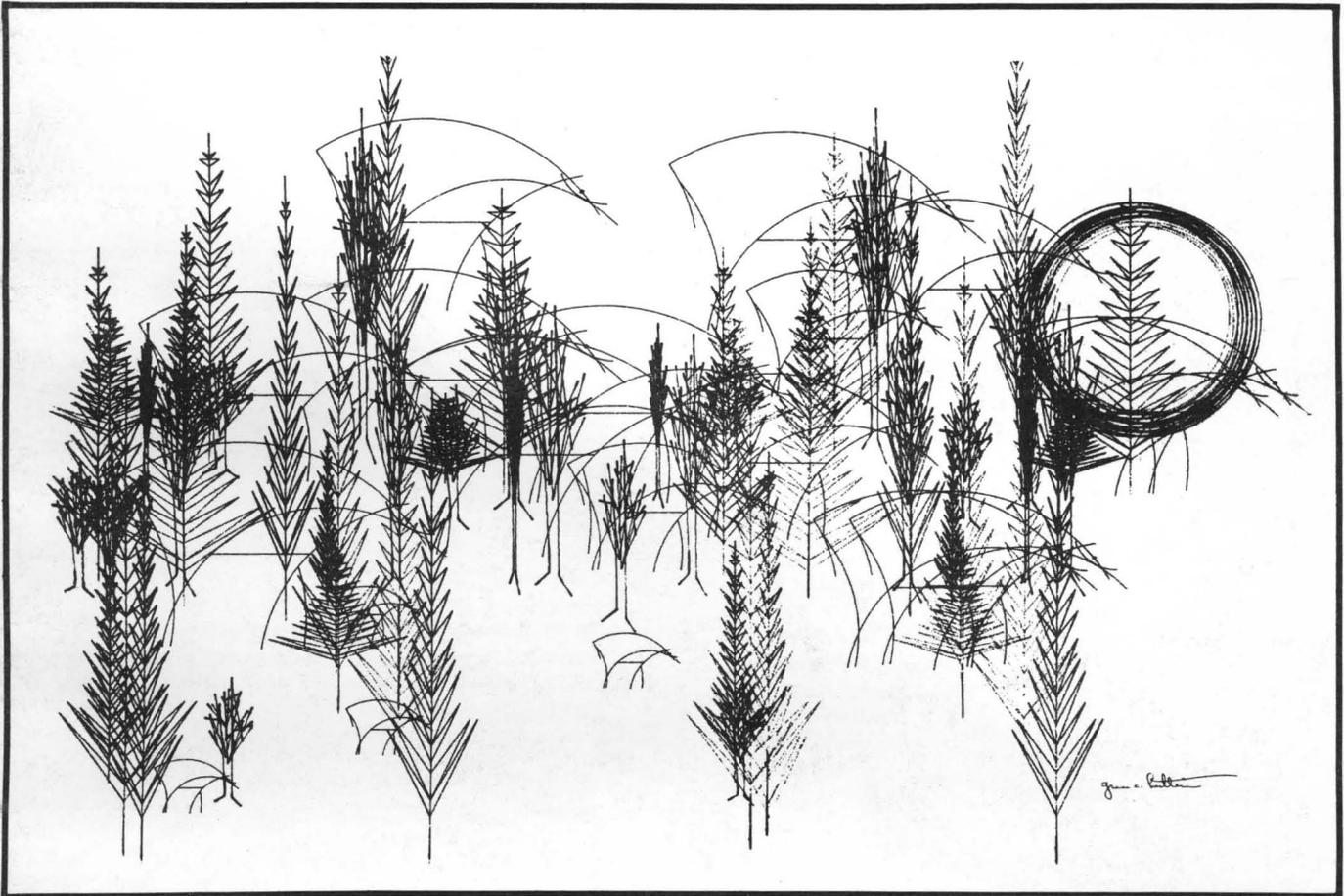


computers and people

formerly *Computers and Automation*

BEASTS IN A FIELD



Point-of-Sale Equipment for Department Stores

— Frank Burnside.

A Catalogue of Bottlenecks

— Donald C. Harder

Facsimile Transmission at New Levels

— Arthur D. Little, Inc.

Computer Art: Steps Towards a Measurable Analysis

— Grace C. Hertlein

Managing Modern Complexity — Part 2 (Conclusion)

— Dr. Stafford Beer

The Assassination of Martin Luther King, Jr., Part 4

— Wayne Chastain

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

by Edmund C. Berkeley, editor,
anthologist, and author

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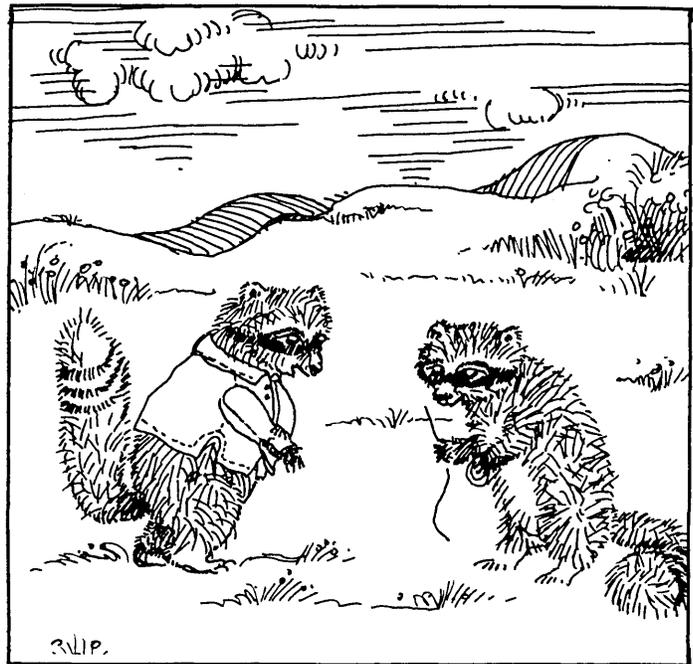
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THE TWO RACCOONS AND THE BUTTON

George Raccoon: Oh, darn, there's a button off my shirt.

Martha Raccoon: My dear, see if there isn't another shirt in your drawer that you can wear.

George: (searching) No, there isn't. That's the only clean white shirt; all the others are gray. And I have to wear a white shirt to-day; there's a meeting this morning with Mr. Wolf and Mr. Fox — we have a problem with the Bears, you know.

Martha: I'm sure there is another white shirt. (She comes and searches the drawer.) Well, there isn't one, you're right. Do you have the button?

George: Yes, here it is. Oh, Martha, are you going to sew it on for me right now? You're amazing, you're wonderful!

Martha: Give me the button. (She swiftly sews the button on the white shirt, while he waits patiently.) There's your shirt.

George: Oh, thank you — you're my dear Martha. You're the best and nicest help a Raccoon could ask for. I just don't know what I'd do without you.

Martha: (smiling) I know what you'd do, you big Raccoon — you'd sew it on yourself, just as you used to before you married me — and you'd save all that flattery.

George: (giving her a Raccoon hug) Not flattery, my dear — persuasion!

Persuade him with kindly gifts and gentle words.

— Homer, 850 B.C.

Persuasion's only shrine is eloquent speech.

— Aristophanes, 405 B.C.

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

To: Berkeley Enterprises, Inc.
815 Washington St., Dept. R21, Newtonville, MA 02160

() Please send me _____ copy(ies) of *Ride the East Wind: Parables of Yesterday and Today* (now published) by Edmund C. Berkeley, Author and Anthologist. I enclose \$7.25 (Publication price + Postage and Handling) per copy.

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WOULDN'T YOU AGREE THAT SENSE, COMMON AND UNCOMMON,
OUGHT TO BE THE KEY TO PREVENTING MISTAKES?

We examine systematically the prevention of mistakes in

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PURPOSES:

- to help you avoid pitfalls
- to prevent mistakes before they happen
- to display new paths around old obstacles
- to point out new solutions to old problems
- to stimulate your resourcefulness
- to increase your accomplishments
- to improve your capacities
- to help you solve problems
- to give you more tools to think with
-

8

REASONS TO BE INTERESTED IN THE FIELD OF
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COMPUTERS are important —

But the computer field is over 25 years old. Here is a new field where you can get in on the ground floor to make your mark.

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But this field is more important than mathematics, because common sense, wisdom, and general science have more applications.

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This field includes the systematic study and development of common sense.

SCIENCE is important —

This field includes what is common to all the sciences, what is generally true and important in the sciences.

MISTAKES are costly and to be AVOIDED —

This field includes the systematic study of the prevention of mistakes.

MONEY is important —

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OPPORTUNITY is important —

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- Forgetting
- Unforeseen Hazards
- Placidity
- Camouflage and Deception

To Come

Preventing Mistakes from:

- Bias
- Interpretation
- Distraction
- Gullibility
- Failure to Observe
- Failure to Inspect
- Prejudice

Topic: SYSTEMATIC EXAMINATION OF GENERAL CONCEPTS

Already Published

The Concept of:

- Expert
- Rationalizing
- Feedback
- Model
- Black Box
- Evolution
- Niche

To Come

- Strategy
- Understanding
- Teachable Moment
- Indeterminacy
- System
- Operational Definition

AND MANY MORE TOPICS

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

Subscription rates: United States, \$11.50 for one year, \$22.00 for two years. Canada: add \$1 a year; foreign, add \$6 a year.

