, N.Y. 10017.

The United States has become a records-oriented society.

In each major zone of personal and civic life (education, employment, credit, taxation, health, welfare, licensing, law enforcement, etc.), formal, cumulative records are assembled about each of us by hundreds of private and government record-keeping organizations. These personal histories are relied on heavily by the collecting organizations in making many decisions about our rights, benefits, and opportunities. Informal networks for sharing record-information among public and private organizations have become a common feature of organizational life heavily dependent on credentials.

During the past two decades, as most government agencies and private organizations have been computerizing their large-scale files, the American public has become concerned that dangerous changes might be taking place in this record-keeping process. Because of the computer's enormous capacities to record, store, process, and distribute data, at great speeds and in enormous volumes, many people have feared that far more personal data might be assembled about the individual than it had been feasible to collect before; that much greater sharing of confidential information might take place among the holders of computerized records; and that there might be a lessening of the individual's ability to know what records have been created about him, and to challenge their accuracy or completeness.

Alan F. Westin is Professor of Public Law and Government at Columbia University and a member of the District of Columbia Bar. For the past two decades he had written about the law and politics of civil liberties and civil rights. In 1968 he received several national awards for his book Privacy and Freedom, a comprehensive study of the social and political functions of privacy in a democratic society. Prof. Westin is a member of the National Academy of Sciences' Computer Science and Engineering Board and served as Director of the Academy's Project on Computer Databanks, 1969-72. He is also Chairman of the American Civil Liberties Union's Privacy Committee and a member of the ACLU National Board.

The book Databanks in a Free Society (currently being published by Quadrangle Books, a New York Times subsidiary) is the report of the first nationwide, factual study of what the use of computers is actually doing to record-keeping processes in the United States, and what the growth of large-scale databanks, both manual and computerized, implies for the citizen's constitutional rights to privacy and due process. This article is a summary of the book. The book also outlines the kinds of public policy issues about the use of databanks in the 1970's that must be resolved if a proper balance between the individual's civil liberties and society's needs for information, is to be achieved.

How the Study was Conducted

The book is the report of the "Project on Computer Data Banks", a three-year research study conducted under the auspices of the Computer Science and Engineering Board of the National Academy of Sciences, under grants of $164,000 from the Russell Sage Foundation. The Director of the Project was Dr. Alan F. Westin, Professor of Public Law and Government, Columbia University, and author of Privacy and Freedom, published in 1967. An inter-disciplinary staff of seven scholars from the fields of law, computer science, and the social sciences collaborated in the research. The project received continuing guidance not only from the Computer Science and Engineering Board but also a special Advisory Board of 18 prominent figures in public life whose views spanned the full spectrum of opinion on issues of databanks and civil liberties.* The final report of the project was written by Dr. Westin and Mr. Michael A. Baker, Assistant Director of the Project and an Instructor in Sociology at Brooklyn College of the City University of New York.

Sources

The major sources collected and used by the Project include:

1. Documentary materials on computerized record systems in more than 500 government agencies and private organizations.

2. Detailed on-site staff visits to 55 of the most advanced computerizing organizations, ranging across the most sensitive fields of personal record-keeping.

3. Replies from over 1500 organizations in a national mail survey of developments in computerization and record-keeping among government agencies and private organizations.

4. Extensive interviews with officials from computer companies, software houses, systems consulting firms, industry associations, civil liberties groups, labor unions, consumer organizations, minority-rights organizations, and professional associations.

5. Legal, legislative and regulatory-agency materials dealing with databank issues in 25 distinct major fields of personal record-keeping.

6. Materials and interviews on the state of databank developments and regulatory controls in 23 foreign nations, for purposes of comparison with the United States.

Organization of the Report

The Report is organized into five parts:

Part I presents a brief, orienting discussion of computer systems and civil liberties concepts for general readers.

Part II consists of "profiles" of 14 governmental, commercial, and private organizations, drawn from the 55 to which the Project staff made on-site visits. Each profile describes the nature and function of the organization, its pre-computer record-keeping, its move into computer usage, the effect of automation on its record-keeping about people, previous civil liberties issues involving the organization's manual record-keeping, the effect of computerization on civil liberties protections, and the organization's plans for further computerization in the next five years.

The 14 organizations given this detailed treatment are:

The U.S. Social Security Administration
The F.B.I.'s National Crime Information Center
Kansas City (Missouri) Police Department
New York State Department of Motor Vehicles
City of New Haven, Connecticut
Santa Clara County, California
Bank of America
TRW — Credit Data Corporation
Mutual of Omaha Insurance Company
R. L. Polk & Company
Massachusetts Institute of Technology
Church of Latter Day Saints
Office of Research, American Council on Education
Kaiser-Permanente Health Plan

Part III has three chapters which present and analyze the Project's principal findings. These include an overview of what kinds of files have and have not been computerized in advanced organizations; an analysis of computer effects on civil liberties that are <u>not</u> taking place as yet; and a description of those changes in record-keeping that the use of computers and communication systems <u>is</u> producing in these organizations.

Part IV is an analysis of the way in which the reception of computer technology is affected by organizational, legal, and socio-political factors, followed by a forecast of developments in new computer and communications technologies that are likely to occur in the remainder of the 1970's, and an analysis of their implications for civil liberties interests.

Part V discusses public policy choices in the 1970's in light of the project's findings and forecasts. The first chapter analyzes the larger socio-political significance of the computer's arrival in the late 1950's and 1960's; it goes on to suggest the basic civil liberties principles that ought to be followed when seeking to safeguard citizen rights in large-scale record systems, especially in the increasingly computerized sectors of American organizational life. The final chapter of the report presents an agenda for the 1970's, identifying six areas of priority for public policy and civic action.

Three appendixes to the report present: the results from the Project's survey of organizations; an analysis of public opinion literature on privacy and the computer; and information about the experience of other advanced industrial nations in dealing with the databanks-and-privacy problem.

Highlights of the Report

A great many commentators have warned that the spread of computers is fundamentally altering the balance between information policies of organizations and individual rights to privacy that marked past eras of record-keeping. Compared to what was done in the manual era, it is said, the new capacities of the computer <u>inevitably</u> lead organizations: to collect more detailed and intrusive personal information about individuals; to consolidate confidential information from previously separate files; and to share confidential personal data with government agencies and private organizations that had not received it before.

The Project's findings from visits to 55 organizations with highly advanced computer applications is that computerization is <u>not</u> yet having such effects in the overwhelming majority of such organizations. For a combination of technological and organizational reasons, central databank developments are far from being as advanced as many public commentaries have assumed. Organizations have so far failed to achieve the "total" consolidation of their information about individuals which raised civil liberties alarms when such goals were announced in the 1960's by various government agencies or private organizations.

* Names of staff and Advisory Board members appear later in this summary.

Continuance of Policies

Further, in computerizing their records on individuals, organizations have generally carried over the same policies on data collection and sharing that law and administrative traditions in each field had set in the pre-computer era. Where new law or practices have evolved to protect individual liberties over the past decade, organizations with computerized systems have followed such new policies as fully as those that still use manual files and procedures. Even the most highly computerized organizations continue to rely heavily on manual record-keeping and retain in their paper files the most sensitive personal information they possess.

Another widely held fear is that computerization makes it more difficult for the individual to know what is in the file about him, to have errors corrected, or have the data erased where public policy specifies that certain information about an individual's past should be ignored.

The Project's inspection of advanced systems showed that notice to the individual about a record's existence, opportunity to inspect and challenge that record, and policies as to the removal of out-of-date or irrelevant information were not being substantially altered by computerization. Where policies affording individuals rights of due process such as the above had been provided in an organization prior to computerization, those rules are being followed in the new computerized systems as well. Where no such rights were given, the adoption of computers has not made the situation either worse or better. Neither has computerization introduced impersonal decision-making in systems where this was not present before, nor forced organizations into greater reliance on "the record" in making decisions about clients, customers or citizens. Where abuses along these lines were present in computerized systems — raising serious due process questions — they had been carried over from the high-volume "processing" of people in the manual era.

Public Misunderstanding

Over and over again, the Project's findings indicate profound public misunderstanding about the effect of computers on large scale record systems. To some extent, the inflated claims and proposals of organizational managers about the capacities of their computer systems helped to generate what were in fact baseless concerns for privacy on the part of the public.

In addition, as the Report shows with respect to law enforcement uses and airline-reservations and charge-card systems, many commentators on computers and privacy issues have failed to do adequate research into the actual operations of systems about which they write, and have presented entirely incorrect pictures to the press and public about how these computer systems work. The danger in this, the report points out, is that we may give up the fight in the belief we have already lost:

> If we assume that computer users are already doing things that they are not, we risk surrendering without a fight the border between properly limited and surveillance-oriented computer applications. ... The question of what border control measures should be adopted can hardly be understood and properly considered ... if the public and opinion leaders assume that the borders have already been obliterated.

Efficiency

Computerization in advanced organizations <u>is</u> producing changes in record-keeping methods that can increase the efficiency with which organizations carry out their basic decision-making about the people they process or serve. Computerization is making it possible for many organizations to: maintain more up-to-date and complete records; obtain faster responses to inquiries about a given individual; and make more extensive use of information already in the files. Computers have also made possible dramatic expansion of networks for exchange of data among organizations that have shared data since pre-computer days; and the creation of some large data bases of information about people that would not have been feasible without automation. These changes have been felt already in police information systems, national credit reporting systems, charge card systems, and others.

Data-Sharing

Looking at technological trends for the remaining years of the 1970's, the Report forecasts that while there will be important continued increases in computer capabilities, no developments are now foreseeable that will alter the technological, organizational, and socio-political considerations that presently frame the databanks and civil liberties issue. Organizations will have more flexible, reliable, and cost-effective computer systems to use in pursuit of their policies, but these will not represent a radical departure from the computer capabilities presently available. The most important development with implications for civil liberties interests will be an increase in the ease with which data can be shared among organizations which have computers, coupled with a reduction in the cost of doing so. This will make it imperative that legal boundaries as to data-sharing are set as clearly as possible.

Augmenting the Power of Organizations

The Project concluded that the real issue of databanks and civil liberty facing the nation today is not that revolutionary new capacities for data surveillance have come into being as a result of computerization. The real issue is that computers arrived to augment the power of organizations just when the United States entered a period of fundamental debate over social policies and organizational practices, and when the traditional authority of government institutions and private organizations has become the object of wide-spread dissent.

Challenge of Goals

Important segments of the population have challenged the goals of major organizations that use personal records to control the rights, benefits, and opportunities of Americans. There is also debate over the criteria that are used to make such judgments (religious, racial, political, cultural, sexual, educational, etc.), and over the procedures by which the decisions are reached, especially those that involve secret proceedings and prevent individuals from having access to their own records.

Distrust of Organizational Record-Keeping

Computers are making the record-keeping of many organizations more efficient precisely at the moment when trust in many large organizations is low and when major segments of the American population are calling for changes in values that underly various social programs, for new definitions of personal rights, and for organizational authorities to make their decision-making procedures more open to public scrutiny and to the review of specific individuals involved.

Little Legislation

Despite the rapid spread of computers, there has been little so far by way of new legislation, judicial rulings, regulatory-agency rules, or other legal remedies defining new rights to privacy and due process in major record systems. The Report stresses that, because of the increased efficiency of record-keeping and the growing intensity of the public's concern, the middle 1970's is the moment when law-makers and the public must confront both long-standing and newly-raised civil liberties issues, and evolve a new structure of law and policy to apply principles of privacy and due process to large-scale record-keeping.

The Report identifies six areas of priority for public action, and presents examples of specific policy measures under each of these that ought to be seriously considered by policy makers:

Right of Access and Challenge

Development of laws to give the individual a right of access and challenge to almost every file in which records about him are kept by city, county, state, or government agencies: At stake here is the possibility that, denied access to records being used for decisions about himself, the citizen is left with "feelings of powerlessness and the conviction that government authority is fundamentally arbitrary."

At the very least, citizens ought to know what record systems exist in government agencies. A Citizen's Guide to Files, published at every appropriate level of government jurisdiction, should "provide the citizen with a thorough, detailed and non-technical directory of the record systems that contain information about him, and the general rules under which it is being held and used." Providing adequate due process protection in government files, the Report suggests, is best achieved by assuming that any individual should be able to see and get a copy of any records used to affect him or her personally — with the record-keeping agency "bearing the burden of proving that some specific public interest justifies denying access."

Explicit Rules

Develop of explicit laws or rules balancing confidentiality and data-sharing in many sensitive record systems that today do not have clearly defined rules: Among these would be rules governing the provision of information to law enforcement agencies from bank accounts, travel and entertainment card records, airline and hotel reservation systems, etc. The Report predicts that one or two large systems will come to dominate in each of these areas.

> This development will make the individual's account record more comprehensive and a very inviting target for investigators of all kinds. With that rise in sensitivity and attractiveness ought to go legislative enactments spelling out retention and destruction policies, confidentiality rules, and procedures for protecting individual rights when outsiders seek to obtain access for what are asserted to be lawful and necessary purposes.

As a case study in how not to build new record systems, the Report discusses some of the major Administration and Congressional proposals for national welfare reform, which generally hinge on the availability of computers for massive data storage and exchange. Several of the welfare system proposals contain "sweeping authorizations for data collection and sharing but almost nothing by way of confidentiality standards and due-process review procedures." The Report points out that we may be "creating one of the largest, most sensitive, and highly computerized record systems in the nation's history, without explicit protections for the civil liberties of millions of persons whose lives will be profoundly affected ... "

Records of the Wrong Kind

Limit the collection of personal information where a proper regard for the citizen's right to privacy suggests that records ought not to be maintained at all by certain organizations, or never furnished for certain uses in the society: Among the examples are the use of arrest-only records in licensing and employment decisions, and the selling to commercial advertising services of names and addresses collected by government under its licensing and regulatory powers, unless the individual specifically consents to such use.

In the case of arrest records, the Report stresses that:

> A democratic society should not allow arrest records to be collected and circulated nationwide with increasing efficiency without considering directly the actual social impact of their use in the employment and licensing spheres, and without examining the possibility that dissemination beyond law-enforcement agencies represents an official stigmatization of the citizen that ought to be either forbidden by law, or closely regulated.

Social Policy

Increased work by the computer industry and professionals within it on technological safeguards which will make it possible to implement confidentiality policies more effectively than is now feasible: The Report notes that:

> No 'technological fix' can be applied to the databank problem. Protection of privacy is a matter of social policy, on which computer professionals are fellow-citizens, not experts.

But the Project calls for more research, development and testing efforts to be undertaken by the computer industry to see that the computer's capacities for protection of confidentiality and insurance of proper citizen access are turned into "available and workable products". Law and public pressure, the Report suggests, require that such measures be taken by managers of sensitive record systems when they are computerized, thereby stimulating the "user demand" to provide a practical market for such devices and techniques.

No Extension of Use of Social Security Number

Reconsideration by Congress and the executive branch of the current permissive policies toward use of the social security number in an increasing number of government and private record systems: The Report notes that having such a number is not a prerequisite for linking files within or between organizations, but notes that a common numbering system clearly makes record linkage easier and cheaper. Further, the Project concludes that resolving the critical civil liberties issues in record keeping "will require that a minimum level of trust be maintained between American citizens and their government. Under these conditions, adopting the social security number as a national identifier or letting its use spread unchecked cannot help but contribute to public distrust of government."

Information-Trust Agencies

Experimentation with special information-trust agencies to hold particularly sensitive bodies of personal data: For example, the Report suggests that the handling of both national crime statistics and summary criminal histories ("rap sheets") might be taken away from the Federal Bureau of Investigation and placed in an independent national agency under control of a board that would have public representatives as well as law enforcement officials on it. Such an agency would have to be established "with a clear legislative mandate to be a 'guardian' institution," paying attention to civil liberties interests as well as law enforcement needs.

Critical Period, 1973-78

The Report stressed that the next five years would be a critical period in the reception and control of sensitive personal record systems, especially those managed by computers. More sensitive areas of record-keeping are being entered by many computerizing organizations; many larger online (instant access) networks are being brought into operations; and more consolidations of presently scattered records about individuals can be seen as a trend in certain areas, such as criminal justice, credit and financial transactions, and welfare. The Report stresses that unless lawmakers and organizational managers develop proper safeguards for privacy and due process, and create mechanisms for public scrutiny and review, the record systems they are building could sharpen the already serious debate in American society over the way to apportion rights, benefits, and opportunities in a credential-oriented society, and leave organizational uses of records to control individual futures too far outside the rule of law.

In its closing paragraphs, the Report sums up the databanks and civil liberties problem as follows:

> If our empirical findings showed anything, they indicate that man is still in charge of the machines. What is collected, for what purposes, with whom information is shared, and what opportunities individuals have to see and contest records are all matters of policy choice, not technological determinism. Man cannot escape his social or moral responsibilities by murmuring feebly that "the Machine made me do it."
>
> There is also a powerful tendency to romanticize the pre-computer era as a time of robust privacy, respect for individuality in organizations, and "face-to-face" relations in decision-making. Such arcadian notions delude us. In every age, limiting the arbitrary use of power, applying broad principles of civil liberty to the troubles and challenges of that time, and using technology to advance the social well-being of the nation represent terribly hard questions of public policy, and always will. We do not help resolve our current dilemmas by thinking that earlier ages had magic answers.
>
> Computers are here to stay. So are large organizations and the need for data. So is the American commitment to civil liberty. Equally real are the social cleavages and cultural reassessments that mark our era. Our task is to see that appropriate safeguards for the individual's rights to privacy, confidentiality, and due process are embedded in every major record system in the nation, particularly the computerizing systems that promise to be the setting for most important organizational uses of information affecting individuals in the coming decades.

Notes

Staff and Advisory Bodies to the Project

Staff Associates for the Project were:

Robert F Boruch, Assistant Professor, Department of Psychology, Northwestern University
Howard Campaigne, Professor of Mathematics, Slippery Rock State College
Gerald L. Grotta, Associate Professor of Journalism, Southern Illinois University
Lance J. Hoffman, Assistant Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley
Charles Lister, Attorney at Law, Washington, D.C.

Advisory Group

The Project had during its existence an Advisory Group that provided the staff with a wide range of diverse viewpoints on the databanks and civil liberties issue and helped shape the project's studies. Members of the Advisory Group were:

Edgar S. Dunn, Jr.
Resources for the Future, Inc.
The Honorable Cornelius E. Gallagher
House of Representatives
Richard Freund
First National City Bank
Justice Nathan L. Jacobs
New Jersey Supreme Court
Nicholas deB. Katzenbach
Vice President and General Counsel, IBM Corp.
John H. Knowles
President, Rockefeller Foundation
Arthur R. Miller
Professor of Law, Harvard University Law School
George A. Miller
Institute for Advanced Study, Princeton, N.J.
Ralph Nader
Attorney, Washington, D.C.
Arthur Naftalin
Professor of Public Affairs, Univ. of Minnesota
Anthony G. Oettinger
Harvard University
John R. Pierce
California Institute of Technology
The Honorable Ogden R. Reid
House of Representatives
L. F. Reiser
Corporate Director, Personnel and Industrial Relations, CPC International Inc.
Richard Ruggles
Department of Economics, Yale University
Roderick O. Symmes
Director, Data Systems & Statistics Staff, U.S. Dept. of Housing and Urban Development
Roy Nutt
Vice President, Computer Sciences Corporation □

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EIGHT PHOTOGRAPHS OF A BUSH: ANSWERS —

Pictorial Reasoning Tests — Part 8

Neil Macdonald
Assistant Editor, Computers and Automation

> "There undoubtedly is a place for non-verbal, non-mathematical testing which is not culture-limited, not occupation-limited, and not background-limited ... and which would enable finding and employing many useful people — including programmers — who do not have American, middle-class backgrounds."

The pictorial reasoning tests which we have been publishing since October 1971 require: observation, perception, comparison, recognition of shapes and designs, and reasoning. These operations are difficult for a computer program (except for the reasoning), yet stimulating to a human being. The techniques needed are those which we as human beings have had to use (and improve) all our lives.

New Style of Test

In the October issue we published a sample of a new style of test, Style 6. It consisted of eight photographs of the same bush taken from time to time during 1972. The photographs were printed in a random sequence, and the test consisted of a number of questions about the photographs. The photographs were published on successive odd-numbered pages of the October issue of "Computers and Automation" so that a reader might cut the eight pictures out of the magazine, place them side by side, and compare them.

Here we give the answers to the test, with some explanation of the observations and the reasoning needed. To understand fully these answers, please refer to the October issue of "Computers and Automation", to the eight pictures (labeled A to H) printed on pages 29, 31, 33, and 35. Except for the pictures, the following discussion is largely self-contained and is independent of what was printed in the October issue.

The introduction to the text contained important information for answering the set of questions:

> Across from our office which is on the north side of Washington St. in Newtonville, Mass. is a strong wire link fence. This fence separates Washington St. from a steep embankment descending to lower ground, occupied by a railroad and a turnpike. At one place on the steep bank behind the fence grows a vigorous bush which pushes its branches against and through the wire fence. The distance between the left end and the right end of one link in the wire fence has been measured at 3¼ inches.

This information implies that (1) the photographs were all taken in the same direction, south, and also (2) gives a scale for measuring what is in any picture.

Bush. Question 1: What kind of bush is pictured? Answer: A rose bush. The five petaled flower showing in picture B (two inches in from the left edge, and one inch above the pipe) is typically the flower of a rose.

Chronological Sequence. Question 2: What is the correct sequence of the pictures? Answer:

F H E B G C D A

Reasons: (1) The buds and the flowers provide the key to the first four pictures. In F, the buds compared with the leaves are smallest. In H, the buds are larger, but there are still no flowers. In E, there is an open flower. In B, there are more open flowers, but many petals have fallen off. In G, D, C, and A, there are no buds and no flowers, and so we have to look further for more evidence.

(2) The sepals (bud coverings) provide some of the key for the last four pictures. They are curved out and backwards in pictures G, D, and C; and they have all fallen off in picture A, which is therefore the last.

(3) The tallest and most prominent flower stalk showing in pictures F, H, and E, about 3 inches in from the left edge, is missing in all later pictures. Evidently some one cut it off. The stalk by itself shows in pictures B and G. In D, the stalk has put out a shoot, with pale leaves, about 2 or 3 inches long, showing in front of the pipe and partially crossing it. In C, the shoot is twice as big, about 5 inches long (entirely crossing the pipe), still with pale leaves; and in A the leaves of the shoot are like the rest of the bush, all of the same degree of darkness; and the shoot is no longer clearly distinct.

Time of Day and Compass Direction. Questions 3 and 4: About what time of day were the pictures taken? and what was the approximate compass direction of the sun?

Answer: The question implies that all the pictures were taken at about the same time of day. Inspection of the eight pictures shows that this is reasonable. Picture H shows brightly contrasting light and shadow; at the bottom, about 3 inches in from the left edge, the shadow of a stem falls across the middle of a leaf to the left; therefore, the sun is at the right. To the right of south is west (in the Northern Hemisphere). Therefore, the sun is in the west, and the time of day is the later part of the afternoon.

Weather. Question 5: For each picture, was the weather sunny and bright? or hazy and dull?

Answer: D, G, and H show sharp contrasts between leaves in sun and leaves in shadow; therefore, in those pictures, the weather was sunny and bright. For the other five pictures, A, B, C, E, F, the weather was hazy and dull, with no sharp shadows.

Distance. Questions 6 and 7: What pictures were taken closest and furthest?

Answer: It is reasonable to assume that all the pictures were taken with the same kind of camera, lens, and film. (This was in fact true.) By measuring the size of the fence links, or by counting the number of links shown in each picture, we can deduce that D was taken closest to the bush and E was taken furthest away.

Duration. Question 8: What was the approximate period of time from the earliest picture to the latest picture?

Answer: About two months (or nine or ten weeks).

Time Intervals between Pictures. Question 9: What was the approximate interval of time between one picture and the next one? Were all the intervals about the same?

Answer: The first seven pictures are about a week apart. The last picture is about three or four weeks after the next to the last.

Calendar Date. Question 10: Approximately what calendar date or calendar week was each picture taken?

This question can probably be answered well only by someone who actually has uncommon knowledge about roses, and who can adjust his knowledge to the seasons in the Boston area. Under these conditions, the following answer is deducible from the pictures. Answer: First picture, end of June / Next four pictures, weekly in July / Next two pictures, first week and second week in August / Last picture, first or second week in September. — The actual dates of the pictures (this of course is not deducible from the pictures) are: F, June 29; H, July 7; E, July 12; B, July 20; G, July 26; D, Aug. 4; C, Aug. 10; A, Sept. 8 (1972).

History. Question 11: What were some ten major events that happened to the bush during the period of the series of pictures?

Answer: Buds opened into flowers / Flowers bloomed / Flower petals fell off / Sepals (the bud coverings) opened / Sepals bent back / Sepals fell off / Rose haws formed / Rose haws became quite large / Two major flower stalks were picked / The stub of one of the flower stalks put forth a shoot / The shoot grew vigorously / The pale green leaves of the shoot changed to normally dark green leaves. / Apparently, between the last two pictures, something happened to the top of the shoot, for its top does not show in the last picture; one thing that might have happened is that it withered as a result of late summer drought.

I showed this test to a friend of mine who teaches botany; she said "This would be an excellent test for students in botany and biology classes". Whether it is as good a test for persons who have only casual acquaintance with plants is open to question. But there is little doubt in my mind that Sherlock Holmes, Arthur Conan Doyle's famous detective character, would have done extremely well on this test — for he made it his business to be as observant as possible of details that related to deducing conclusions about what had happened in relation to crimes or potential crimes.

Perhaps some readers of "Computers and Automation" would like to send us a set of 8 related photographs (6 is rather few, 10 is rather many) of a subject, with searching questions in observation and reasoning; we would be much interested in publishing additional pictorial reasoning tests of this nature.

Also, does any reader have a computer program which might attain a good score on this test? □

c.a NUMBLES

Neil Macdonald
Assistant Editor
Computers and Automation

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

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

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

Andrew M. Langer
Newton High School
Newton, Mass.

NUMBLE 731

```
          F O R E       P = E
      x S I G H T       F = R
      -----------
        G F E R I
      O G L G O
    P N E N G
  H E S H N
G L N L H
-------------------
G H S E N T P S I     83270 81294 715
```

Solution to Numble 7212

In Numble 7212 in the December issue, the digits 0 through 9 are represented by letters as follows:

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

The message is: Life is a dancing girl.

Our thanks to the following individuals for submitting their solutions – **to Numble 7211**: Harold Schofield, Davenport, Ia.; Jack Smock, Palo Alto, Calif. – **to Numble 7210**: E. A. Finn, Tucson, Ariz. – **to Numble 729**: T. M. Kaegi, CH-9500 Wil, Switzerland; M. H. Davies, Bath, England.

President Richard M. Nixon, the Bay of Pigs, and the Watergate Incident

Richard E. Sprague
Hartsdale, N.Y. 10530

"The similarities between the actions of E. Howard Hunt, Jr., James McCord, Bernard Barker, Frank Sturgis, and others in 1960 planning for the Bay of Pigs and in 1972 planning for re-election of Richard M. Nixon are very striking."