NOTE: The above rates do not include our publication "The Computer Directory and Buyers' Guide". If you elect to receive "The Computer Directory and Buyers' Guide," please add \$12.00 per year to your subscription rate in U.S. and Canada, and \$15.00 per year elsewhere.

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Postmaster: Please send all forms 3579 to Berkeley Enterprises, Inc., 815 Washington St., Newtonville, MA 02160.

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computers and people

formerly *Computers and Automation*

Computer Applications

8 Point-of-Sale Equipment for Department Stores: [A]

A Tool to Avoid Complexity and a Story of Success

by Frank Burnside, President, Fowler Dick and Walker, Wilkes Barre, Pa.

How four main ingredients: magnetic marking equipment; interactive terminals with magnetic reading capacity; some minicomputer control arrangements; and thorough and complete systems analysis — worked out extremely well in an installation in a large department store.

11 A Catalogue of Bottlenecks [A]

by Donald C. Harder, Computer EKG, Cleveland, Ohio

As production volumes increase in an installation of electronic data processing, different aspects of data processing become the limiting bottlenecks; it is worthwhile to be aware of the succession of limits, and to adopt measurements to observe and control them.

Competition with Computers

10 Facsimile Transmission at New Levels [A]

by Arthur D. Little, Inc., Cambridge, Mass.

A method of transmission which bypasses the computer and will cost less than first class mail is expected to become a business of \$2 billion a year in half a dozen more years.

Computers and Society

18 Managing Modern Complexity — Part 2 (Conclusion) [A]

by Dr. Stafford Beer, Visiting Professor of Cybernetics, Business School of Manchester University, Manchester, Great Britain

History did not design our society to deal with the complexity which confronts it; there are major threats to the continuance of our society in crisis after crisis ahead of us.

The dangers need to be studied, understood, and dealt with, using the principles that govern complex systems.

7 Privacy and Computer Security, and Some Other Topics [F]

by Major G. A. Strassburger

33 Professional Certification of Computer People, by Paul M. Pair [F]

33 Technological Innovation Opportunities, by Peter Schwartz [F]

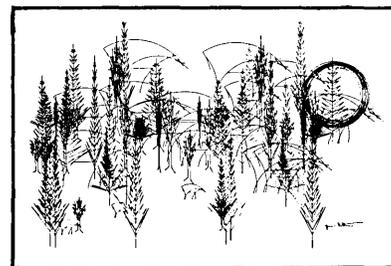
Computers and Art

13 Computer Art: Steps Towards a Measurable Analysis [A]

by Grace C. Hertlein, Asst. Prof., Computer Science Dept., Calif. State Univ.-Chico, Chico, Calif.

Art produced using a computer can be observed, perceived, and analyzed stylistically and in many other aspects. Such analysis of works of art, coupled with intuitive appreciation, leads to a more profound understanding.

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



The Profession of Information Engineer and the Pursuit of Truth

- 29 Unsettling, Disturbing, Critical [F]
Statement of policy by *Computers and People*
- 6 Pressure to Conform [E]
by Edmund C. Berkeley, Editor
Why a professional information engineer should devote a portion of his abilities and his reading to some of the most important problems facing society; and why he should resist pressure to conform, and seek ways to avoid blinders.
- 25 The Assassination of the Reverend Martin Luther King, Jr., and Possible Links with the Kennedy Murders – Part 4 [A]
by Wayne Chastain, Jr., Reporter, Memphis, Tenn.
The report of a diligent study into the details and circumstances of the assassination of the Reverend Martin Luther King, Jr., on April 4, 1968, and related events, and the considerable evidence of a conspiracy.
- 33 Conspiracy to Kill Leaders of Blacks, and FBI Involvement In It, by United Press International [F]
- 34 The Title *Computers and People*, by D. Lyman Sorrell [F]

From *The Boston Globe* of April 7, 1974

The Rev. Ralph D. Abernathy said he believes "people in higher places" were implicated in the assassination six years ago . . . of Dr. Martin Luther King, whom he succeeded as head of the Southern Christian Leadership Conference. He told a group of black students at Kansas State University he does not believe James Earl Ray, who pleaded guilty in the slaying, acted alone. "Maybe he fired the shot but I think others were involved," Abernathy said.

Computers, Games and Puzzles

- 30 Games and Puzzles for Nimble Minds – and Computers [C]
by Edmund C. Berkeley, Editor
COMPMEANO – Does this series of digits have meaning?
ALGORITHMO – Expressing a procedure for going from given input to given output, in an "unusual" situation.
GIZZMO – Some computational Jabberwocky.
ESSENTIALO – Summarizing a long sentence?
ARGUMENTO – The validity of an argument?
NAYMANDIJ – A systematic pattern among randomness?
PICTORIAL REASONING – Observing and judging.
NUMBLES – Deciphering unknown digits.
- 7 Naymandij Puzzle Solving, by A. Hugh Argabrite [F]
- 33 Zoonayman – A Game That Is Enjoyed, by John A. White [F]

Front Cover Picture

Beasts in a Field was programmed by Grace C. Hertlein, Asst. Prof., Computer Science Department, Calif. State Univ.-Chico. For more information, see pages 13-17.

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Key

- [A] – Article
- [C] – Monthly Column
- [E] – Editorial
- [F] – Forum

NOTICE

*D ON YOUR ADDRESS IMPRINT MEANS THAT YOUR SUBSCRIPTION INCLUDES THE COMPUTER DIRECTORY. *N MEANS THAT YOUR PRESENT SUBSCRIPTION DOES NOT INCLUDE THE COMPUTER DIRECTORY.

PRESSURE TO CONFORM

From time to time this magazine receives a lot of pressure to conform to being the ordinary kind of trade magazine, a magazine which assumes:

- that the field of business or engineering or industry, etc., in which it reports is *good*, by itself and of itself;
- that the dominant organizations (and nearly all the other organizations) in that field are *good*;
- that the ways in which people work in that field are *good*;
- that the only real problems are how to do everything better and more, the sky is the limit, and progress is inevitable.

Here are some of the ways in which pressure to conform is exerted:

- You will not have advertisers unless you
- You will lose your subscribers if you
- The field which you are in is your reason for existence. Leave it to other magazines to deal with extraneous subjects outside of your field.
- Take it from me, old buddy, I am your friend; cut out that fool stuff about political assassinations in the United States and "the reality behind the lies" in Vietnam and similar material: stick to your knitting.
- OK, OK, you want to publish that stuff. So start a second magazine. Or put it into books. Just leave it out of your present magazine - it does not belong there.
- My friend, what you want to do is accentuate the positive.
- I have subscribed to your magazine for ten years and used to like it, but I cannot tolerate what you say about Mr. Richard M. [or somebody else] and so I am dropping my subscription.

Needless to say, this magazine does not intend to yield to this sort of pressure to conform. Why not? There are many important reasons.

First, we believe that "computer professional" is old-fashioned language for an occupation which in the future will be "information engineer". An information engineer is an educated and responsible person who understands the engineering of information and systems and how to use them to help both customers and society, and who is professionally committed to so doing.

Second, we believe that the information engineer has a broad responsibility in a professional and engineering sense for:

- the reliability and social significance of data that is input into an information system;
- the social value and the truth of information that is output from an information system.

In other words, the information systems which information engineers organize must basically be to the benefit of society. For example, to design and operate an information system about criminals using arrest information *without* notices of the disposal of arrests is clearly wrong - and clearly dishonorable.

Third, we believe that many of the most important problems facing society need the professional skills of those who think of themselves as information engineers, engineers whose field is operating with information.

- Is it necessary that so vital a resource as oil and gasoline should be controlled by multinational corporations, ungoverned international committees, and Arabian sheiks, so that the owners and managers should increase their profits by a factor of four in one year - while millions of people all over the world suffer over doubled prices for gasoline and oil?
- Is it necessary that environmental standards be modified so that there will be more pollution instead of less?
- Is it reasonable to believe that, since 1963 when President John F. Kennedy was assassinated, the military industrial complex in the United States gained essential control over the United States, so that over \$100 billion of U.S. taxpayers money was wasted in South East Asia? (More is still being wasted to support the Thieu dictatorship, which has over 200,000 political prisoners in jail, contrary to the peace treaty the U.S. signed in January 1973.)

Can computers help to decide answers to such important questions as these? Of course they can.

Look at the computer which helped Senator Sam Erwin's committee in the investigation of the Watergate crimes - a computer which overnight produced references to prior testimony, ready for the senators to ask critical

FORUM

Privacy and Computer Security, and Some Other Topics

Major G. A. Strassburger
Headquarters, First U.S. Army
Directorate Management Information Systems
Data Processing Activity
Fort Meade, Md. 10755

As a recent subscriber, I am writing my first letter to you, primarily to transmit my solution to the NUMBLE 743 (enclosed), but also to raise a few points.

First, I came across a couple more of your "stupid mistakes", i.e., "decisions" on page 25 and "Ram-say's" on page 28.