Introduction

This article is another installment of a continuing report on the Watergate Incident, and its ramifications. The incident consisted of the breaking in of the offices of the National Committee of the Democratic Party, on the 6th floor of the Watergate Office Building, Washington, D.C., and resulting arrests. The forced entry took place around 2:30 a.m., Saturday, June 17; five men were arrested by Washington police. They had with them extensive photographic equipment and electronic surveillance devices, and wore rubber surgical gloves. The five men arrested were:

- James W. McCord; a Lt. Colonel in the U.S. Air Force Reserve; 19 years service with the CIA; head of a security agency; on the payroll of the Committee to Re-elect the President as late as May 31, 1972; an organizer of the CIA for the Bay of Pigs invasion of Cuba in 1961.
- Bernard L. Barker; a Cuban-born Miami business man; long associated with the CIA; he established secret Guatemalan and Nicaraguan invasion bases.
- Frank Fiorini (alias Frank Sturgis)
- Eugenio R. Martinez
- Virgilio R. Gonzalez

These men were closely connected with:

the Republican Party,
the White House,
President Richard M. Nixon,
the Central Intelligence Agency, and
the Committee for Re-Election of the President.

For more information and background, see the prior articles on this subject, published in "Computers and Automation", August, October, and December, 1972.

Questions to President Nixon

The Watergate Incident raised questions during the election campaign about the relationships between President Richard M. Nixon and the Watergate invasion team. The President denied any knowledge of the Watergate affair and issued statements saying that no one in the White House was connected with the operation. To test the reliability of Mr. Nixon's official statements it is necessary to go back to the campaign of 1960 and the Bay of Pigs.

The Bay of Pigs Invasion

Many citizens of America have forgotten that Richard Nixon in 1959 and 1960 was Vice President of the United States. As an old anti-communist from Alger Hiss and Khrushchev debate days, Nixon was in the forefront of pressure for the Bay of Pigs invasion of Cuba. What has not been remembered is that Nixon was largely responsible for the covert training of Cuban exiles by the CIA in preparation for the Bay of Pigs. He so stated in his book "Six Crises".

Nixon's Lies October 1960

Mr. Nixon's truth-telling capacity during an election campaign is nowhere more clearly demonstrated than by the deliberate lies he told on national TV on October 21, 1960. He said in his book that the lies were told for a patriotic reason, namely to protect the covert operations planned for the Bay of Pigs at all costs. The significance of this is that Mr. Nixon considers patriotism as covering the protection of plans or the actions of individuals that he considers are working for the United States' best interests.

The similarities between the actions of Everette Howard Hunt, Jr., James McCord, Bernard Barker, Frank Sturgis, and others in 1960 planning for the Bay of Pigs and in 1972 planning for the re-election of Richard M. Nixon are very striking. In both cases, what the plotters themselves considered to be patriotic, anti-Communist actions, were involved. In 1960 the actions were directed against Fidel Castro, a man they hated as a Communist. In 1972 the actions were directed against Edward Kennedy, Edmund Muskie, and finally George McGovern. Bernard Barker stated the group's collective belief when he said after his arrest that, "We believe that an election of McGovern would be the beginning of a trend that would lead to socialism and communism, or whatever you want to call it."

Nixon admitted lying to the American people to protect Hunt, Barker, Sturgis, and McCord in 1960. The likelihood that he lied to protect them again in 1972 seems to be quite good. The likelihood that he actually hired the same old crew he trusted from the Bay of Pigs days for the 1972 Watergate and other espionage activities, also seems to be rather good.

Here are the facts.

Nixon's Statements in "Six Crises"

Richard Nixon stated in "Six Crises":[1] "The covert training of Cuban exiles by the CIA was due in substantial part, at least, to my efforts. This had been adopted as a policy as a result of my direct support." "President Eisenhower had order the CIA to arm and train the exiles in May of 1960. Nixon and his advisors wanted the CIA invasion to take place before the voters went to the polls on November 8, 1960."[2]

While the Bay of Pigs operation was under the overall CIA direction of Allen Dulles, Richard M. Bissell, Jr. was the CIA man in charge, according to Ross & Wise.[3] Charles Cabell,[4] the deputy director of the CIA, and a man with the code name Frank Bender, were also near the top of the operational planning.[5]

E. Howard Hunt

Everette Howard Hunt, Jr. was in charge of the actual invasion, using the code name "Eduardo". Bernard L. Barker, using the code name "Macho," worked for Hunt in the CIA Bay of Pigs planning. James McCord was an organizer for the invasion and was one of the highest ranking officials in the CIA. Frank Sturgis, alias Frank Fiorini, was also involved in the Bay of Pigs operations. Virgilio Gonzales was a CIA agent active in the Bay of Pigs and so was Eugenio Martinez. Charles Colson was a former CIA official who knew McCord and Hunt during the Bay of Pigs period.[6]

Hunt, Barker, McCord, Sturgis, Gonzales, and Martinez are under indictment for the Watergate affair. Colson is Nixon's special counsel who handles "touchy" political assignments. According to <u>Time</u> magazine, Colson brought all of the others into the re-election committee espionage project at the request of Nixon.[7]

In other words, the same basic group who worked for Nixon, Bissell and Co. in 1960, were also working for Nixon, Colson and Co. in 1972. They were all "loyal, patriotic," anti-Communist, anti-Castro CIA agents with covert (black) espionage training. They needed Nixon's protection in 1960 and 1972, and they got it both times.

In 1960 here is how Nixon protected them.[8]

Kennedy-Nixon Debates, 1960

John Kennedy and Richard Nixon engaged in a series of national TV debates during the 1960 campaign. Kennedy was briefed by Allen Dulles, head of the CIA at Eisenhower's request, on secret CIA activities and international problems, on July 23, 1960. Nixon was not aware of the briefing contents and was not sure whether Dulles told Kennedy about the Bay of Pigs plans. As it turned out Dulles had not mentioned the plans but had kept his remarks rather general about Cuba.

On October 6, 1960, Kennedy gave his major speech on Cuba. He said that events might create an opportunity for the U.S. to bring influence on behalf of the cause of freedom in Cuba. He called for encouraging those liberty-loving Cubans who were leading the resistance to Castro.

Nixon became very disturbed about this because he felt Kennedy was trying to pre-empt a policy which he claimed as his own. Nixon ordered Fred Seaton, Secretary of the Interior, to call the White House and find out whether Dulles had briefed Kennedy on the Cuban invasion plans. Seaton talked to General Andrew Goodpaster, Eisenhower's link to the CIA, who told Seaton that Kennedy <u>did</u> know about the Bay of Pigs plans.

Attack on Kennedy by Lying

Nixon became incensed. He said, "There was only one thing I could do. The covert operation had to be protected at all costs. I must not even suggest by implication that the U.S. was rendering aid to rebel forces in and out of Cuba. In fact, I must go to the other extreme: I must attack the Kennedy proposal to provide such aid as wrong and irresponsible because it would violate our treaty commitments."[9]

So Richard M. Nixon, then our Vice President, now our President, actually went on national TV (ABC) on October 21, 1960, knowing we were going to invade Cuba, and lied like a "patriotic" trouper. He said during the fourth TV debate that Kennedy's proposal was dangerously irresponsible and that it would violate five treaties between the U.S. and Latin America as well as the United Nations' Charter.[10]

On October 22 at Muhlenberg College, Nixon really turned on the fabrication steam. He said, "Kennedy called for — and get this — the U.S. Government to support a revolution in Cuba, and I say that this is the most shockingly reckless proposal ever made in our history by a presidential candidate during a campaign — and I'll tell you why. ..."

The reason we must take with a grain of salt whatever words the President utters about Watergate and Donald Segretti's espionage is clearly demonstrated in that October 22, 1960 speech. He not only fiercely attacked John Kennedy for advocating a plan that he, Richard Nixon, secretly advocated but one that he claimed as his own creation. Not only that, but he later had the sheer gall to brag about it in his own book as a very patriotic act.

Today, the "patriotic" act is the re-election of Mr. Nixon, and the prevention of communism from taking over the White House.

Protection of Hunt and Co.

How is Nixon protecting Hunt and company now? He is using the Justice Department and the Republican Congressmen, plus others, to delay and dilute the prosecution of the Watergate seven. He has slowed down, suppressed, and all but stopped six separate investigations, suits, and trials of the affair. These are: Wright Patman's House Banking Committee investigation, the FBI-Justice Department investigation, a White House investigation by John Dean, a General Accounting Office investigation, a suit by the Democratic Party, and a trial in criminal court of the seven invaders. Only two trials or investigations have a chance of exposing the truth. One of these, a trial of Bernard Barker in Florida, has ended with not much help. The other is an investigation promised by Senator Edward Kennedy using his Senate subcommittee.

So the battle for truth boils down again to a Nixon vs. a Kennedy. Apparently, the only power or strength in the U.S. since 1959 able to contest the power of Richard M. Nixon and his cohorts is the strength of the Kennedy family and name.

Footnotes

1. "Six Crises". Richard M. Nixon. Doubleday, 1962.
2. "The Invisible Government". Wise & Ross. Random House, 1964.
3. Ibid.
4. Brother of Earl Cabell, mayor of Dallas when Kennedy was assassinated.
5. Ibid.
6. "New York Times" articles on Watergate, June 18 to July 2, 1972.
7. "Time" magazine, September 8, 1972.
8. This episode is related in detail in "The Invisible Government".
9. "Six Crises".
10. "The Invisible Government".

Appendix 1
E. Howard Hunt

Who is Everette Howard Hunt? His cover identity as a CIA agent by the name of "Eduardo" during the Bay of Pigs is well known. His novels about spies, writing under the pseudonyms of Robert Dietrich, Gordon Davis, and John Baxter, are also well known.

Apparently Mr. Hunt had reason to disguise his true identity when he became an author named Dietrich. At least he seemed to try and mislead the publishing field. The chart below shows how Mr. Hunt described himself to both Who's Who in America, and Contemporary Authors, a publication listing each year new or recent authors.

It should be remembered that Who's Who does some checking on the person listed, while Contemporary Authors does not. Contemporary Authors merely reprints whatever the author sends in. Also, the only link in the two publications between the two men is the pseudonym Robert Dietrich listed under Hunt's biography in Who's Who.

Comparison of E. Howard Hunt & Robert Dietrich

Source	Who's Who in America 1972	Contemporary Authors 1963
Name	Everette Howard Hunt, Jr.	Robert Salisbury Dietrich
Birthdate	October 9, 1918	October 9, 1928
Birthplace	Hamburg, N.Y.	Washington, D.C.
Age	54	44
Father	Everette Howard Hunt	Everette Howard Dietrich
Mother	Ethel Jean Hunt	Ethel Jean Dietrich
Mother's Maiden Name	Ethel Jean Totterdale	Ethel Jean Totterdale
Residence	Witches Island, River Road, Potomac, Md. (1972)	5029 Millwood Lane, Washington, D.C. (1963)
Pseudonyms	Robert Dietrich, John Baxter, Gordon Davis	Gordon Davis
Occupation	Public Relations Consultant, author, government official	U.S. Government, Internal Revenue Service
Education	AB, Brown University, 1940	CPA George Washington University, 1950; LLB, George Washington University, 1957
Military	USNR 1940-42, USAAF 1st Lt., Political Officer-Far East Comd. 1954-56	U.S. Army Infantry 1951-53 1st Lt., Bronze Star
Marital Status	Married-Dorothy Wetzel Sept. 7, 1949	None listed
Children	Lisa Tiffany, Kevan, Howard, David	None listed
Career	Movie script writer, editor March of Time, war correspondent Life magazine 1943, screen writer 1947-48, attached U.S. embassy Paris, France 1948-49, Vienna, Austria 1949-50, Mexico City 1950-53, Far East Command Tokyo 1954-56, First Secretary consul Montevideo, Uruguay 1957-60, Dept. of Defense 1960-65, Dept. State 1968-70, Robert Mullen & Co. 1970-71, Consultant to the President 1971-72	U.S. Government, Internal Revenue Service 1949-51, private tax consultant 1953-63
Awards	Guggenheim fellow 1946	None listed
Clubs	Brown University (NYC), Army & Navy, Lakewood Country Club Washington, D.C.	American Institute of Accountancy, Bar Association District of Columbia, Army & Navy, Lawyers Agent: Littauer & Wilkinson (NYC), office Washington Bldg. Washington, D.C.
Writings	Author 1942-72, Pseudonyms: Robert Dietrich, John Baxter, Gordon Davis; Contributor to foreign affairs and political journals	11 books listed under Gordon Davis
Hobbies	None listed	Sailing, shooting, riding

(Continued on next page)

c.a

PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

PROBLEM 731: A SIMPLE SOLUTION

Bob had hardly entered the Computer Center when Al asked him, "Ever have the experience of telling someone how to solve a problem only to have him say, 'We haven't had that yet in this course; we can't use that'?"

"Many times," Bob replied. "It's a little like speaking Basic English. You have to keep thinking of what words not to use. What brought this up?"

"Joe has a problem in his course which involves finding the larger of two numbers, using a certain very simple computer. It can perform only the operations of addition, subtraction, multiplication, division, and taking the absolute value. Joe's a little puzzled."

"Why doesn't he just subtract one from the other and see whether the result is positive or negative?"

"That was his first thought," Al said. "But 'see whether the result is positive or negative' is not in the instruction set of his computer."

"Hmm. He might be able to Monte Carlo it. Try all sorts of random combinations of the five operations and ..."

"No need to do anything so complicated," Al interrupted. "It's very simple."

How can the larger of two numbers be determined using only the operations mentioned?

Solution to Problem 7212: No Losers

Al, Bob, and Charlie began with $32, $56, and $74 respectively. After the first game they had $96, $24, and $42; after the second game, $72, $72, and $18; and after the third game, $54 each.

Readers are invited to submit problems (and their solutions) for publication in this column to: Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160.