Second, I don't know what type of forum you have for comments about articles, but I have a few about the Davis article on Privacy and Security in Data Systems for whatever action you deem appropriate. I feel that this article was both misleading and illogical in relation to the stated subject. The connection between the privacy question (I agree a true "societal" problem) and computer security is erroneously presented as a direct link. It is true that privacy results in determinations of confidentiality for various type of data, and also that the degree and type of confidentiality determines the type and extent of ADP security. But ADP security is a technological and procedural problem whose dimensions are determined only by the desired level of protection (confidentiality) and is only incidentally related to the type and nature of the data to be so protected. It may or may not be related to data on

EDITORIAL — Continued from page 6

questions of persons testifying, and so confront them immediately with discrepancies.

Are computers being widely applied in these socially important ways? No, not widely. Why not?

Basically and simply, the answer is this:

- Computers are being applied in a big way to serve the interests of all persons, organizations, and institutions who can make profits or reduce expenses from their use.
- Computers are being applied in only a very small way and only here and there to solve the giant problems facing society.

Is this right? No.

Can something be done about it? Yes.

THE PURPOSE OF FORUM

- To give you, our readers, an opportunity to discuss ideas that seem to you important.
- To express criticism or comments on what you find published in our magazine
- To help computer people and other people discuss significant problems related to computers, data processing, and their applications and implications, including information engineering, professional behavior, and the pursuit of truth in input, output, and processing.

Your participation is cordially invited.

individuals (e.g., consider national security data, company patents and trade secrets, formulas, pricing information, etc.), but the point is that the treatment is dependent only on the level of security required. The other major fallacy in the article concerns the purported value of encryption as a security measure. The value of this technique is largely negated by the fact that since the encryption algorithms are usually contained within the computer, it merely becomes the first task of a penetrator to obtain this information. Thus, although encryption does have value in data transmission, in the computer it does not deter a skilled penetrator who obtains access to a computer system.

Finally, not withstanding my disagreement with the Davis article, I would like to say that I am most pleased to be a subscriber to your magazine, and admire and encourage continuance of your high standards of publication. For example, "Effective Program Design" was well worth the price of the whole magazine. It's a real jewel.

Keep up the good work.

Naymandij Puzzle Solving

A. Hugh Argabrite
827 Cumberland Drive
Sunnyvale, Calif. 94087

My solution for Naymandij Puzzle 743 is enclosed.

My method of solution is not the most scientific. I first examine the entire grid visually looking for any obvious or apparent patterns. I look at the
(please turn to page 33)

What can be done?

- Become informed.
- Search for information off the beaten path: look for and read newspapers and magazines that do not conform — which print unsettling, disturbing, and critical information.
- Get rid of the mental blinders which are easily and smoothly provided by the newspapers and magazines that support establishments.
- Organize and work to apply computers to the giant problems facing society.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

Point-of-Sale Equipment for Retail Stores —

A Tool to Avoid Complexity and a Story of Success

The 7th Annual Electronic Data Processing Conference for Retailers took place in San Francisco in September 1965. There I made an appeal for Standardization of Classification content definitions, with a view to source-marking in a standard format. Concluding that presentation I said,

Hardware must be developed to read these standard tickets at the point-of-sale and to provide for at least some variable information. Let it also read the account identification number of a customer credit card and we will have it made.

Some other pointed observations to some of the hardware suppliers were made at that time, as well as on earlier occasions and many times since. We, and many other progressive retailers, knew then what we wanted and needed; and many of us were well prepared for it; but broadly speaking, the equipment manufacturers only knew what they wanted to sell us, and scarcely had an ear for what their potential customers needed.

Point-of-Sale Data On-Line

As a result small and new people took a crack at the point-of-sale problem. Many of us spent a good deal of time, effort, and not a few dollars, testing a half dozen or more proposed devices or combinations of devices, none of which completely or satisfactorily met the requirements. For the last ten years many stores which were opening new branches or otherwise compelled to acquire new point-of-sale (P.O.S.) equipment have been investing in obsolete, often archaic gear.

At our organization we used these years to further develop, by our merchandise control system, the design, assortment planning, unit marking, and data base preparing for the day when we could collect P.O.S. data on line. We also engaged in ceaseless effort of shopping the terminal market and state of the art. We deliberately over-designed and over-built our systems to provide maximum flexibility and translating ability at the main frame level. We used some 1600 standard definitions classifications, and we have been for a number of years marking in two formats. We developed system and software for accounts receivable and put it on the shelf; we deferred the decision on new credit cards until the language situation on customer identification would clarify itself. Because we were using several million N.R.M.A. Standard Format, print-punch tickets a year, either our own or source-mark, we aimed originally to develop customer identification in the same format. No one else was much interested in this approach. To those of us who had dedicated our best efforts to standardization, the highly proprietary character of the NCR announcement involving the color-code was almost insulting, though certainly, not surprising in the light of their historic philosophy and our long experience with them.

Based on a talk written in December 1973 and given at the 63rd Annual Convention of the National Retail Merchants' Association, New York, January 7, 1974.

What Stores Needed and Wanted

The Sweda 700 system announcement of April 1971 with the multi-language ticket concept, the magnetic Datapen, and the fully interactive 720 terminal began to look for the first time that someone of consequence in the hardware business had an ear for what stores needed and wanted. We kept hearing tidbits from IBM about Raleigh and Delta Distance monochrome bars but little or nothing concrete.

The war against paper work, which was the only one we were interested in, was pushed into the background by the war between magnetics and optics which was being fought and fought again at every convention session and clinic or equipment both.

In September 1971, we fixed a time frame by committing ourselves to build a new total assortment store of 126,000 square feet in another market, Hazleton, Pennsylvania, 24 miles from the main store. We knew that this gave us about 18 months to come up with some decision on point-of-sale. By this time, the airlines and major nation-wide credit card people were beginning to plump for magnetics, and the Systems Specification Committee apparently wasn't making any better progress with the hardware people than we had.

Through late 1971 and early 1972 we had new in-depth discussions with everyone in the P.O.S. business. In June 1972 Hurricane Agnes inundated our main store and market and it took us the best part of six months to restore operations. Now, we also were under pressure to replace flood-damaged registers in the main store.

System Design Requirements

We engaged Gambit Services to consult with us in firming up our thinking on system design requirements and preparing appropriate specifications, in order to get out of the jungle of canned sales pitches and to get proposals in a comparable and in-



Frank Burnside is a graduate of Haverford College (B.S. in economics, 1935), and Harvard Graduate Business School (Military Certificate, 1943). He served with the U.S. Naval Reserve Supply Corps, 1942-46. He is a director of Bethlehem Acceptance Corp., United Penn Bank, and Commonwealth Telephone Co.

Frank Burnside, President
Fowler, Dick and Walker
15 - 25 South Main St.
Wilkes-Barre, Pa. 18701

"Broadly speaking, the equipment manufacturers only knew what they wanted to sell us, and scarcely had an ear for what their potential customers needed."

telligent format as much as possible. All major suppliers responded; on an adjusted basis per terminal the pricing was not sufficiently different to buy a good lunch. Some vendors had delivery, or software, or service support problems, or all three. Some couldn't create for us a log tape that we could read on our IBM 360. We were compelled to learn quite a bit about "back-rooms" and "minis" in the evaluation process. We ultimately got to the point where we were more concerned with evaluating people than we were concerned with hardware.

Magnetic Marking

To make a long story a little shorter, we ultimately chose and in February 1973 awarded a contract to Sweda International for 140 Model 720 interactive terminals with Datapen magnetic reading capacity, a 60 unit installation for the main store for January 1974, each with duplex Nova mini control gear and inter-connected for remote telephone polling.

Simultaneously, we awarded contracts to other Litton subsidiaries for Kimball magnetic marking equipment and M&M magnetic customer identification cards for both stores. We thereby acquired an umbrella of related if not totally uniform responsibility.

Optical Marking

Our consultants did not fully concur with this decision, and pointed out that it was premature, if not unwise, to make the investment in magnetics in view of the trend in thinking as reported from the Systems Specifications Committee toward optics of which we were fully aware. The reactions of the unsuccessful bidders were equally interesting; outright disbelief; suggestions concerning the state of our mental health; offers of a better deal; proffers of assistance when the crash came; sincere expressions of sympathy.

Engineering the System

Our own systems and training people began working immediately with a talented and experienced team brought together by Sweda for the project. These people worked about half-time with us in Wilkes-Barre and about half-time with their software people in New Jersey. They produced in about twelve weeks what I can only describe as a very simple, extremely sophisticated, point-of-sale data collection system. It handles 30 odd different types of transactions, including of course, returns, credits and exchanges. It also provides for some fifteen to twenty other functions, including collections on utility accounts, as well as our own store accounts, at all terminals, and inquiry and readouts by terminal, demand center, or item in the backroom. Additions to stock and inventory detail are read into any terminal. Some 15% of the locations are selectively operated in cashier check-out mode. Full 16 character alpha descriptors for some 1600 sub-classifications are carried on back office disc and called up for printing out a fully descriptive three-ply terminal receipt, one part of which is country club billing media on charge transactions.

We are scheduled to make the shift to computer descriptive billing on the main frame in June of

1974, using of course, the log tapes generated in the P.O.S. back office. The only paper in the system, in addition to the terminal receipt, is an address label inserted for machine verification for sends, and a special combination form for C.O.D. and Layaway transactions, also processed by terminal but requiring additional handwritten address and contract information. All credit vouchers and payment receipts are terminal generated tape.

Installation on Schedule

The new store equipment was installed precisely on schedule, August 1, 1973, up and running immediately for training and recording additions to stock. Some 250 new people were trained in about three weeks, averaging about five hours; at the same time they were also being trained in the unit magnetic marking, and entering the entire opening inventory into the system through the terminals. About 90% of the inventory was magnetically unit-marked in either our 12-digit basic unique number S.K.I. system or the standard 24 digit fashion control system. The balance of course, was the traditional exceptions, such as greeting cards, paperback books, patterns, et cetera. The store opened October 4, 1973, one week later than schedule, occasioned partly by failure of delivery of certain unrelated fixture and critical equipment items and partly by our miscalculation of the time allowed (8 weeks) for the massive total assortment unit marking job at a remote location.

Completely Satisfactory Operation

Performance of the system and the new store since the moment of opening have been so completely satisfactory that we immediately accelerated the installation and transition schedule for the main store, which had been wired for the terminals over the summer. The backroom gear was installed and four training terminals set up November 5th. Thirty of the ultimate 80 terminals were installed over the weekend of November 18 in selected locations where training had been completed and remarking had been accomplished. This of course was four days before Thanksgiving and a real measure of our confidence in the system and people involved. The trade-offs to the risk were the immediate full usage in the main store of the magnetic credit cards which had been issued in October and the resulting improvement in service, usage of the magnetic marking and addition to stock features which were being transitionally implemented. Of course, this was a really Spartan test of the whole system under peak conditions; we gained a substantial increase in main frame efficiency through elimination of key punching and ticket conversion of sales data input. We could not have had a smoother transition experience. As this is being written we have passed the big post Thanksgiving weekend peak with no failures or problems of any sort in either store. The thirty operative terminals in the main store recorded slightly over half of our dollar sales and slightly less than half the transactions for that big week. We were particularly pleased with the substantial improvement in

(please turn to page 29)

Facsimile Transmission at New Levels

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"With even lower charges for dial telephone connections in prospect, the emergence of domestic satellite communications systems, and the growth of data-oriented common carriers, facsimile is becoming more attractive, and in many cases can be an economical alternative to first class mail services."

The availability of long-distance communications links and development of solid state electronics have resulted in the rapid growth of facsimile transmission. Business letters, as well as other material such as photographs, charts, invoices, and engineering drawings, can be sent by telephone line or radio quickly and without errors. The first facsimile transmissions were largely for long-distance distribution and delivery of news photographs, and this still accounts for a substantial portion of the industry. Now, facsimile offers business an alternative to the communications service normally supplied by telegraphic printing terminals. Coupled with high-speed computers, facsimile equipment will soon find application for an even greater variety of business and industrial communications problems. It is estimated that revenues for lines, equipment, and services will approach \$2 billion by 1980, about 8 times the current level.

The basic principle of facsimile transmission was demonstrated with crude telegraphic equipment in 1842, and is still fundamentally the same. Graphic or pictorial material is examined point-by-point with some sort of optical reading device. For each picture point, an electrical signal is generated that specifies the darkness of that spot. This signal is transmitted over telephone or telegraph channels or by radio to a receiving device where the brightness of each point is reconstituted and printed in the correct location on a receiving sheet. Thus, from the stream of incoming signals and a knowledge of their original location on the page being transmitted, the receiver can reconstruct an image identical to that being scanned at the sending terminal.

A Wide Range of Technical Disciplines

Business facsimile equipment brings together a wide range of technical disciplines. In the simplest devices, scanning and writing are synchronous; the transmitter and receiver are locked together during transmission. The inexpensive machines are hand-loaded for transmission and reception, with simple mechanisms to handle the input and output documents. They may be acoustically coupled to any dial tele-

phone set, which gives them the advantage of portability. There is no need for wired connection to the telephone instrument.

For transmitting a few documents each day, these desk-top units perform admirably, often substituting for mail and messenger service because they can provide speed, accuracy, and authenticity at approximately the cost of a long distance telephone call. Some 80,000 of these light-duty machines are already installed, and there will be about 700,000 by 1980. Like the teleprinter wire services, facsimile is fast, and goes directly to the addressee. Unlike many wire systems, however, facsimile transmissions are quiet and accurate; even with an unskilled operator, errors in numbers and letters are almost impossible because the complete image of a page is sent.

Sophisticated Systems

On the other end of the scale, equipment is now being introduced that involves many of the most advanced technologies of image scanning, data processing, transmission engineering, and reprographics. The more complicated systems allow time for a variety of data and image processing steps, such as storage or multiple addressing, to intervene between scanning and recording. Some units employ extremely elaborate digital or analog schemes to "compress" the image signals into a concentrated form, even before transmission. Many of these machines incorporate high-speed "modems" that get more information on the telephone line to speed up the process as well as to reduce time charges for the communication circuit. The machines handle stacks of input documents automatically, receive copy unattended, and print on roll-fed paper. To save time and line costs still further, copy length can be programmed according to the size of the input sheet.

Unlike the simple models, which take three to six minutes to transmit a page, the high-speed machines may transmit an average letter in well under a minute over a regular dial telephone line. With even lower charges for dial telephone connections in prospect, the emergence of domestic satellite communications systems, and the growth of data-oriented

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A Catalogue of Bottlenecks

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*"We must keep in mind the teamwork and interaction
between client and the data processing machinery."*

One of the nation's leading mathematical modelers of computers, Prof. Peter Denning, recently wrote a splendid article, "Why Our Approach to Performance Evaluation is SDRAWKCAB"¹ (which means backwards). In this he accused us all of being biased with our own measurement specialties to the point we were "incapable of seeing the forest because of the trees". He felt we were not learning from past mistakes. He further stated that evaluation is related to the design problem and the service objectives of the installation.

Objectives

When we think of service objectives, we must keep in mind the teamwork and interaction between client and the data processing machinery. As the production volumes increase, different attributes seem to be the limiting items. The list shown in Table 1 attempts to rank them in the order of importance to overall production. This might be called a progressive catalogue of bottlenecks. We have been accustomed in the EDP business to talk about overall growth rates of 15% to 25% per year, which has typically been IBM's growth rate. (I have seen growth rates, in terms of jobs processed by the computer, ranging from +100% per year to -7% per year.)

While every one of these shops will admit to having problems, it seems to me the problems of those experiencing growth rates of 30% (or more)

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per year are excessive. Even with the advantage of low incremental processing costs (i.e., the amount of effort required to process just one more data card), we really don't know which part of the production system will be stressed the most. In these situations management finds themselves contending with more than one of these bottlenecks at a time. And unfortunately, it is customer service which suffers in the meeting of these emergencies. Worse still, the future of the EDP shop is probably being mortgaged severely in order to get past just this one crisis.

Bottlenecks

When you look at these bottlenecks, you will see a high amount of labor intensive situations. For instance, take the I/O Control area. This means, for some of us, the keypunch area along with the receiving document control and the checking of "hash" totals to insure proper translation. The machinery problem here is to have, mainly, enough keypunches on hand. Otherwise, this is a big people business.

Supervisory skills, Multi-shift operations, Manning operations, and Management skills are totally manual, while Project Control and Job Mix bottlenecks may be considered only partially manual.

Fascinatingly enough, the pre-sales hoopla of many hardware and software products walks directly into this mine field saying, "Buy my product and your bottlenecks will be removed and you will save 25% — guaranteed. Just call my friend -----." While all of these hardware and software suppliers are profit-motivated and well-intentioned, we must be extra sure of ourselves when we agree that their claims can be realized in our individual shops.

In other words, there is no way in the world that the IBM 370 price-performance claim can be realized if the airconditioning doesn't work right. And we have to be astute enough to know this.

To further confuse the dealing with these bottlenecks, one has to look at the organizational structure that surrounds the various operational groups. Thus the determination of the overriding goals for the organization becomes a critical problem. For instance, one can imagine very good reasons for presenting the company's list of goals in the following order: ease of systems development; fast turnaround for customers; economy of processing; centralization of company data banks; and the protection of company data banks. It is just as easy to see another organization re-order these motivators and add such things as: observe the laws, provide good employment, be a responsible citizen, etc.

Table 1
CATALOGUE OF BOTTLENECKS

Item	Comments
Physical Area: Layout, Environment Control	Permit people and machinery to work if they want to
I/O Data Control	Good Stuff In → Good Stuff Out
Supervisory Skills	Need for teamwork with increasing staff and to cope with employee turnover
Multi-Shift Operations	Easy way to more production hours
Multiprogramming	Taking advantage of the Operating System to get more hours of production
Project Control and Documentation	The implementation of a new system and its turnover to the operations staff may become critical
Memory	Space to handle more programs, simultaneously, of greater complexity
Manning Operations	Scheduling loads; need for more hands and brains to keep greater Multi-Job Levels active, under the rules of the Operating System
Channels	Increases accessibility of files; balancing of loads aids productivity
Peripherals	They increase: space available; maybe speed of access of files; hence, productivity
Management Skills	Growth rates, 5 year plans; Management Information Systems; Interdependent systems; Employee motivation; Corporate goals; span of control; the technician-turned-manager problem
Job Mix	Turn-around times; program optimization
Telecommunications	The really "big" leagues. Changeover to a new system means starting at the top. Physical layout

Thus the matter of goal setting for the company has an overriding effect on bottlenecks. In the matter of goal setting, I like the approach that Paul Meyer, President of Success Motivation Institute, employs:

1. Crystallize your thinking
2. Develop a plan for achieving your goal, and a deadline for its attainment
3. Develop a sincere desire for the things you want in life
4. Develop a supreme confidence in yourself and your abilities
5. Develop a dogged determination for follow-through on your Plan regardless of obstacles, criticism, or what other people say, think, or do.