Sprague *(continued from previous page)*

Appendix 2
Postscript

Mrs. E. Howard Hunt was unfortunately killed in a crash of a United Airlines jet at Chicago on December 8, 1972. The crash investigators found in her purse 100 crisp new $100 bills. When Mr. Hunt was queried, he claimed she was carrying the money to a relative in Chicago for a real estate investment. But it is reasonable to suspect that these bills bore serial numbers in the same sequential series as those found on Bernard L. Barker when he was arrested, and that Mrs. Hunt was transferring "hot money" to a new location. □

Michie — *Continued from page 9*

The Future

Although no one has yet begun to apply relational structure techniques to computer chess, these techniques are currently under vigorous development for a wide range of other applications. In our own laboratory in Edinburgh R. M. Burstall, H. G. Barrow, R. J. Popplestone and others have used this approach for writing a "teachable" program for recognizing ordinary objects viewed through the TV camera, with special reference to ultra-fast methods for matching descriptions in the machine and coping with partial matches in a quantitative fashion. A number of laboratories are exploring the use of relational structures — sometimes called "semantic nets" — for storing facts about storybook worlds extracted from English language input. It is a matter of time before the next person to write a chess program avails himself of the new methodology.

No single technique is going to bring about a magic transformation. But the consequences of effective methods for representing chess knowledge could be great. Programs of existing type have knowledge-bases not significantly larger than that of a chess beginner. If the machine look-ahead speed and short-term memory (working space) were not better than human, such programs would necessarily play like beginners.

But the speed and accuracy of modern computing hardware, and the large scale of mechanized tree-searching operations (Gillogly's program has, at times, a tree containing up to 500,000 possible board positions under review), enable these mechanized ignoramuses to play at tournament level. The "brute force" factor is evidently worth a lot of points on the USCF scale.

A Much Stronger Strategy

Hence if the knowledge of the chess-master were built into a computer program we would see not master chess, but something very much <u>stronger</u>. As with other sectors of machine intelligence, rich rewards await even partial solutions to the representation problem. To capture in a formal descriptive scheme the game's delicate structure — it is here that future progress lies, rather than in nanosecond access times, parallel processing, or mega-mega-bit memories.

An interesting possibility which arises from the "brute force" capabilities of contemporary chess programs is the introduction of a new brand of "consultation chess" where the partnership is between man and machine. The human player would use the program to do extensive and tricky forward analyses of variations selected by his own chess knowledge and intuition, and to check out proposed lines of play for hidden flaws. In this way the worth of the "brute force" component, which might perhaps be estimated as lying somewhere in the 500-1000 interval, could actually be measured on the USCF scale.

A Wager

In 1968 John McCarthy, Seymour Papert and I combined to make a bet with a young computer scientist, David Levy, now an international chess master. We wagered £1000 that he would be beaten by a chess program by the year 1978. The former world champion M. M. Botvinnik has told Levy, "I feel very sorry for your money," but M. Euwe, also an ex-world champion, thinks otherwise. Levy's own comment is "Only time can tell". □

The Frenchman Who Was to Kill Kennedy

Phillippe Bernert
Camille Gilles
L'Aurore, October 2, 1972
Paris
France

translated by
Ann K. Bradley
Computers and Automation and People

The extraordinary confession revealed in an exclusive interview to Camille Gilles by a veteran officer of the 1st REP, ex-chief of the Delta Commandos of the O.A.S., who is now raising livestock in South America.

On May 31, 1961, from the top of an apartment building in the Rue de Rivoli or the Champs-Elysees, ex-lieutenant Romero of the O.A.S. was supposed to shoot down President Kennedy while pretending to aim at General de Gaulle. The attempt would have been called a tragic error, due entirely to internal French problems. And no one would have dreamed of looking for the real instigators of the plot: Americans.

"Armed with a rifle with an infra-red sight, I was supposed to miss General de Gaulle and kill President Kennedy. This, precisely, on May 31, 1961, during Kennedy's official visit to France. The attempt was to take place on the Rue de Rivoli or, preferably, on the Champs-Elysées. I really didn't need the infrared sight — I was considered one of the best sharpshooters in the French army."

The man who just made this fantastic revelation, a revelation capable of turning a whole page of contemporary history upside down, of calling into question the famous Warren Report and breaking wide open the investigation into into a plot against Kennedy at the time of the Dallas assassination — this man's name is José Luis Romero.

Nine years after Kennedy's assassination, Romero has decided to talk. Leaving his hacienda somewhere in South America, he made a quick trip to Paris to sign an exclusive contract with Marcel Julian, P.D. P.D.-G. of Plon and Julliard, publishers. This took place last Saturday afternoon. In Plon's summer garden — they are the editors of General de Gaulle's "Memoirs" — this veteran killer of the Delta commandos during the war in Algeria began to dictate his extraordinary confession to my colleague Camille Gilles, well-known reporter of pied noir origin and chronicler of the Algerian drama in his novel Où sont les roses de Fouka? (Where are the roses of Fouka?)

It was while working on his new book about the dozen veteran killers who regrouped, in the heart of the O.A.S., around the celebrated Jesus de Bab-el-Oued ("Jesus and his apostles") that Camille Gilles established contact with Jose Luis Romero and uncovered the story of an earlier secret plot against Kennedy.

At the heart of the affair was Romero: a big fellow over 6'1", with intensely black eyes, his body covered with tattoos and with scars from the splinters of a mine that exploded in Indochina. A colossal man whose hair, today, is entirely white. "Late in 1963, several weeks after I learned of the murder of Kennedy in Dallas, I woke up one morning with my hair like this. My moustache was white, and all the hair on my body had turned white."

But this is the same man who, two and a half years earlier, had agreed to kill Kennedy "for the money and the adventure". He was offered two hundred million old francs.

But who is Romero? Born in Madrid in 1926, son of a revolutionary hunted by Franco's forces, he sought refuge with his family in France, spent two years in a refugee camp at Argelès, near Perpignan, and then joined the underground resistance with his father, who was a leader in the F.T.P. Following that he left France for Oran where his father, a shoemaker, started to produce espadrilles.

When he was twenty, Jose Luis joined the French Foreign Legion and fought in Indochina, then in Algeria. After serving in the 2nd B.E.P. he became one of the best officers in the 1st B.E.P. under Dufour, Sergent, Denoix de Saint-Marc. He found himself among those responsible for keeping the Casbah under control. It was around 1958 that Lt. Romero became friends with a counselor at the American consulate in Algiers, a friendship founded on confidence and mutual esteem.

Mysterious Mike

The American, whom we shall call Mike from his code name, worked visibly for certain U.S. secret service organizations. But at the same time he showed himself to be very sympathetic toward elements in the French Army that wanted a French Algeria. He even said one day to Jose Luis (whom he called "George"):

"I know certain U.S. financiers who wouldn't be unhappy to put their money into Algeria. But in a French Algeria or, at least, an independent Algeria that was dominated by European interests."

In brief, like Lt. Romero, Mike showed himself to be violently anti-Gaullist and anti-communist. And when part of the Army revolted and formed the O.A.S., Mike kept up his contacts with Romero and provided him with information, false passports, money, arms, and explosives.

At this time Romero, who had organized the Delta commandos, had shed his uniform and was strictly a clandestine operator, going around in cotton knit shirts, light chinos and string sole shoes, shoes all the Delta commandos wore because they were ideal for running and for scaling walls without slipping and falling.

This is what he was wearing one evening in May, 1961, on his way to a meeting his friend Mike had arranged with him at a Vietnamese restaurant in Algiers, the Madrague, not far from the sea. Everything started that night. Here is how Romero told it Saturday to the man writing this incredible history, the journalist Camille Gilles:

"Mike was supposed to bring me some false passports so that some of our men could rejoin Capt. Sergent, chief of the O.A.S., in continental France. I left my two bodyguards standing outside the restaurant, in front of the door, and slipped my Luger under my bath towel that I'd left lying on a chair beside me."

"A few minutes later two men came in and, without hesitating a second, walked over to me and sat down at my table. With their typical walk, as if they were afraid of breaking eggs, and their black hats with the wide ribbon, they had to be Yankees. They came, they told me, from Mike.

"First of all they gave me the passports Mike had promised me, as well as a plain envelope filled with bank notes. They said it was for the O.A.S. We had dinner together. Then, after we had finished, the bigger one, the one who did the most talking (the other seemed content with monosyllables) suddenly said to me:

"I want to talk to you seriously. I want you to get rid of those two gorillas that are waiting for you outside and then we'll go for a ride so I can explain to you what I have in mind."

A Strange Contract

"I didn't have any reason to be suspicious of Mike's friends, so I agreed. A little later, after they stopped the car in the forest of Sidi Ferruch, the spokesman for the two proposed the following "contract" to me. On May 31, President Kennedy would be in Paris on an official visit. I was supposed to fake an attempt on the life of General de Gaulle (an almost classic phenomenon at present: insurrection in Algeria, trial of Generals Challe and Zeller in Paris, etc.) and to "accidentally" kill Kennedy, at the moment when he would be next to the President of the French Republic."

"My interlocutors knew exactly who they were talking to. They seemed to know my record as a sharpshooter, that I hit the bullseye 98 times out of 100. They offered me $400,000 — half right away, the rest once the thing was over."

" — But you have to make up your mind now. Drop everything and come with us."

"I accepted. They took me immediately to the little port of Bou-Haroun, near Castiglione. There they gave me a Swiss passport in the name of Broeger, issued April 20, 1961 by the Canton of Geneva. Then they put me on a French trawler that sailed that night. The sea was rough and I suffered down in the hold on my air mattress. The whole night the boat resounded with hammer blows. The next morning we reached the small Spanish port of Andraix di Porto."

"Curiously, the trawler was no longer French but was flying the Spanish flag, with a Spanish maritime registry number. A Seat, a Spanish-made car, was waiting for us on the quay. We drove for three long hours, but it seemed more like centuries to me. Afterwards I found out that the villa they were taking me to was actually only twelve miles from Andraix."

"At the villa I was able to shower, shave and change clothes. I found a shirt, suit and a pair of shoes, all in my size, but there was nothing in any of them to show where they came from. I also saw my friend Mike again there, but it was for the last time. The diplomat who had helped us so much in Algeria greeted me effusively."

" — I knew you'd come!" he said.

"Mike completed my transformation into a Swiss citizen by giving me a Swiss driver's license in the name of Broeger, a membership card to a private club in Geneva, and the number of my bank account in Lausanne where $100,000 in West German marks had already been deposited in my name. It had been agreed that my pay would be entirely in marks."

"And for a start," Mike announced, "We are going to give you your first $100,000 right now, for your trip."

Prelude to Dallas

"They gave me a belt that I put on, with the Deutsch marks in slits on the inside. First I went to Geneva, where a car was waiting that took me to Lausanne. The second half of the funds had already been deposited in my account there. I withdrew the money and was careful to redeposit it in a new account. The evening of May 30, I was in Paris."

"I immediately took a cab to a cafe in the Champs-Elysees, 'Le Paris'. There a contact gave me a plan that I still have — in a safe place. The plan offered me three alternatives. The first was to fire on Kennedy from the top of an apartment house on the Rue de Rivoli, along the route the presidential motorcade was to take. It gave the addresses of two apartments, along with the names of their occupants — both of them old people living alone, who could be locked up in another room while I was taking care of things at the front window."

"The second possibility was to try to shoot Kennedy from one side of the Place de l'Etoile, just as the two presidents were getting out of their car to approach the tomb of the Unknown Soldier. Here again, an apartment had been selected that was on the next to the last floor and had windows that were well located for our purposes. This was the same tactic Oswald used two years later in Dallas ... "

"The gun I was supposed to use, a Remington carbine 280 with an infrared sight, was in a small trunk in the baggage room at the Gare du Nord. To get the key to the trunk, I had to go to the Lost and Found at the station and stand near a particular newsstand, where a man would give it to me."

"It was up to me to choose the place where I wanted to shoot, but either way my contacts promised me a safe escape — cars would be waiting near each of the sites to make sure I got away without a trace."

"I don't know why, but on my way to my hotel in the Champs-Elysees, to think things over, I suddenly felt very uneasy. All at once it hit me what a really shrewd plan my employers had come up with. The "accidental" murder of Kennedy was to be blamed on the O.A.S. which, they would say, had decided to kill de Gaulle but failed. A nice, neat 'secret plot' story that would cover their own trail perfectly."

"I said to myself that this small group of Americans had chosen me not just for my strong anti-Gaullist feelings, but also so that, if I were ever captured, people would think I was a little "cracked". I had to have a trepaning operation in Indochina after I was wounded in a mine explosion. So, if I started talking in front of police and judges about a U.S. plot against Kennedy, they would simply figure I didn't know what I was talking about."

Algiers Intervenes

"And then, almost as if I'd foreseen Oswald's fate — to be killed only 24 hours after shooting Kennedy in Dallas — I told myself 'This is too big. They'll never let you live after you finish the job; they'll have to get rid of you.' Anyway, I was worried enough to ask my commanding officers in the O.A.S. for their advice."

"As soon as I got back to the hotel I put in a call to Algiers. I told the O.A.S. staff there honestly what the situation was. My colonel said, 'I'll call you back in half an hour. Don't make a move until you hear from us.' Half an hour later the order came from Algiers. 'Don't touch this deal. Let the Americans take care of their own dirty business. The whole thing is likely to backfire on us!' I may be wrong, but I think that General Salan himself was consulted about it and that he was the one who made the final decision. The O.A.S. saved Kennedy's life that day."

"My problems were just beginning though, because I'd felt I was being followed ever since I'd left the Vietnamese restaurant, "La Madrague", near Algiers — guarded, but watched, too. How could I give my employers the slip at this point in the game? The best way, I figured, was just to pretend I was still going through with the whole thing. So I caught the subway at the George-V station and got off at the Gare du Nord. There I went up to the woman selling papers and asked her loudly where the toilets were."

Stop

"To get my contact, as well as the men following me, to wait for me by the newsstand, I went off in the direction of the toilets. But since I knew the station like the back of my hand, I slipped out as soon as I could and then ran what must have been a record hundred meters. Then, figuring I'd given everyone the slip, I went back to the Porte d'Italie. I didn't even try to stop at the hotel. With my belt still stuffed with Deutschmarks, I hitched to Nice. My Swiss passport got me into Italy and from there I went on to Lausanne."

"Once in Lausanne, instead of foolishly putting in a personal appearance at the bank, I asked to have my account transferred to another branch. There I had the bank change the marks in my account into dollars. Then, with my little bundle safely tucked away, I returned to Rome. Since I was still afraid of being followed by Mike's friends, I ended up enlisting with a group of mercenaries that were leaving for the Congo. No one was going to find me fighting in the Congo — it was the ideal hiding place. After the Congo business was over, I hit the road for South America. With the money Mike had given me, the money that was supposed to pay for Kennedy's assassination, I finally set myself up there in a hacienda where I'm now happily raising bulls."

"This whole story might sound crazy to you, of course. I know what it implies — that from 1961 on there were men trying to eliminate Kennedy by means of a hired killer. Maybe the same men finally succeeded two years later in Dallas, with Oswald. Why did I wait so long to talk? Because my friends told me the time had come to explain some things, because my former commanding officers in the O.A.S. gave me the green light — and because I decided when I met Camille Gilles that he was a journalist who deserved to write this story."

"I will no doubt be asked to prove what I'm telling you. The proof exists, and the men who contacted me know it. It's now safely in the hands of a lawyer in Geneva: letters I exchanged with 'Mike', the American diplomat; the three passports they gave me; the addresses of the Paris apartments that were supposed to be used; the names of the people living there; the actual written plans I got from the go-betweens, and the little official notebook they gave me that described in detail the schedule Kennedy was to follow."

"I'm not talking for money. I'm rich and happy already. I spend my life on horseback, in the middle of my herds. I've had enough of adventure. But the moment of truth always arrives. There are certain things you can't keep to yourself forever ..."

Saturday evening, ex-lieutenant Romero was back in South America. He is corresponding by means of tape recordings with his biographer, Camille Gilles, and his editor, Marcel Julian. Will we, thanks to the revelations of this solitary adventurer, finally be able to penetrate the darkness surrounding the death of Kennedy in Dallas? Was the attempt that misfired in Paris nothing but a dress rehearsal for the tragedy that shook the world? □

Why I Distrust the Romero Story

Robert P. Smith, Director of Research
Committee to Investigate Assassinations
927 15th St., N.W.
Washington, D.C. 20005

As Director of Research for the Committee to Investigate Assassinations, I sit at the hub of a sort of wheel of information. Some may say, perhaps not without cause, that it is a wheel of misinformation. Certainly there are some rickety spokes to it, and it isn't always easy to keep from running off the road. After long practice, though, and after having read and heard a lot of stories, I think I may have acquired some skill in avoiding the more obvious ditches.

I. F. Stone, now with the "New York Review" but whose "Newsletter" was rightly regarded as one of the best in the country for many years, is said to have called the efforts to solve the mysteries of President Kennedy's assassination a "swamp of paranoia". He may be partially right.

But with all deference to psychoanalysis, I submit that the investigation of President Kennedy's assassination is a good deal more. It is, for one thing, a serious avocation for some very sincere and competent people who are trying to find out what really happened on November 22, 1963. Our Government has failed to explain it satisfactorily.

Secondly, it is a challenge to a number of dedicated researchers and students of the factual details of the assassination. Some of them are professionals in their own fields, and they find this case, quite literally and for absolutely objective and non-neurotic reasons, to be more baffling than any Sherlock Holmes story ever written. I do not exaggerate.

Those opinion leaders who believe this case is solved cannot have tried to grapple with the physical evidence of the case. Their persistence in pooh-poohing the problems of reconstructing the actual shooting, for example, reflects a kind of paranoid gullibility of their own.

Thirdly, and unfortunately, pursuit of the facts behind the JFK assassination tends to be an abode for a certain number of jokers and opportunists who are out to make a buck by exploiting the gullible. With these I have lost all patience. They interfere with the serious things that need to be done, and they bring ridicule on the genuine efforts at understanding.

In regard to the killing of President John F. Kennedy, it is an unpleasant but very real fact that one can find in the National Archives many scores of reports about people who said they wanted to kill the President, or who expected someone to do it, or who claimed they knew someone who actually planned to do it. I have read a great many of these reports.

The motives, or implied motives, are all over the political spectrum. Moreover, some of the stories were on record before the assassination and were every bit as plausible, from any standpoint, as the Romero story. So why should we believe Romero, whose story didn't come to light until nine years after the JFK assassination and eleven years after the plot itself? He says he was afraid, which may account for him, but the question is, why should we believe?

There are curious details in Romero's story that make no sense to me:

Item 1: Why an "infra-red sight" on the rifle when the assassination is to take place in broad daylight?

Item 2: Why did Romero, while going to what he expected was merely a rendezvous with his "friend" Mike, take along two bodyguards?

Item 3: Why later, at the restaurant, but still before he knows that anyone besides Mike is coming, does he place his Luger under a towel on the next chair?

Item 4: How can he be a "sharpshooter for hitting 98 bull's-eyes out of a hundred", with nothing said about the distance of the target or any of the other details needed to attach significance to such a figure?

Item 5: Why couldn't Romero have been given the key to the trunk (containing the special rifle) in advance, instead of using another man to give him the key, with the added and unnecessary risks that this implies? (After all, they had already given him the money and other papers.)

These dubious details, of which many other examples could be cited, sound more like melodrama than realism.

There is more to this story — not Romero's, but the story about Romero's story. Not all of it is yet known to me, but I do know that CBS, which is certainly a large and competent news organization with offices in Paris, spent a fair amount of time and money checking it out.

Actually, they were drawn into it by a later embellishment in which Romero purportedly identified two of the "Watergate Five" as being the two Americans who approached him in 1961. This added sensation involved some intermediaries who, I am convinced, were entirely sincere in their beliefs. But the end result of all this effort was a flat zero. The news organization concluded that the whole business was a hoax. I had previously come to the same belief for the reasons I have stated above.

Does this imply that the CBS investigation was CIA-controlled, and that the CIA influenced it to arrive at this conclusion?

The answer is that I don't know. I haven't any evidence either way. But why should I impugn the integrity of a large organization involving many people, in effect assuming that they were all CIA influenced, in favor of believing the story of one man who has no corroboration from anybody and who keeps his supposed evidence locked up in a vault somewhere? Particularly I cannot believe him when his story fails to hang together and when I know at least a half-dozen similar kinds of story (contradictory to Romero's, however) which are just as "plausible" as his.

Finally, I ought to make one other point that may appeal to those who insist on reasoning from motives. I do believe that Romero was (and is) part of a conspiracy. Cui bono? Yes, a good question — and here's my answer: The conspiracy was one to sell books! □

ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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APPLICATIONS

COMPUTERIZED FEED MIXING BEGINS AT GOOCH MILL

Mervin Eighmy, Gen. Manager
Millard Farmer, DP Manager
Gooch Feed Mill Corp.
Lincoln, Nebr.

Gooch Feed Mill Corp. has begun using a small computer to control the measuring-in of ingredients for its animal feeds. Until now the process of compounding numerous ingredients has been largely manually controlled. The System/7 computer, using predetermined feed formulas stored in its memory, calls out the precise amount of each of up to 20 ingredients for any of 20 different feed mixes. The feed formula itself is determined by another IBM computer based on the nutrient requirement of the particular animal to be fed, also taking into account the unit cost of each ingredient.

The feed is mixed in three-and-one-half ton mixers. Because there is such wide variation between the amounts of the several ingredients needed, a blend may call for a quantity weighing as little as an ounce and as much as a ton or more. When a particular kind of feed is called for, an operator merely enters the feed number into the computer. The computer automatically begins selecting ingredients stored in any of 50 bins. The System/7 transmits a signal to the selected bin, which sets in motion an auger. The auger starts pulling out the selected ingredient into an enclosed chute which empties on to a scale. As the ingredient hits the scale, the computer begins measuring the weight, shutting off the auger when the precise weight has been reached.

If when selecting the desired bin — say of soybean meal — it is empty, the computer signals the operator that is should be refilled, and goes on to the next soybean meal bin for its needs. This ensures that the mixing process will not be interrupted as long as the needed ingredient is available in any bin to which the computer has access.

Besides more accurate feed mixes, there is better control of inventory. For the first time Gooch Mill can track the precise amount of each ingredient from the time it arrives at the mill until it leaves in the completed blend. This is a major factor for a mill such as Gooch, which can produce 700 tons, or 1,400,000 pounds of feed a day.

MINICOMPUTERS DELIVER DAILY NEWSPAPERS IN FORT WORTH, TEXAS

A. T. Le Ance
Computer Automation, Inc.
18651 Von Karman
Irvine, Calif. 92664

In Fort Worth, Texas, a minicomputer is the heart of a new Automated Newspaper Delivery System (ANDS). The ANDS (developed and produced by AVCON, Inc., of Fort Worth) is a self-contained, on-board system which guides a delivery truck along a complex route and tells two men on either side of a specially designed vehicle, when to throw their papers. According to the AVCON people, they never miss.

The system continuously measures the vehicle's location in relation to a pre-planned route, then issues audio and visual instructions which guide the driver and the paper throwers on their appointed rounds. It even activates the vehicle's turn signals shortly before it is scheduled to make a turn, giving the driver added warning of the impending maneuver. In addition, the ANDS detects driver errors and immediately prescribes appropriate corrective actions.

Because of the system's unique guidance capabilities, neither the driver nor the throwers need maps, subscriber lists, or prior knowledge of the route. It is all done by tape and computer memory. First, a fixed route is divided into segments and a "signature" for each segment is recorded by driving over the segment with the AVCON system operating in its mapping mode. Locations of delivery points are recorded in terms of their distance from the beginning point, when the driver or an assistant depresses a switch at each location. For basic route control, verbal instructions are recorded on audio tape. To travel over a previously mapped route, the driver simply starts the route at a specified point and follows the system's real-time audio and visual commands.

The paper throwers mounted by open windows on either side of the van wear earphones that receive the signals telling them when to hurl their rolled-up papers. Lead times for the throwers are automatically adjusted to the speed of the truck, which may be traveling anywhere from 15 to 30 miles an hour along its routes.

The system hardware is mounted above the truck's windshield, except for a digital display console which is mounted atop the dashboard in front of the driver and provides visual instructions. The ANDS includes a miniature NAKED MINI 16 digital processing and logic unit (built by Computer Automation, Inc., Irvine, Calif.), a tape cartridge drive, proprietary sensing devices, control/display console with message printer, and a variety of annunciator and actuator devices.

EDUCATION NEWS

NEW PRISON ARRIVAL SPARKS COMPUTER PROGRAMMING STUDIES

Honeywell Inc.
60 Walnut St.
Wellesley, Mass. 02181

A new "inmate" has been welcomed to Massachusetts maximum security prison at Walpole, Mass. The new resident of the prison is a computer to be used by prisoners who study computer programming. The computer, formerly in Honeywell's custody, is being loaned permanently to the inmates.

For the past five years, volunteers from the company have been teaching programming courses to a group of inmates at the Massachusetts Correctional Institution (MCI) in Walpole in response to an inmate-initiated request for courses in computer programming. The career-training program has paid off in both professional accomplishment and an extremely low recidivism rate for those in the group who have been paroled — only 4 1/2 per cent compared to a national rate of 68 per cent.

Malcolm D. Smith, a professional teacher and programmer who was then a Honeywell staff adviser in programming systems, was in charge of setting up the program, which he designed to be self-perpetuating. When students complete their first course, they teach what they have learned to a new class, at the same time beginning the second phase of their own program. Students in the first phase of the program work at other prison jobs during the morning and attend classes in the afternoon. Those who successfully complete the courses join the group of 12 men who are full-time programmers.

The Walpole programmers have complete responsibility for conducting classes for students in the first phase of the program, as well as for the professional programming work done for the state and municipalities. They also attend advanced classes conducted by Honeywell instructors. According to Smith, now manager of Honeywell's Conversion Technology Center and still head of the Honeywell group, "The Walpole instructors have been extremely meticulous in their teaching. The way they have handled their teaching and programming responsibilities shows they are very competent professionals."

In addition to these significant personal accomplishments, the Walpole programmers have been doing professional programming for the state departments of Education, Natural Resources, and Corporations and Taxation, and for several cities and towns in Massachusetts. Estimated savings to their "clients" have amounted to over $700,000 in four years, even after deducting wages of 50 cents per day paid to inmates and the costs of keeping a man in prison.

Before installation of the Honeywell Model 55 none of the inmates had seen a computer. They wrote their programs and keypunched them on cards or coded them with a Honeywell Keytape (provided by the state Department of Education) onto magnetic computer tape. The card decks and tapes were picked up twice a week, transported to a "client" computer site where the programs were run. The results were returned to the inmates later for corrections. Having their own computer will enable inmates to work on program devel-- opment and to try out their ideas while they are fresh. There will be greater continuity between each phase of development, — and the Walpole programmers will be able to supply their clients with finished products.

The computer also will permit expansion of the program to include computer maintenance and operator training courses. Instructors from Honeywell's Field Engineering Division have begun teaching a group of six inmates the computer maintenance courses. This program also will be self-perpetuating. Operator training courses will be conducted by the Walpole programmers. This course will be aimed at men who do not have enough prison time left to complete programming courses or who are more interested in computer operation than programming.