Once these goals and motivators are identified, we become in position to establish the types of measurement specialty to deploy. They may be merely time stamps or accounting logs reduced manually. Or they may be elaborate software and hardware monitoring systems, if the fundamentals are in order. And simulation and data collection are not enough.

It is the presentation of this data, over a period of time, that begins to give meaning to management so that the bottlenecks that impede the realization of goals can be identified and remedied.

Reference

1. "Sept. 73 Performance Evaluation Review," Prof. Peter J. Denning, Department of Computer Sciences, Purdue University, Lafayette, Ind., published by ACM-SIGME. □

ADL, Inc. — Continued from page 10

common carriers, facsimile is becoming more attractive, and in many cases can be an economical alternative to first class mail services. Many of the machines offered by various vendors are now compatible, and the concept no longer has to be explained in order to sell equipment. Addition of computer tapes and disk packs to facsimile systems will eventually make possible highly integrated image and data transmission networks for business.

Special Systems

In addition to the business community's interest in facsimile, there is a growing use in other applications, often characterized by custom equipment, "dedicated" transmission circuits, and special functions. News photo-facsimile continues to account for the largest number of these special systems, with the news networks now able to distribute high quality pictures all over the world.

The publishing industry has also found that high resolution facsimile can provide the capability to transmit edited text and graphic material to satellite printing plants, where the actual printing of regional editions of magazines and newspapers takes place. Facsimile makes centralized editorial control possible, and reduces costs at the printing plant.

Another widespread facsimile network distributes meteorological and weather data, including weather maps for local and regional surface forecasting, high altitude data for aviation use, and graphic and pictorial data from satellites and atmospheric probes for long-range forecasting. □

Computer Art: Steps Towards a Measurable Analysis

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"For centuries, there has been surrounding the arts a mystique or tradition of non-verbal analysis, and attempts to objectively define and judge art have been considered heresies."

For many individuals, the idea of analyzing art is unthinkable. This attitude is common among both laymen and professionals. For centuries, there has been surrounding the arts a mystique or tradition of non-verbal analysis, and attempts to objectively define and judge art have been considered heresies. Art has been traditionally categorized as impossible to measure, define, and analyze. I have often heard these comments: "To analyze art is to render it lifeless. If you try to analyze art, you kill it."

Further, I have heard superior, highly knowledgeable artists assert these strong views. I respect their talents and their reactions; yet I disagree strongly with this attitude of the un-analyzable quality of art. For those who negate rational analysis of art, analysis is not possible, for they have not opened their minds to analysis of art in objective terms. Even as a manual artist (before becoming a computer artist), I was firmly convinced that the sensitive observer could define, measure, and appreciate many of the elements of art, and that through such analysis and objective study of art, one might understand and appreciate a work of art much more fully. In other words, an analysis of a work of art (coupled with intuitive appreciation) gives the viewer a much deeper understanding than simply intuitive appreciation without analysis.

What of computer art? Is it more measurable? Can we analyze kinds of computer art? Can a computer artist (or an ordinary observer) discern a measurable analysis and understanding of creative works in this new medium?

Grace C. Hertlein, Art Editor and Director of "Computers and People", is Assistant Professor of Computer Science at California State University, Chico, Calif. She is one of the few artists working in the field of computer graphics who was formerly engaged in fine art painting, sculpture, graphics, etc. Prof. Hertlein studied at the School of the Art Institute of Chicago, and her works have been shown in traditional national museums throughout the country. She is represented in many private collections in the Midwest, where she formerly lived and worked. Her computer art has been shown in national and international exhibitions since 1969; she has chaired many special sessions on the visual arts and the computer. Her work may be seen in May at the National Computer Conference & Exposition in Chicago.

She is a writer as well as an artist interested in the principles of the computer arts; and also much engrossed in teaching in the area of computers, society, and social responsibility.

Prof. Hertlein teaches summer courses in computer art at the School of Art & Art History, Univ. of Iowa, Iowa City. This article is part of a forthcoming book on computer art.

What Is Meant by Analysis of Art?

The term "analysis of art", used in this article, implies that there are measurable elements in a given art form that people can identify, or define, and categorize fairly precisely without being a professional art critic. For example, in poetry, there are many parts of a poem that may be identified and studied: the tone of a poem; examples of consonance, assonance, and alliteration; figures of speech; meter; etc. By intellectually dissecting a poem, the student or reader can perceive its inner structure and identify precisely how the poet attains specific effects within his poem. Further, the scholar or student can see more fully and understand better what makes a poem by a specific poet typical or not typical of works by that author. This kind of precise search is called stylistic analysis. It is quite common in the field of computers and the humanities.

In music, a few measurable elements are: rhythm; meter or time; consonance; dissonance; melody; lack of melody; specific use of selected instruments; etc. In the visual arts, measurable elements include: form; color; positive or negative use of space; emphasis on use of a specific medium, which varies with the materials and systems being used by the artist; etc.

Thus among certain groups of scholars and artists, stylistic analysis is not uncommon. It is only moderately developed, however. What artists (and many individuals) object to is that we may go beyond this partial initial stylistic analysis and arrive at a more definitive analysis of style that will stand as "analysis of art". It is the philosophy of defining or not defining art that is the moot question. However, it is my firm belief that this negative attitude stems from tradition, a "programming of the mind" to consider intuition superior to logic and decision-making. (And the attitude operates the other way around also: those who practice logic and decision-making tend to denigrate intuition and spontaneous creative insight.)

From time to time, art critics and art historians of sufficient stature emerge, who are able to define and analyze art. Examples are Janson, Berenson, and Barzun. We know their analyses of art are accepted, because their words are read avidly, quoted greatly, and at times, almost considered as "oracles" of art. These critics and historians do not, however, list, categorize and dissect art. They reveal their analyses of art in an intuitive style of writing. Thus what is recommended here is a new departure: that of minute analysis and dissection, much as one cuts up a corpus preserved in formalin solutions in natural science classes, to discern the given inner structure and form.

However, dissection and identification of a given style or genus must be unified with genuine appreciation of the given subject. This is true of biological analysis, or stylistic analysis in the arts, i.e., analysis without appreciation is incomplete. Such objective analysis is added to the traditional methods of analyzing and categorizing art. The reason for such objective analysis is added appreciation and understanding of a work of art.

Analysis of Computer Art

Computer art is more measurable than manual art, because the use of the computer medium requires initial analysis of design and resultant variations of the original module or component. Further, the computer program specifies highly objective steps in the execution of a given work of computer art.

However, manual art is also subject to analysis of elements of art, by study of the: use of the medium; use of color, form, design; the period or style in which the artist is working; etc. A check-sheet for analyzing manual art may be developed and used in art classes.

Stylistic Analysis of Computer Art

Analysis of computer art may be broken down into specific modules, as presented in this article. The presentation applies to graphics and the visual arts, particularly, but many of the same principles apply to other computer arts.

Computer art is a modular art; that is, there is a basic module or form which is the design or component. This is changed and varied in many ways, producing what may be called variations. Also, at times there are combinations of forms in a given work of computer art. See the examples below of art and analyses.

What kinds of forms or components are to be found in computer art? How are they varied? In Table 1 is a modular checksheet I have devised for use by my students to increase their capacity to observe and consider computer art. A student may respond to it in many ways (see page 16):

1. By checking items liked or disliked;
2. By a plus or minus grade;
3. By a letter grade;
4. By a stanine grading (low values for negative responses, high values for positive reactions);
5. By any similar system the student finds satisfactory to him.

Responses to actual works of computer art, illustrations of art, or slides of art (others people's or one's own) may be the subject matter for applying the checksheet.

The user will observe differences in his preferences as time passes. For example, a practicing computer artist will change his preferences somewhat by analysis and practice of art. A serious student of computer art, after much study, will also notice his changing preferences and responses. It is useful to fill out the forms and date them, and add other notes as background material.

Approaches to Analysis of Art

The question is frequently asked, "How can you take people with no art backgrounds, and teach them to be creative in computer art within a very short time?" "What methods do you use?"

A parallel process of learning by doing, and of simultaneously searching for a personal choice of direction, is used in my classes. Here is a brief description of the process:

1. The student is asked to draw some form he does not dislike, program it, and to take the component through different design states, searching for design states he finds pleasing and rejecting those he finds non-pleasing. Students learn quickly from the process of doing, rather than from relying on theory.

2. At the same time, a student is asked to respond to computer art, searching for a personal choice of direction. He takes notes on:

- Actual art work from computer art exhibitions;
- Computer art illustrations;
- Slides of computer art;
- Beginning work, his own and other people's.