GENERAL TURTLE, INC. – A SMALL COMPANY WITH A STRANGE NAME

General Turtle, Inc.
545 Technology Square
Cambridge, Mass. 02139

A new educational technology has recently become available from General Turtle Inc. — a small company with a strange name. General Turtle Inc. has been formed in response to requests from schools and research groups for computer-controlled devices similar to those used in the program of Research on Education conducted by the "LOGO GROUP" of MIT Artificial Intelligence Laboratory.

The set of devices, developed by the new company, is designed to be compatible with the financial, technical and computational resources typically available in schools which already are using a minicomputer or telephone connections to a time-shared service The devices have, however, been designed to serve even better where more computational resources are available — so that when computer resources grow, these devices will not become obsolete but will also grow in power.

By means of General Turtle's devices, schools can extend the range of programming projects to include generating music, graphics, controlling cybernetic turtles, and more. The new applications reach more students and also deepen the intellectual content of the computer experience. They appeal to "mathephobic" children who find traditional programming "too mathematical" as well as to "math buffs" who want something involving more hard core mathematics.

The recommended starter mini-system includes the following components: turtle with touch sensors; plotter; music generator; a components kit of motors, relays and sensors, and a controller to connect the precending devices to a freestanding or remote computer.

The simplest mode of operation of the mini-system requires no expertise in hardware or systems software and no changes to the operating system or language already in use. Other modes of operation require small changes to the system software. General Turtle will design configurations to meet individual needs, plans, and budgets.

NEW PRODUCTS

COMPUTER PROGRAM HELPS IN TREATMENT OF HEART PATIENTS

Robert A. Morris
Manager of Information
IBM Corporation
Data Processing Division
1133 Westchester Ave.
White Plains, N.Y. 10604

Cardiologists can interpret large volumes of electrocardiograms — used in identifying heart disorders — faster and more easily with a new computer program recently announced by IBM Corporation, White Plains, N.Y. Using the IBM Health Care Support Electrocardiogram (ECG) Analysis program, cardiologists can significantly reduce the time it normally takes to analyze ECGs (recordings of the heart's electrical impulses). They can then speed their interpretations to attending physicians for use in diagnosis and treatment of heart patients.

When the new ECG Analysis program, an IBM System/370 or System/360 processes — in less than a minute — the ECG readings which have been recorded in digital form on magnetic tape. The computer produces a printed report containing interpretative statements about the condition of the patient's heart. Cardiologists can quickly validate the statements by comparing the printed report with the strip chart recording, which are then sent to the patient's doctor.

The Health Care Support Electrocardiogram (ECG) Analysis program is scheduled to be available in February 1973, at a monthly charge of $350.

RISK ANALYSIS PROGRAM ANNOUNCED BY MCDONNELL DOUGLAS CORP.

McDonnell Douglas Corp.
Box 516
St. Louis, Mo. 63166

The construction business, like a poker game, involves a great many risks. Poker is less a gamble, though, when the odds are known and the hands played accordingly.

To help take some of the gamble out of the construction business, McDonnell Douglas Automation Company is marketing and processing a computerized risk analysis program developed by Decision Sciences Corporation, St. Louis. Called Contractor's Early Warning System (CEWS), the program helps reduce the risk involved in construction cost bidding by alerting a contractor to a possible cost overrun soon enough to allow him to adjust his bid.

Using McDonnell Douglas's IBM Model 195 computers, 5000 simulations can be performed in less than one minute. A wide variety of conditions, including labor strikes and weather, can be considered to determine the possible effects on the contractor's potential profit on a project. The contractor need have no knowledge of statistical variations and standard deviations. He simply identifies those cost items which can vary by more than one per cent of the total anticipated profit. The program produces eight management reports which may be used to examine company risks involved in making a bid.

CEWS is available exclusively through a processing or licensing agreement from McDonnell Douglas Automation Company, a division of McDonnell Douglas Corporation.

NOVA COMPUTER BECOMES TEACHER'S AID IN NEW SINGER DRIVER TRAINING SYSTEM

Data General Corp.
Routes 9 and 495
Southboro, Mass. 01772

From the time Janet Austin began her across-town drive to the moment she backed into a parking space and turned the engine off, everything she did was meticulously noted and recorded by a small Nova computer, made by Data General Corporation of Southboro, Mass. Janet was one of a group of high school students "driving" a new Link® Model L-210 simulator, a streamlined driver training device that looks like the driver's section of a new car. It has dashboard instruments, steering wheel, gear selector, and driver's seat. The trainer is made by The Singer Company's Simulation Products Division, Binghampton, N.Y.

The Nova, mounted in a small cabinet under the instructor's control console, lets the instructor monitor the actions of an entire group, part of a group, or an individual. The instructor can select percentage levels of achievement at the console, and the Nova indicates which students fall below that level.

Students "drive" on a realistic motion picture roadway projected on a screen at the front of the room. A binary code track on the film triggers the Nova, which starts all the automatic functions of the system, and monitors student responses to various driving situations. Some of the automatic functions handled by the Nova are:

- checking student responses to filmed situations
- displaying results on the instructor's console
- indicating when group performance needs improvement

Student errors are classified in five categories — acceleration, speed, braking, steering, and signal. When a student makes a mistake, an indicator in the simulator lights, and stays on until the student takes corrective action. The Nova keeps a running check on the number of checks in each of the five categories and the number of errors for each student in each category. When a class is over, the instructor can determine such information as total checks by category, total errors for each student in each category, and the student's score. An optional package lets the instructor accumulate student performance over a period of time. In addition, the instructor can override the computer and make unprogrammed checks into the system.

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NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Sanders Associates, Inc., Nashua, N.H.	Lockheed-California Co.	Long lead preparation and startup costs on second production lot (Lot IV) of acoustic data processors for Navy's new S-3A carrier-based anti-submarine warfare aircraft	$6 million (approximate)
Burroughs Corp., Detroit, Mich.	National Life and Accident Insurance Co., Nashville, Tenn.	Electronic terminal computers and other equipment for use in nationwide communications system	$4.5 million
TRW Inc., Cleveland, Ohio	Swedish State Power Board, Stockholm, Sweden	A Totally Integrated Data System (TIDAS) for electrical power production and power system control; TRW's role includes integration of total system, and design and fabrication of central data processing system; ASEA is prime contractor for the $15.5 million project	$3 million (approximate)
Computer Sciences Corp., Los Angeles, Calif.	Strategic Air Command (SAC), Omaha, Neb.	Serving as prime contractor for the integration phase of the 436M program at SAC's Omaha headquarters; includes supply of all equipment, computer programs and engineering services	$2.1 million
Sperry Univac Div., Sperry Rand Corp., Blue Bell, Pa.	South African Coal, Oil and Gas Corp. (SASOL), Sasolburg, Orange Free State, South Africa	A UNIVAC 1106 system to be used for linear programming, production statistics and other general office and general accounting applications	$1.8 million (approximate)
Honeywell, Inc., Tampa, Fla.	Safeguard Communications Agency (SAFCA), Grand Forks, N. Dak.	An automated communications circuit-monitoring system	$1.7 million
TBS Computer Centers Corp. (NASDAQ: TBSC), New York, N.Y.	Catalina and Cole of California, Inc., div. of Kayser-Roth	3-year renewal of original contract providing various data processing services	$1.5+ million
National Cash Register Co., Postal Systems Division, Dayton, Ohio	United States Postal Service	A number of service test models of the Postal Service's advanced facer/canceler machine for high-speed automatic processing of letter mail	$1.3+ million
Intermetrics Inc., Cambridge, Mass.	North American Rockwell (NR) Space Div., Downey, Calif.	A high-level computer programming language, designated HAL, tailored specifically for Space Shuttle's flight computers	$1 million (approximate)
Autonetics Div., North American Rockwell Corp. (NR), Anaheim, Calif.	U.S. Department of Transportation	Studying and defining an air traffic management system for the 1985 and beyond time period	$948,171
SYSTEMS Engineering Laboratories, Inc., Fort Lauderdale, Fla.	NASA's Manned Spacecraft Center, Houston, Texas	Dual SYSTEMS 86 computers to be used as part of dedicated hybrid digital/analog complex for agency's space shuttle program	$925,000 (approximate)
Varian Data Machines, Irvine, Calif.	State Bank of Czechoslovakia, Prague and Bratislava, Czechoslovakia	Multiple Varian 620/L-100 minicomputers, multiplexers, controllers, adapters and other devices for use in eight bank data acquisition and communications systems	$810,000+
Honeywell, Inc. Wellesley Hills, Mass.	Australian National Line, Melbourne, Australia	A Honeywell Series 2000 computer system to control ANL's central booking office for its passenger ships, to rationalize internal supply and purchase accounting systems, and monitor container movements in Australasia	$750,000
SYSTEMS Engineering Laboratories, Inc., Fort Lauderdale, Fla.	National Severe Storms Laboratory (NSSL), Norman, Okla.	SYSTEMS 86 computer for research methods program related to weather predicition and storm notification throughout the central United States.	$362,000 (approximate)
Optical Scanning Corp., Newtown, Pa.	U.S. Navy	Thirty OpScan 17 Optical Scanning systems for use at Naval Air Training stations to process pilot evaluation forms	$250,000 (approximate)
Bunker Ramo Corp., Westlake Village, Calif.	Colonial Pipeline Co., Atlanta, Ga.	A major expansion to the dual BR-340 computer system.	$175,000+
Computer Audit Systems, Inc., East Orange, N.J.	U.S. Comptroller of Currency	Installing a customized version of Computer Audit Retrieval System (CARS 2) to help agency achieve a unified program for national bank examinations	$67,000
Auerbach Associates, Inc., Philadelphia, Pa.	U.S. Department of Commerce, National Bureau of Standards, Fire Technology Div.	Designing National Fire Loss Data System (NFLDS) to serve as central source of data concerning fire losses, fatalities, and injuries in U.S.	—
Bunker Ramo Corp., Electronics Systems Div., Westlake Village, Calif.	McDonnell Douglas Automation Co., Long Beach and Torrance, Calif.	Development of a factory data entry system to be installed initially at DAC's Long Beach and Torrance facilities	—
Computer Sciences Corp., Los Angeles, Calif.	National Can Corp., Chicago, Ill.	Development of a nationwide on-line information system linking more than 40 manufacturing plants with a central computer facility at NCC's headquarters	—
Quantum Science Corp., Palo Alto, Calif.	State of Israel	A study of Israel's data communications requirements through the mid 1980's — recommendations on services to be offered, technologies to be used, tariff policies for communication network	—

NEW INSTALLATIONS

OF	AT	FOR
Cyber 70 Model 73 system	Philco-Ford Corp., Houston, Texas (2 systems)	Scientific data processing for the National Aeronautics and Space Administration (NASA); applications include data management of multiple data bases, data base maintenance, inter-processor communications with NASA's RTCC and processing of Earth Resources data
DECsystem-1055	Plessey Telecommunications, Liverpool, England	Software development, testing and exchange interface integration before installation at international telephone exchange currently under construction in London
IBM System/3	Braille Institute of America, Inc., Los Angeles, Calif.	"Talking Book" service which helps librarians gather and mail out tons of recorded books to the blind; system will eventually handle cassette tape recordings, Braille books and recorded periodicals
IBM System/7	Cook County, Chicago, Ill.	Helping reduce air pollution; monitors pollution levels in county and spots dangerous pollution buildups for early corrective action
IBM 360 system	Florida Software Services, Orlando, Fla.	Providing data processing services to clients
NCR Century 50 system	Present Co., Inc., Rochester, N.Y.	New inventory control system
	Wilmorite, Inc., Rochester, N.Y.	Payrolls, accounts payable, and job costing for firm and two other associated companies
NCR Century 101 system	Rochester Germicide Co., Rochester, N.Y.	Managing invoicing system
UNIVAC 1106 system	Fisher-Price, East Aurora, N.Y.	Order entry and order status systems, on-line inquiry for credit and collections, a complete assortment of sales and marketing statistical reports and summaries (system valued at $1.3 million)
	State University of New York (SUNY), Buffalo, N.Y.	Added capacity permitting improved administrative computer services; replaces older computer equipment
UNIVAC 9200 system	City of Santa Fe, Santa Fe, New Mexico	Payroll, general accounting, paving assessments, criminal statistics, and a system for municipality's "Model Cities" program
	Mr. Insurance, Smyrna, Ga.	Policy accounting and statistical reports
UNIVAC 9200-II system	Chiltonian Limited, London, England	Sales ledger, sales analysis, stock control and payroll and an extended management information system; replaces tabulating equipment
UNIVAC 9211 system	Mahoning Valley Joint Vocational School, Canfield, Ohio	Training students for opportunities in data processing; future use includes administrative tasks
Xerox Sigma 3 system Xerox Sigma 5 systems	Air Combat Maneuvering Range (ACMR), Marine Air Station, Yuma, Ariz.	Monitoring pilots' performance in Air Combat Maneuvering Range (ACMR) — Sigma 3; Missile simulations and computing missile hits and misses — Sigma 5; computing spatial position and inter-aircraft parameters — 2nd Sigma 5; and 3rd Sigma 5 will control the other computers as well as two interactive display systems

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

MISCELLANEOUS

SDA INFORMATION SCIENCES, INC. ELECTS NAOMI J. SPINNER PRESIDENT AND CHAIRMAN OF THE BOARD

Frances Greenberg
SDA Information Sciences, Inc.
1540 Broadway
New York, N.Y. 10036

At a recent meeting of the Board of Directors of SDA Information Sciences, Inc., Naomi J. Spinner was elected President and Chairman of the Board. She succeeds the late Robert E. Spinner. Prior to her election to these offices, Mrs. Spinner had been Treasurer of SDA as well as a member of the Board, and had served actively in the management and operation of the corporation.