3. Students engage in what may be called derivation exercises, learning to derive designs from many sources:

- Nature and the environment: drawing; simplifying forms; going from highly representational sketches to minimal outlines or forms;
- Art sources, such as Graphis, art magazines, books, art history, etc.; going from close copies to distant outlines or forms;
- Objects: going from complex forms to simple ones, or from simple to complex;
- Designs taken from their hobbies and interests;
- Designs relating to the student's major discipline (Physics, Zoology, Chemistry, Mathematics, etc.); it is instructive to the student to have his own major study serve as the design source.

Finding a Personal Mode of Working

Here are some basic steps students use to find a personal way of working in computer art. It depends upon personal experimentation and choice of many elements:

1. Taking a component (without programming) through a series of offsets, rotations, etc., to determine whether the final forms desired are symmetrical or non-symmetrical, simple or complex, or gradations between these two extremes.

2. Analyzing and knowing what kind of components and design states are personally appealing, using the checklists and actual art, slides, etc.

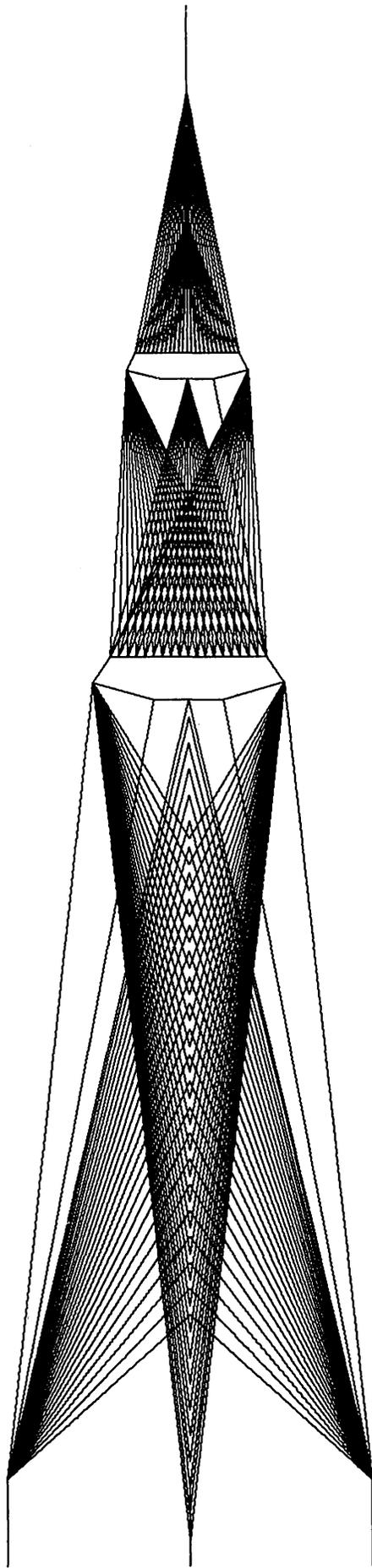
3. Analysis of materials, colors, etc., that will express one's self; these may be different from the work of others, or similar.

4. Exploring tentatively the opposite of one's chosen direction to test the given direction, and to induce growth and change.

5. Analyzing manual art, to see if there is a similarity or difference in one's personal art preferences.

6. Planning a series of graphics (without programming all the works), and listing very many creative alternatives, then choosing those that seem most appealing, and programming these personal works.

7. Learning to judge and appreciate forms and final works that are different from one's personal direction.



8. Identifying and verbalizing the reasons why something is pleasing or non-pleasing to one's self; identifying when a work seems complete or incomplete, using precise vocabulary and rational analysis.

9. Identifying subjective vs. objective criteria in art. For example, symmetry vs. asymmetry is a purely personal preference; there is really no superiority or inferiority of either direction, although there tends to be a fashion in such preferences. The same is true of complexity vs. simplicity, etc.

Finally, the student is asked to consider what are the specific capacities or qualities of the computer medium. This is attained by study of computer art, practicing computer art, analysis, and verbalization. Some of the specific qualities of computer art are: capacity for redundancy; capacity for repetition, with or without variation; transformation of the component; precision of line; randomization of the object; etc.

Examples of Analysis of Computer Art

1. *Rocket* by Sanford Ma

This work was executed by a student, a Computer Science major and a mathematician, as an undergraduate in a beginning course in computer art. The work was executed in black and white, and reduced, as shown. The graphic is more interesting in this reduced form, since the moire effects are more obvious. A moire effect is attained by lines that cross; or interference patterns. It is common in computer art and exploited much by computer artists. Printmakers for centuries have been using crossing lines — moire effects — to attain dimensional, optical effects. But it is used fondly by computer artists, since the computer is capable of making innumerable precise interference patterns that delight the eye (unless one has astigmatism). It can also be considered optical or "op art".

The work resulted from an assignment: Take a flight form. Develop it beyond the stereotyped forms one sees in abundance in computer periodicals.

A flight form is a form that contains a component or module that has a point from which radiate other lines, that may be continuous along a given path, evenly distributed, or incremented, or decremented via a formula. It is a natural device for computer art, since it is formula art. It resembles the string paintings that have recently become popular, which eighth grade mathematics teachers had their students execute five years ago.

In this work the module is a flight form. It is mirrored, repeated in larger and smaller forms throughout the rocket form.

The graphic is a subtle intellectual pun on the assignment of a flight form: it is a flight form to end all flight forms — a rocket, which shows a sense of humor. The symmetric composition is serene, almost virginal in quality, and is phallic, if one is inclined to this mode of thought. The use of positive space (densely filled areas) and negative space (empty areas) is restful and satisfying. The precision and delicacy of the work reflects the student's own nature, precise, sensitive.

The black and white is somewhat classical or traditional, as in manual printmaking, where black and

Table 1 STYLISTIC ANALYSIS OF COMPUTER ART

I. ANALYSIS OF COMPONENT FORMS

A. Polygon Manipulations

- Evenly Decrementing Polygons
- Irregularly Decrementing Polygons
- Combinations of Related Polygon Forms
- Identical Polygon Forms with Asymmetric Sides
- Combinations of Non-identical Polygon Forms
- Overlapping Polygon Forms
- Experimental Polygon Forms
- Polygons within Varied Design State Forms

B. Continuous Line Designs

- Maze-Like Patterns
- Non-Maze Patterns or Abstract Forms
- Examples from Art History:
 - Primitive Cave and Wall Paintings, Pictographs, Petroglyphs
 - Archaic Pottery or Ceramic Derivations
 - Primitive Seals from India and Sumeria
 - Egyptian Hieroglyphics
 - Aztec, Babylonian Figure Forms
 - Persian Wall Reliefs, Sculpture
 - Archaic Texts, Illuminated Manuscripts, Tapestries
- Natural Derivations
- Combinations of Related Continuous Line Design Forms

C. Curvilinear Components

- Angular Components used with CUFIT to Achieve Curved Versions
- Irregular Components input via Rand Tablets and Digitizers
- Combinations of Angular and Curved Component Forms

D. Structural Components

- Repeated Groupings (Programmatically Looped) Horizontals, Verticals, or Diagonals
- Bauhaus Architectural Patterns
- Structures Constructed of Groupings of Polygon Forms (Buildings)
- Derivations from Any Specific Architect (Nervi, Corbusier, Mies, van der Rohe), Etc.
- Archaic Forms, Greek Columns, Aqueducts, Arch Forms
- Bridge Patterns
- Architectural Modules from Structural Architecture
- Combinations of Structural Forms

E. Contemporary Fine Art and Computer Art Derivations

- Josef Albers
- Piet Mondrian
- Pablo Picasso
- Maurice Escher
- Paul Klee
- Kenneth Knowlton
- Frank Stella
- Andy Warhol
- Derivations from Other Computer Artists (Define)
- Cybernetic Serendipity Derivations
- Other Artists (List)

F. Alpha-Numeric Forms

- Alpha-Numeric Design (Posters Anti Something)
- Alpha-Numeric Design (Posters Pro Something)
- Environmental Signs, or Combinations
- Advertising or Package Design
- Corporate Image Logos
- Combinations of Other Components and Alpha-Numerics
- Alpha-Numerics as Components

G. Natural Derivations

- Shell Forms
- Seed, Pod, Spore Forms
- Mushroom Forms
- Smaller Sea Forms (Non-Fish), including Microscopic Patterns
- Fish Forms and Larger Sea Forms
- Paleontology, Extinct, or Archaic Forms
- Beast Patterns (Mammals, Reptiles, Etc.)
- Butterflies, Moths, Insects
- Bird Forms
- Tree, Leaf Forms
- Flower and Grass Forms
- Dogs and Cats
- General Flora Forms
- Human Forms
- Other Natural Derivations (List)

II. ANALYSIS OF DESIGN STATE VARIATIONS

- ### H. Mathematical Forms or Derivations, Including Other Scientific Forms
- Flight Forms (Formulas for a Number of Points Emanating from a Given Point — See Illustrations)
 - Mathematical Functions and/or Formulas
 - Patterns from Fluid Dynamics
 - Derivations from Molecular Model Building
 - Shape Generation Forms Using Fourier Descriptors, Transformations
 - Transformations from One Object into Another
 - Crystallography
 - Microscopic Patterns from Science
 - Any Forms from Mathematics and/or Science (List)

III. ANALYSIS OF DESIGN STATE VARIATIONS

A. Increments and/or Decrements

- Even Decrements within the Form
- Irregular Decrements within the Form
- Even Decrements Departing from the Form
- Irregular Decrements Departing from the Form
- Decrements toward Specific Points or Areas of the Form (may vary within each ensuing form in a given work)

B. Offsets (With or Without Change of Scalar Value)

- Simple Offsets
- Complex Offsets
- Intermediate Offsets
- Asymmetric Offsets
- Symmetric Offsets
- Any of the Above with Changes of scalar Value

C. Rotations

- Regular, Evenly Repeated Rotations of the Form
- Irregular Rotations (May be Random within Each Sequential Form)
- Random Rotation of Angles Varying within Each Ensuing Form
- Complete Rotations (Full Circle)
- Incomplete Rotations (Partial Circle or Rotation)

D. Radiations

- Simple, Growing Scalar Values
- Complex, Growing Scalar Values
- Growing Scalar Value Forms, then Decreasing Values of Form
- Full Radiate Forms
- Incomplete or Partially Radiating Forms

E. Mirrors

- X Mirrors Only
- Y Mirrors Only
- X/Y Mirrors
- Combinations of Mirrors and Any of the Aforementioned Forms

F. Randomization

- One Form Only, Directional Components (One Way)
- Directional Forms Proceeding Several Ways (Up, Down, Right, Left)
- XSTART Use Only Randomized
- YSTART Use Only Randomized
- XSTART, YSTART, XFACTOR, YFACTOR Randomized
- Number of Times (ITIMES) (Lines, Rays, etc. in a Component) Randomized
- Angle Randomized
- Combinations of Above and Any of the Aforementioned

G. Three-Dimensional Views and Transformations

- Lorenz Transformations
- Fourier Transformations
- 3-D, Viewing the Component from Varied Angles
- General Transformations, One Object becomes Another
- Other Transformations (List)

H. Serial Imagery

- Block-Like Forms, Redundantly, without Negative Space
- Redundant Forms, with Use of Space as a Design Element
- Elongated X or Y Forms (Horizontal or Vertical Repetitions of Forms)
- Any Combinations of Serial Imagery with Varying Borders Around Forms
- Metamorphic (Changing) Serial Imagery
- Circular Imagery, Large to Small Forms
- Circular Serial Imagery, Small to Large Forms
- Block-Like Forms, Large to Small Forms
- Block-Like Forms, Small to Large Forms
- Combinations (List)

III. ANALYSIS OF FORM PER SE

A. Component or Module

- Highly Symmetrical
- Highly Asymmetrical
- Moderately Symmetrical
- Moderately Asymmetrical
- Complexity of Initial Pattern
- Simplicity of Initial Pattern
- Intermediate Pattern (Neither Complex nor Simple)
- Minimal or Essence Forms
- Highly Representational Patterns
- Semi-Abstract Modules
- Futuristic Patterns
- Organic Modules
- Non-Organic Modules
- Fine Art Derivations
- Contemporary Art Derivations
- Environmental Derivations
- Natural Derivations
- Microscopic Forms or Derivations
- Scientific Derivations (List)
- Other Derivative Sources (List)

B. Design State Variation Analysis

- Simplicity of Repetition of Form (Applications of Pattern)
- Complexity of Repetition of Form (Highly Complex)
- Intermediate Degrees of Repetition of Form
- Listing of Preferred Design State Variations
 - Analysis and Listing of Reasons for Such Design State Variation Use
 - Listing of Design States Used Thus Far
 - Listing of Design States Not Used (Reasons for Non-Use)

IV. ANALYSIS OF COLOR (PAPERS, INKS, PENS)

A. Papers and/or Pen Colors

- Hot Colors
- Cool Colors
- Transparent Inks
- Opaque Inks
- Colors within A Graphic
 - One Color
 - Two Colors
 - More Than Two Colors (List)
- Earth Colors
- Natural-Appearing
- Realistic Colors of Materials
- Contemporary Colors of Materials
- Unnatural Colors of Materials
- Analogous Colors
- Complementary Colors
- Other Colors (List)
- Non-Realistic Use of Materials
- Traditional Uses (List and Define)
- Psychedelic (DayGlo or Black-Light)
- Experimental Uses (Discuss)
- Futuristic (Foil)

B. Materials (Papers or Other Materials)

- Traditional Art Papers (List)
- Contemporary Papers from Art or Applied Art (List)
- Industrial Materials
- Multi-Media Materials (List)

V. ANALYSIS OF INPUT, PROGRAMMING, AND EXECUTION MODES OF WORKING

A. Programming, Running/Execution Methods

- Totally Preplanned (No Participation)
- Allowance for Participant Running/Execution
- Heuristic Programming and Running (No Intervention - Totally Computer Designed, Executed)

B. Input Methods

- Rand Tablet (or Digitized Methods)
- Cards and X/Y Identification of Coordinates
- Joystick
- Mouse or Cursor
- Lightpen
- Combinations (List)

C. Output Methods and Product

- Static Graphics on Art or Industrial Papers
- Films, Non-Static, Moving Graphics
- General Multi-Media (Define and List)

D. Programming and Design State Variation Methods

- Canned Routines (Cards)
- Canned Software (Library)
- Personal Writing of All Programs and Design State Variation Routines
 - Programmer Makes Decisions
 - Heuristic Systems Make Decisions
 - Intermediate States
 - Others (List and Define)

white works are regarded as standard. The work is totally preplanned. The connotations of the overall work are futuristic, reflecting a space age; yet the symmetry and precision of the work lends an overall tone that is complex yet serene.

2. *Beasts in a Field* by Grace C. Hertlein

The original work is large, 26" x 30", executed on a tan pastel paper with a strong pastel texture. The oak-like tree (*Psilotum*) is executed in a gray felt pen that looks like a lead pencil. This gives an informal sketch effect to the work. The pine tree (*Ferntree*) is executed in a dark amber (brown) flow-pen, and this dark opaque ink application appears to come forward, with the gray forms optically receding. (Use of opaque, dark colors has this optical effect.) The animal forms are a Picasso derivation, relating to cave drawings, and are executed in black on an acetate overlay. The latter gives a definite dimensional effect. The random, moving sun is executed in an ochre (mustard color) felt pen, which appears to recede into the paper.

Because of the static, directional progression of the beasts, there is a quiet quality in the work. The primitive forests bring to mind archaic landscapes. With the overlay technique, the beasts stand out more in the actual graphic, than they do in the present black and white illustration.

The sources for the works are paleontology, and reflect the artist's interest in this area. The tree, *Psilotum*, is a direct derivation from one of the first forms of vegetation on the earth. The same is true of the pine tree. The beasts are an essence form that recalls simultaneously many primitive animal forms, yet sufficiently cow-like to resemble modern bovine animals. The slightly unusual head suggests a sloth-like beast of very primitive origin. Yet at the same time, the viewer can relate to present tree and beast forms, and pretend he is in a marginal pasture at twilight, and that the animals are quietly going to nearby feeding.

This particular search for patterns that are from archaic sources, yet may be identified in the present, is typical of this artist's work, stemming from a life-long focus on the classical, the enduring.

Materials, both papers and inks, are quite traditional, organic. (The same work, run on Day-Glo papers achieves a contemporary effect.) The viewer can associate the forms with forms he knows; and this is pleasing to those who have either traditional or organic preferences in art, or both.

A very different effect may be attained by having the pine trees in curved form, rather than angular, as within this work.

The objective was to take related, organic materials, and to execute a related, almost monochromatic work, in browns, blacks, which gives a certain serenity, because of mere coloration.

This artist prefers complex patterns. This is evident in the work. The work is traditional, relating to science and manual art; the viewer can perceive this relatedness to manual art.

All forms are randomized, with constraints imposed by the programmer/artist. Graphics are preplanned, but programmed with pauses to allow for participant running. Programming of both works is by the artist, in FORTRAN IV. □

Managing Modern Complexity --

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Editorial Note:

In order to make clearer what is being said, we repeat a few paragraphs from the end of Part 1, published in the April issue.

We may take any facet of social policy and find the strings and networks of highly stable esoteric boxes [establishments or social institutions] which between them make a composite but not integrated impact on the individual citizen. We may do this for security, discovering esoteric boxes for the police, esoteric boxes for fire protection, and esoteric boxes which are the armed services themselves. We may do the same thing for the movement of goods, discovering esoteric boxes for every method of transport. We may do it for the movement of money, detecting esoteric boxes for emolument and social benefit, for taxation, for credit

Unstable Networks

Then the question arises, why are those strings and networks as unstable as they appear to be? If there is no genuine metasystem, why has one not grown up? Was there never a stabilizing structure of any kind? I think that there was a metasystemic structure of a very remarkable kind, but that it has been abandoned. We have thereby lost the meta-controls which made the composite systems of esoteric boxes viable. If this be true, no wonder we need assiduously to design replacements.