SDA Information Sciences, Inc., a publicly held corporation with stock traded over the counter, conducts market research studies and surveys in many areas. These have included toiletries, drugs, foods, banking, packaging, advertising, household commodities, and airlines. It supplies interviewing nationwide; study questionnaire and sampling design; editing, coding, tabulation of data, and preparation of a final printed report with tables and analysis.

The corporation has a wholly-owned subsidiary, SDA Systems, Inc., a company which specializes in the solution of source data automation problems. This is done primarily through the manufacturing and marketing of a portable data collection device called the Porta-Station®. Mrs. Spinner will also act as President of this subsidiary.

CALENDAR OF COMING EVENTS

Jan. 17-19, 1973: Hospital Information Systems Sharing Group, Information Science and the Health Care Institution seminar, Frontier Hotel, Las Vegas, Nev. / contact: Dean R. Cannon, P.O. Box 305, Bountiful, UT 84010

Jan. 17-19, 1973: 1973 Winter Simulation Conference, San Francisco, Calif. / contact: Robert D. Dickey, Bank of California, 400 California St., San Francisco, CA 94120

Jan. 31-Feb. 1, 1973: San Diego Biomedical Symposium, Sheraton-Harbor Island Hotel, San Diego, Calif. / contact: Dr. Robert H. Riffenburgh, Program Chmn., San Diego Biomedical Symposium P.O. Box 965, San Diego, CA 92112

Feb. 20-22, 1973: Computer Science Conference, Neil House, Columbus, Ohio / contact: Dr. Marshall Yovits, 101 Caldwell Lab., 2024 Neil Ave., Ohio State Univ., Columbus, OH 43210

Mar. 4-9, 1973: SHARE Meeting, Denver, Colo. / contact: D.M. Smith, SHARE, Inc., Suite 750, 25 Broadway, New York, NY 10004

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

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

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

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

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

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

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

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

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

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

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

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

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

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

May 14-17, 1973: Spring Joint Computer Conference, Convention Hall, Atlantic City, N.J. / contact: AFIPS Hdqs., 210 Summit Ave., Montvale, NJ 07645

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

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

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

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

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

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

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

Aug. 13-17, 1973: SHARE Meeting, Miami Beach, Fla. / contact: D. M. Smith, SHARE, Inc., Suite 750, 25 Broadway, New York, NY 10004

Aug. 20-24, 1973: 3rd International Joint Conference on Artificial Intelligence, Stanford University, Stanford, Calif. / contact: Dr. Max B. Clowes, Laboratory of Experimental Psychology, University of Sussex, Brighton, Sussex BN1 9QY, England

Aug. 27-29, 1973: ACM '73, Atlanta, Ga. / contact: Dr. Irwin E. Perlin, Georgia Institute of Technology, 225 North Ave., N.W., Atlanta, GA 30332

Aug. 30-Sept. 1, 1973: International Conference on Systems and Control, PSG College of Technology, Coimbatore, India / contact: Dr. R. Subbayyan, PSG College of Technology, Coimbatore 641004, Tamil Nadu, India

Sept. 4-7, 1973: International Computing Symposium 1973, Davos, Switzerland / contact: Dr. H. Lipps, International Computing Symposium 1973, c/o CERN, CH-1211 Geneva 23, Switzerland

Oct. 2-4, 1973: 2nd International Computer-Aided Design and Computer-Aided Manufacturing Conf., Detroit Hilton Hotel, Detroit, Mich. / contact: Public Relations Dept., Society of Manufacturing Engineers, 20501 Ford Rd., Dearborn, MI 48128

Oct. 8-12, 1973: BUSINESS EQUIPMENT SHOW, Coliseum, New York, N.Y. / contact: Rudy Lang, Prestige Expositions, Inc., 60 East 42 St., New York, NY 10017

MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND AUTOMATION

The following is a summary made by COMPUTERS AND AUTOMATION of reports and estimates of the number of general purpose electronic digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide. Please note the variation in dates and reliability of the information. Several important manufacturers refuse to give out, confirm, or comment on any figures.

Our census seeks to include all digital computers manufactured anywhere. We invite all manufacturers located anywhere to submit information for this census. We invite all our readers to submit information that would help make these figures as accurate and complete as possible.

Part I of the Monthly Computer Census contains reports for United States manufacturers. Part II contains reports for manufacturers outside of the United States. The two parts are published in alternate months.

The following abbreviations apply:

- (A) -- authoritative figures, derived essentially from information sent by the manufacturer directly to COMPUTERS AND AUTOMATION
- C -- figure is combined in a total
- (D) -- acknowledgment is given to DP Focus, Marlboro, Mass., for their help in estimating many of these figures
- E -- figure estimated by COMPUTERS AND AUTOMATION
- (N) -- manufacturer refuses to give any figures on number of installations or of orders, and refuses to comment in any way on those numbers stated here
- (R) -- figures derived all or in part from information released indirectly by the manufacturer, or from reports by other sources likely to be informed
- (S) -- sale only, and sale (not rental) price is stated
- X -- no longer in production
- \- -- information not obtained at press time

SUMMARY AS OF DECEMBER 15, 1972

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)		NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Part 1. United States Manufacturers								
Adage, Inc.	AGT 10 Series	4/68	X		32	3	35	X
Brighton, Mass.	AGT 100 Series	1/72	100-300	(S)	8	3	11	3
(A) (11/72)								
Autonetics	RECOMP II	11/58	X		30	0	30	X
Anaheim, Calif.	RECOMP III	6/61	X		6	0	6	X
(R) (1/69)								
Bailey Meter Co.	Metrotype	10/57	40-200	(S)	8	0	8	0
Wickliffe, Ohio	Bailey 750	6/60	40-250	(S)	37	15	52	0
(A) (6/72)	Bailey 755	11/61	200-600	(S)	7	0	7	0
	Bailey 756	2/65	60-400	(S)	15	12	27	2
	Bailey 855/15	12/72	50-400	(S)	0	0	0	2
	Bailey 855/25	4/68	100-1000	(S)	16	0	16	0
	Bailey 855/50	3/72	100-1000	(S)	0	0	0	12
Bunker-Ramo Corp.	BR-130	10/61	X		160	-	-	X
Westlake Village, Calif.	BR-133	5/64	X		79	-	-	X
(A) (12/72)	BR-230	8/63	X		15	-	-	X
	BR-300	3/59	X		18	-	-	X
	BR-330	12/60	X		19	-	-	X
	BR-340	12/63	X		19	-	-	X
	BR-1018	6/71	23.0	(S)	-	-	-	-
	BR-1018C	9/72	-		-	-	-	-
Burroughs	205	1/54	X		25-38	2	27-40	X
Detroit, Mich.	220	10/58	X		28-31	2	30-33	X
(N) (12/72)	B100/B500	7/65	2.8-9.0		-	-	-	-
	B2500	2/67	4.0		52-57	12	64-49	117
	B3500	5/67	14.0		45	18	62	190
	B5500	3/63	23.5		65-74	7	72-81	8
	B5700	-	-		1	-	-	-
	B6500	2/68	33.0		4	-	4	60
	B6700	-	-		1	-	-	-
	B7500	4/69	44.0		-	-	-	13
	B8500	8/67	200.0		1	-	1	5
Computer Automation, Inc.	108/208/808	6/68	5.0	(S)	165	10	175	110
Newport, Calif.	116/216/816	3/69	8.0	(S)	215	20	235	225
(A) (4/71)								
Consultronics, Inc.	DCT-132	5/69	0.7		35	65	100	-
Garland, Texas								
(A) (12/72)								
Control Data Corp.	G15	7/55	X		-	-	295	X
Minneapolis, Minn.	G20	4/61	X		-	-	20	X
(R) (7/71)	LGP-21	12/62	X		-	-	165	X
	LGP-30	9/56	X		-	-	322	X
	RPC4000	1/61	X		-	-	75	X
	636/136/046 Series	-	-		-	-	29	-
	160/8090 Series	5/60	X		-	-	610	X
	921/924-A	8/61	X		-	-	29	X
	1604/A/B	1/60	X		-	-	59	X
	1700/SC	5/66	3.8		-	-	425-475	0
	3100/3150	5/64	10-16		-	-	83-110	C
	3200	5/64	13.0		-	-	55-60	C
	3300	9/65	20-38		-	-	205	C
	3400	11/64	18.0		-	-	15	C
	3500	8/68	25.0		-	-	15	C
	3600	6/63	52.0		-	-	40	C
	3800	2/66	53.0		-	-	20	C
	6200/6400/6500	8/64	58.0		-	-	108	C
	6600	8/64	115.0		-	-	85	C
	6700	6/67	130.9		-	-	5	C
	7600	12/68	235.0		-	-	8	C
								Total: 160 E
Data General Corp.	Nova	2/69	9.2	(S)	-	-	920	-
Southboro, Mass.	Supernova	5/70	9.6	(S)	-	-	200	-
(A) (11/72)	Nova 1200	12/71	5.4	(S)	-	-	2100	-
	Nova 800	3/71	6.9	(S)	-	-	310	-

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
Data General (cont'd)	Nova 1210/1220	2/72	4.2;5.2 (S)	-	-	535	-
	Nova 820	4/72	6.4 (S)	-	-	85	-
Datacraft Corp.	6024/1	5/69	52-300 (S)	17	0	17	2
Ft. Lauderdale, Fla.	6024/3	2/70	33-200 (S)	108	13	121	55
(A) (11/72)	6024/5	12/71	11-80 (S)	28	0	28	65
Digiac Corp.	Digiac 3060	1/70	9.0 (S)	78	-	78	8
Plainview, N.Y.	Digiac 3080	12/64	X	16	-	16	X
(A) (5/72)	Digiac 3080C	10/67	X	8	-	8	X
Digital Computer Controls, Inc.	D-112	8/70	10.0 (S)	634	100	734	-
Fairfield, N.J.	D-116	1/72	10.0 (S)	488	30	518	-
(A) (11/72)							
Digital Equipment Corp.	PDP-1	11/60	X	48	2	50	X
Maynard, Mass.	PDP-4	8/62	X	40	5	45	X
(A) (5/72)	PDP-5	9/63	X	90	10	100	X
	PDP-6	10/64	X	-	-	23	X
	PDP-7	11/64	X	-	-	100	X
	PDP-8	4/65	X	-	-	1402	X
	PDP-8/I	3/68	X	-	-	3127	X
	PDP-8/S	9/66	X	-	-	918	X
	PDP-8/L	11/68	X	-	-	3699	X
	PDP-8/E	-	4.9 (S)	-	-	3787	-
	PDP-8/M	-	3.9 (S)	-	-	365	-
	PDP-8/F	5/72	3.9 (S)	-	-	2	-
	PDP-9	12/66	X	-	-	436	X
	PDP-9L	11/68	X	-	-	40	X
	DECSystem-10	12/67	700-3000 (S)	-	-	243	-
	PDP-11/20	-	10.8 (S)	-	-	2740	-
	PDP-11R20	-	13.8 (S)	-	-	14	-
	PDP-11/05	-	10.8 (S)	0	0	0	-
	PDP-11/45	-	-	0	0	0	-
	PDP-12	9/69	-	-	-	620	-
	PDP-15	2/61	17.0 (S)	-	-	545	-
	LINC-8	9/66	X	-	-	200	X
						Total: 18456	
Electronic Associates Inc.	640	4/67	1.2	109	61	170	1
West Long Branch, N.J.	8400	7/67	12.0	21	8	29	0
(A) (11/72)	PACER 100	7/72	1.0	12	18	30	18
EMR Computer	EMR 6020	4/65	5.4	15	1	16	0
Minneapolis, Minn.	EMR 6040	7/65	6.6	6	0	6	0
(A) (11/72)	EMR 6050	2/66	9.0	15	2	17	0
	EMR 6070	10/66	15.0	7	8	15	0
	EMR 6130	8/67	5.0	34	13	47	0
	EMR 6135	-	2.6	36	5	41	4
	EMR 6145	-	7.2	-	-	-	8
	EMR 6140	-	-	-	-	-	0
General Automation, Inc.	SPC-12	1/68	-	-	-	1400	-
Anaheim, Calif.	SPC-16	5/70	-	-	-	800	-
(A) (8/72)	System 18/30	7/69	-	-	-	200	-
General Electric	GE-PAC 3010	5/70	2.0	25	1	26	35
West Lynn, Mass.	GE-PAC 4010	10/70	6.0	30	4	34	32
(Process Control Computers)	GE-PAC 4020	2/67	6.0	200	60	260	32
(A) (10/72)	GE-PAC 4040	8/64	X	45	20	65	X
	GE-PAC 4050	12/66	7.0	23	2	25	1
	GE-PAC 4060	6/65	X	18	2	20	1
Hewlett Packard	2114A, 2114B	10/68	0.25	-	-	1182	-
Cupertino, Calif.	2115A	11/67	0.41	-	-	333	-
(A) (7/72)	2116A, 2116B, 2116C	11/66	0.6	-	-	1171	-
	2100A	3/71	0.5	-	-	2080	-
Honeywell Information Systems	G58	5/70	1.0	-	-	-	-
Wellesley Hills, Mass.	G105A	6/69	1.3	-	-	-	-
(R) (6/72)	G105B	6/69	1.4	-	-	-	-
	G105RTS	7/69	1.2	-	-	-	-
	G115	4/66	2.2	200-400	420-680	620-1080	-
	G120	3/69	2.9	-	-	-	-
	G130	12/68	4.5	-	-	-	-
	G205	6/64	X	11	0	11	X
	G210	7/60	X	35	0	35	X
	G215	9/63	X	15	1	16	X
	G225	4/61	X	145	15	160	X
	G235	4/64	X	40-60	17	57-77	X
	G245	11/68	X	3	-	3	X
	G255 T/S	10/67	X	15-20	-	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	240-400	-
	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	255	0
	H-115	6/70	3.5	30	-	30	-
	H-120	1/66	4.8	800	160	960	-
	H-125	12/67	7.0	150	220	370	-
	H-200	3/64	7.5	800	275	1075	-
	H-400	12/61	10.5	46	40	86	X
	H-800	12/60	30.0	58	15	73	X
	H-1200	2/66	9.8	230	90	320	-
	H-1250	7/68	12.0	130	55	185	-

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-1400	1/64	14.0	4	6	10	X
	H-1800	1/64	50.0	15	5	20	X
	H-2200	1/66	18.0	125	60	185	-
	H-3200	2/70	24.0	20	2	22	-
	H-4200	8/68	32.5	18	2	20	-
	H-8200	12/68	50.0	10	3	13	-
	DDP-24	5/63	2.65	-	-	90	X
	DDP-116	4/65	X	-	-	250	X
	DDP-124	3/66	X	-	-	250	X
	DDP-224	3/65	X	-	-	60	X
	DDP-316	6/69	0.6	-	-	450	-
	DDP-416	-	X	-	-	350	X
	DDP-516	9/66	1.2	-	-	900	-
	H112	10/69	-	-	-	75	-
	H632	12/68	3.2	-	-	12	-
	H1602	-	-	-	-	-	-
	H1642	-	-	-	-	-	-
	H1644	-	-	-	-	-	-
	H1646	-	-	-	-	-	-
	H1648	11/68	12.0	-	-	20	-
	H1648A	-	-	-	-	-	-
IBM	305	12/57	3.6	40	15	55	-
White Plains, N.Y.	650	10/67	4.8	50	18	68	-
(N) (D) (12/72)	1130	2/66	1.5	2580	1227	3807	-
	1401	9/60	5.4	2210	1836	4046	-
	1401-G	5/64	2.3	420	450	870	-
	1401-H	6/67	1.3	180	140	320	-
	1410	11/61	17.0	156	116	272	-
	1440	4/63	4.1	1690	1174	2864	-
	1460	10/63	10.0	194	63	257	-
	1620 I, II	9/60	4.1	285	186	471	-
	1800	1/66	5.1	415	148	563	-
	7010	10/63	26.0	67	17	84	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	2	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7020, 2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-
	7094-I	9/62	75.0	10	4	14	-
	7094-II	4/64	83.0	6	4	10	-
	System/3 Model 6	3/71	1.0	2	-	-	-
	System/3 Model 10	1/70	1.1	-	-	-	-
	System/7	11/71	0.35 and up	-	-	-	-
	360/20	12/65	2.7	7161	6075	13236	1780
	360/25	1/68	5.1	1112	759	1871	1287
	360/30	5/65	10.3	5487	2535	8022	-
	360/40	4/65	19.3	2454	1524	3977	1363
	360/44	7/66	11.8	109	57	166	39
	360/50	8/65	29.1	1135	445	1580	662
	360/65	11/65	57.2	601	144	745	562
	360/67	10/65	133.8	57	6	63	99
	360/75	2/66	66.9	50	17	67	12
	360/85	12/69	150.3	11	1	12	55
	360/90	11/67	-	5	-	5	-
	360/190	-	-	13	2	15	-
	360/195	4/71	232.0	-	-	9	48
	370/135	5/72	14.4	3	-	-	-
	370/145	9/71	23.3	1	-	-	-
	370/155	2/71	48.0	-	-	-	-
	370/158	-/73	49.5-85.0	-	-	-	-
	370/165	5/71	98.7	-	-	-	-
	370/168	-/73	93.0-170.0	-	-	-	-
	370/195	6/73	190.0-270.0	-	-	-	-
Interdata	Model 1	12/70	3.7	205	75	280	85
Oceanport, N.J.	Model 3	5/67	-	-	-	200	X
(A) (11/72)	Model 4	8/68	8.5	270	115	385	40
	Model 5	11/70	X	70	20	90	X
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	X	1	5	6	X
	Model 18	6/71	X	2	6	8	X
	Model 50	5/72	6.8	7	3	10	21
	Model 70	10/71	6.8	207	49	256	141
	Model 80	10/72	14.9	4	0	4	21
Microdata Corp.	Micro 400	12/70	0.1-0.5	160	0	125	-
Santa Ana, Calif.	Micro 800	12/68	0.2-3.0	1916	700	2616	-
(A) (11/72)	Micro 1600	12/71	0.2-3.0	263	80	343	-
NCR	304	1/60	X	5	2	7	X
Dayton, Ohio	310	5/61	X	8	0	8	X
(A) (12/72)	315	5/62	7.0	255	200	455	-
	315 RMC	9/65	9.0	55	35	90	-
	390	5/61	0.7	160	325	485	-
	500	10/65	1.0	1100	1750	3650	-
	Century 50	2/71	1.6	580	0	600	-
	Century 100	9/68	2.6	1175	780	1955	-
	Century 101	12/72	3.7	50	-	50	-
	Century 200	6/69	7.0	575	330	905	-
	Century 300	2/72	21.0	5	5	10	-
Philco	1000	6/63	X	16	-	-	X
Willow Grove, Pa.	200-210,211	10/58	X	16	-	-	X
(N) (1/69)	2000-212	1/63	X	12	-	-	X

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL $(000)	NUMBER OF INSTALLATIONS In U.S.A.	Outside U.S.A.	In World	NUMBER OF UNFILLED ORDERS
Raytheon Data Systems Co.	250	12/60	X	115	20	135	X
Norwood, Mass.	440	3/64	X	20	-	-	X
(A) (10/72)	520	10/65	X	26	1	27	X
	703	10/67	12.5	(S) 175	33	208	4
	704	3/70	7.2	(S) 260	70	330	30
	706	5/69	19.0	(S) 75	15	90	2
Standard Computer Corp.	IC 4000	12/68	9.0	9	0	9	2
Los Angeles, Calif.	IC 6000-6000/E	5/67	16.0	3	0	3	-
(A) (6/72)	IC 7000	8/70	17.0	4	0	4	1
	IC-9000	5/71	400.0	(S) 1	0	1	-
Systems Engineering Laboratories	SYSTEMS 810B	9/68	2.6	168	10	178	-
Ft. Lauderdale, Fla.	SYSTEMS 71	8/72	0.9	-	-	-	-
(A) (12/72)	SYSTEMS 72	9/71	1.0	14	3	17	-
	SYSTEMS 85	7/72	6.0	3	1	4	-
	SYSTEMS 86	6/70	10.0	31	1	32	-
UNIVAC Div. of Sperry Rand	I & II	3/51 & 11/57	X	23	-	-	X
New York, N.Y.	III	8/62	X	25	6	31	X
(A) (4/72)	File Computers	8/56	X	13	-	-	X
	Solid-State 80 I,II, 90, I, II, & Step	8/58	X	210	-	-	X
	418	6/63	11.0	80	39	119	23 E
	490 Series	12/61	30.0	76	14	90	15
	1004	2/63	1.9	1522	610	2132	-
	1005	4/66	2.4	617	248	865	72
	1050	9/63	8.5	136	59	195	-
	1100 Series (except 1107, 1108)	12/50	X	9	0	9	X
	1107	10/62	X	8	3	11	X
	1108	9/65	68.0	103	129	232	58 E
	9200	6/67	1.5	1106	835	1941	725
	9300	9/67	3.4	412	62	474	510 E
	9400	5/69	7.0	82	41	123	83 E
	LARC	5/60	135.0	2	0	2	-
UNIVAC - Series 70	301	2/61	7.0	144	-	-	-
Blue Bell, Pa.	501	6/59	14.0-18.0	16	-	-	-
(A) (11/72)	601	11/62	14.0-35.0	3	-	-	-
	3301	7/64	17.0-35.0	71	-	-	-
	Spectra 70/15, 25	9/65	4.3	17	-	-	-
	Spectra 70/35	1/67	9.2	102	-	-	-
	Spectra 70/45	11/65	22.5	303	-	-	-
	Spectra 70/46	-	33.5	34	-	-	-
	Spectra 70/55	11/66	34.0	15	-	-	-
	Spectra 70/60	11/70	32.0	12	-	-	-
	Spectra 70/61	4/70	42.0	7	-	-	-
	70/2	5/71	16.0	58	-	-	-
	70/3	9/71	25.0	4	-	-	-
	70/6	9/71	25.0	13	-	-	-
	70/7	12/71	35.0	7	-	-	-
Varian Data Machines	620	11/65	X	-	-	75	X
Newport Beach, Calif.	620i	6/67	X	-	-	1300	X
(A) (8/72)	R-620i	4/69	-	-	-	80	-
	520/DC, 520i	12/69;10/68	-	-	-	350	-
	620/f	11/70	-	-	-	201	3
	620/L	4/71	-	-	-	474	114
	620/f-100	6/72	-	-	-	13	16
	620/L-100	5/72	-	-	-	21	19
	Varian 73	-	-	-	-	-	12
Xerox Data Systems	XDS-92	4/65	1.5	43	4	47	-
El Segundo, Calif.	XDS-910	8/62	2.0	170	10	180	-
(N) (R) (12/72)	XDS-920	9/62	2.9	120	12	132	-
	XDS-925	12/64	3.0	15	1	16	-
	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	32	3	35	-
	XDS-9300	11/64	8.5	25-30	4	25-34	-
	Sigma 2	12/66	1.8	163	36	199	-
	Sigma 3	12/69	2.0	13	0	10	-
	Sigma 5	8/67	6.0	29	14	43	-
	Sigma 6	6/70	12.0	-	-	-	-
	Sigma 7	12/66	12.0	30	7	37	-
	Sigma 8	2/72	-	3	-	-	-
	Sigma 9	-	35.0	-	-	-	-

ADVERTISING INDEX

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

WILL YOU HELP?

Yes, *you.* It may come as a surprise that you'd be asked . . . but as a reader of *Computers & Automation* you are in a unique position to help us.

NAMES . . . people, institutions, companies who should be interested in 1) the computer industry and/or 2) seeking truth in information are very much needed to join you as readers of *C&A*.

Will you tell us who they are? And perhaps even more, will you let us use your name in writing to them? But with or without your name (we'll only use it if you grant permission) we need to know those *you* think might be interested in also reading *C&A*.

****** *reprint from* computers and automation**

Science and the Advanced Society, by C. P. Snow, Ministry of Technology, London, England (April 1966)
The Information Revolution and the Bill of Rights, by Dr. Jerome B. Wiesner, M.I.T. (May 1971)
Employment, Education, and the Industrial System, by Prof. John Kenneth Galbraith, Harvard Univ. (Aug. 1965)
Computers and the Consumer, by Ralph Nader, Washington, D.C. (Oct. 1970)

Please give us their names and addresses on the form below or add another sheet of paper. Trim out the card with scissors and drop it in the mail. We'll gladly pay the postage to learn of possible new friends. And many thanks for your help! As a token of our appreciation we'll send you our ****Reprint.

P.S. If you like you may mail your list separately to:
R. A. Sykes, Circulation Mgr.
Computers & Automation
815 Washington Street
Newtonville, MA 02160

cut here and tuck in flap

TO: R. A. Sykes, Circulation Mgr.
Computers & Automation

I suggest you send information on C&A to . . . (attach list if you like)

(1) Name____________________
Address____________________
City____________State________ZIP______

(2) Name____________________
Address____________________
City____________State________ZIP______

May we use your name? ☐ YES ☐ NO

Please give us your name and address on the form below so we can send you your ****Reprint. Just cross out the subscription request — unless you also want to enter your new or renewal order.

cut here — cut here

cut here

Fold here — do not cut

bend here and fold

FIRST CLASS
PERMIT NO. 33531
BOSTON, MASS.

BUSINESS REPLY MAIL
No postage stamp necessary if mailed in the United States
POSTAGE WILL BE PAID BY BERKELEY ENTERPRISES, INC.

COMPUTERS AND AUTOMATION
815 Washington Street
Newtonville, MA 02160

B — staple or glue to A

cut here

YES, start my subscription to COMPUTERS AND AUTOMATION according to the instructions checked below.

One Year (including the Computer Directory and Buyers' Guide — 13 issues) U.S. only. ☐ $18.50

One Year (excluding the Computer Directory and Buyers' Guide — 12 issues) U.S. only. ☐ $9.50

Name:________________Title:________
Organization:________________
Address:________________
City:____________State:________Zip:________
Country if not U.S.:________________
Signature:________________P.O. No.:________

☐ Payment enclosed ☐ Renewal
☐ Bill me ☐ New subscription

To SPEED the processing of your order, please check the one best descriptor in each of the two categories below. (This information will be used for statistical purposes only.)

BUSINESS TYPE

01—Computer Manufacturer
02—Aerospace / Aircraft Manufacturer
03—Other Manufacturing
04—Raw Materials Processing; (chemical, primary metal, petroleum, food, etc.)
05—Mining and Construction
06—Computing & Consulting
07—Finance, Insurance, Publ., and Service Organizations
08—Transportation Companies
09—Public Utilities
10—Research
11—Wholesale, Retail, Sales, and Marketing Firms
12—Educational; (College, University, or School)
13—Government and Military
14—Libraries

JOB FUNCTION

1—Technical Management; (computer installation management, program management, or engineering mgmt.)
2—Computer Center Personnel; (methods & procedure analysts, and operators)
3—Programming Personnel; (systems, application & research programmers)
4—Professional: (systems analysts, mathematicians, operations researchers, and professors)
5—General Management Executives; (corporate officers, owners, and partners)
6—Engineering Personnel; (systems engineers, research & development engineers)
7—Research Personnel
8—Students
9—Library Subscription
10—Subscription in Company Name Only

A — staple or glue to B

cut here