First, there was the structure of society's "external skeleton": the religious, legal and moral framework. Into this hooked the structure of the "internal skeleton"; there were indeed formal bonds linking social institutions themselves. Younger people seem to be systematically abandoning the

Reprinted from *The Management of Information and Knowledge* (a compilation of papers prepared for the eleventh meeting, 1970, of the Panel on Science and Technology), published by the Committee on Science and Astronautics, U.S. House of Representatives.

values of the external system, so that it ceases to be relevant to any control process dependent on negative feedback. Given that almost fifty per cent of the population of the United States is now under twenty-five years of age, the revolt of youth in destroying metasystems whose stabilizing value they do not understand is a serious matter indeed. The young have more power in society than ever before: purchasing power, and the power that derives from not being afraid of inherited norms. Most of them are not taking technology for granted. Many of them are questioning established values in terms which their elders do not understand. Some have already begun smashing up computer installations. As to the internal system, changes in technology are moving the interfaces between the esoteric boxes representing established institutions — and they are not responding. Instead of evolving by adaptation, these boxes are putting up the shutters and seeking to maintain themselves as integral systems while the context changes around them. This will not work.

Thus the strings and networks are unstable, and the metasystems are missing. Rather than attempt the exhaustive enumeration of these composite systems let us try to state the features they share in terms of knowledge, information and control. They seem to me to be the following:

Characteristics of Strings and Networks of Esoteric Boxes

1. In all cases some esoteric boxes in the system are part of the public sector and some part of the private sector.
2. In all cases the esoteric boxes are generating, and (inefficiently) passing between themselves, knowledge about the world in which they operate.
3. In all cases they are also generating, either as primary or as spin-off data, knowledge about the individual citizen which they rarely interchange.
4. In all cases the very forces which produce stability within the esoteric boxes themselves conduce to instability between the boxes.
5. In all cases, what constitutes the improved management of knowledge within the esoteric box has to do with the rapid matching of sets of possible

Part 2

*"OUR CULTURE DOES NOT TAKE KINDLY TO THE NOTION
THAT IT NURTURES THE SEEDS OF ITS OWN DESTRUCTION."*

courses to sets of actual conditions, and the rapid correction of mismatches by feedback governors.

6. In all cases what would count as an improvement in the management of information between esoteric boxes, and therefore an embodiment of the meta-system concerned, would be an integral information network and a mutual trade-off in knowledge — both of the world and of the citizen.

If this list of six points correctly states the position, it behooves us to elucidate them further.

3. ELUCIDATION OF SYSTEMIC CHARACTERISTICS

We begin this elucidation by developing a generalization about the management of information within the esoteric box. This is an explanation of point 5 in the foregoing list.

Whatever we are looking at at any given moment in time will be found to represent a complex state of affairs. Call this total situation the initial condition. For example, a patient entering a health system has an initial condition; so has a pupil in any educational situation. The first step taken by a professional in reviewing this initial condition is to try and characterize it with a name. In the case of health, this name is the diagnosis (diabetis = "he needs more insulin than he has got"). In the case of the educational condition, we may name a state of ignorance relative to some need (advanced physics = "he needs more physics than he has got"). This naming process may be very inefficient, as for instance when we name the complicated economic status of a citizen within the economy as: credit = \$100. And even in medical diagnosis, for instance in psychiatric medicine or in prophylactic medicine, the name may not be very much help. Then why do we go through the naming process?

Encapsulating Complexity in a Name

The answer to this is surely that the brain is a coding device. We are not cerebrally organized to hold in our heads large wedges of information about complicated states of affairs. Having examined the

complexity of the initial condition, we seek to encapsulate it in a name — which can later be used to retrieve at least the critical attributes of the situation so named. Next, we use this name in our search of courses of action from which to select a treatment of the initial condition. Thus the very mention of a medical diagnosis selects in the mind of the physician a subset of the whole set of human therapies which relates to the name, and from this subset one therapy will be selected and applied. Similarly, "advanced physics" selects a subset of courses from all possible education courses, and from that subset one course will be recommended. The credit rating simply selects one figure from a small number of possible figures to be applied as a ceiling on purchasing power.

Depending on the seriousness of the situation, as measured perhaps by its "professional" content, this naming filter is a more or less elaborate tool for making the system work. A higher professional content can be injected into the process by a more elaborate taxonomy of names, and also by iterating the process of selection. Thus, having made a diagnosis and selected a possible therapy, the physician will go back through the name filter to the actual initial condition, and verify the treatment in every particular. In most social situations, however, this iteration is far too expensive to undertake. And for that reason, many of the responses which social systems make to the initial condition are crude indeed.

Abandoning the Naming Filter

The first general capability of automation within such a system is to abandon the naming filter. For computers can hold large wedges of information. The computer is faced with the problem of matching one complex profile (the initial condition) with another — probably less complex — profile of possible courses of action. Far from simply automating the human professional component in the system, then, the automatic system should much improve upon it, especially if it is organized to interrogate the subject in order to fill out details of the initial condition which it perceives to be relevant. More-

over, as its model of the system it handles is enriched and improved by experience, it becomes possible in principle for a preliminary choice of action to be iteratively simulated. Then the likely effects of choosing this action, and in particular the vulnerability of this strategy to unknown factors or a range of possible futures, may rapidly be estimated before any indication of choice is given at all. Next again, if the automated system is geared to invigilate the actual process of applying the course to the initial condition, so that the subject's response is continuously monitored, then corrective action against any mismatching or systemic oscillation may be continuously taken. And of course it will be taken on the basis of the total richness of possible interaction between the two sets (states of the subject and possible treatments) rather than through the exiguous filtering channels of the naming which have hitherto been used with so little finesse.

The Law of Requisite Variety

In all of this we find key applications of another fundamental cybernetic principle: Ashby's Law of Requisite Variety. Variety is the cybernetic measure of complexity. It is explicitly the possible number of states of a system. The Law says that the variety of a given situation can be managed adequately only by control mechanisms having at least as great a capacity to generate variety themselves. Names typically do not do this: they are archetypes of variety reducers. Indeed, in most socio-economic situations of our age, we seek to obey Ashby's law by reducing the variety of the real world, necessarily in a somewhat artificial way, as with naming. As I said earlier, this leads us to manage low-variety theories about the economy, because we can handle those, rather than to manage the high-variety economy itself. A much more satisfactory method of handling the problem is to increase the variety of the system doing the judging, managing or controlling — by automating the "professional" component. The second method is now technologically open as we saw in the last section. Allied to fast feedback, whether through simulations of the total system or through the invigilation of actual results, the whole mechanism permits a much more refined and much speedier convergence on a stable outcome.

The Major Threat to Privacy

By looking at this mechanism in its relevant detail, we simultaneously lay bare the major threat to privacy of which everyone who has ever contemplated these matters is already aware. As we seek better control of situations by confronting variety with variety within the system, we lose the anonymity which used to cloak the identity of an individual by the use of a name. This is quite clearly seen in the simplest case of all — the name of the citizen as normally understood. My name identifies me from others; but it undertakes to disclose no more information than this primary selection. Yet the more effectively any esoteric box handles my case, then the higher the variety it disposes as a measure of my own variety; therefore the more risky to my personal integrity does the whole process become. Here is the person rawly exposed. Because in higher variety, within the professional system appropriate to any esoteric box, I am saying that the better the system, both from the point of view of the social institution concerned and therefore from my own as its patient or pupil or client in any other way, ipso facto the more potentially damaging to me is that system. Am I psychologically ill? The medical system will know. Am I educationally inadequate to my job? The educational system will know. Where was I at the time the murder was committed? The

credit system knows when and where I bought petrol that night

This analysis successfully generalizes the problem of privacy, and also says a great deal about the reasons why esoteric boxes are under such pressure to withdraw into themselves — instead of collaborating in metasystemic management systems (see point 6 in the list).

Privacy Disappearing Without Anybody Noticing

It is all too possible that the computer will sweep forward to destroy privacy and freedom of choice without our really knowing that this is happening — much as the motor car has swept forward, poisoning us and inexorably changing the quality of life. Consider two major mechanisms which might bring this about.

My Reality vs. What the System Says I Am

First, there is the question of a man's credibility as a citizen. When a man is too well documented, electronically buttoned-up, in what sense can he make a new start? How can he restore his credit, once it is lost? How will he persuade the machine to emulate his own God-given capability to forget? A man is to himself as to others a complex package of information. In behavioural terms at least, his vital statistics, his knowledge, his actions and his emotional response as well — all may be catalogued and stored. By the criteria of information theory, then, my electronic image in the machine may be more real than I am. It is rounded and retrievable. Above all, it is a high-variety image — higher very likely than the image is predictable in statistical terms. Probably I am not. But the strength of the machine image is its pragmatic validity. There is no confusion here, no ambiguity, no loss of history, no rationalization. I am a mess; and I don't know what to do. The machine knows better — in statistical terms. Thus is my reality less real than my mirror image in the store. That fact diminishes me.

My Manipulation by the System

Second of the threats to my reality, there is the likelihood of my manipulation on a scale which is also frightening. Overt advertising has already taken us to the brink of what seems to be tolerable in this respect. But at least we are conscious of the risk — we may note the Freudian images of the ad-man cult, and the importunity of slogans which are akin to physiological conditioning. We may thus protect our personalities. But the computer's mechanisms are covert. A long-term record of my purchases should enable a computer to devise a mailing shot at me which is virtually irresistible.

More Involved Arrangements

We earlier made the assumption that esoteric boxes themselves will engage in dialogue with their own clients and with governments to protect the citizen in this threatening situation. The important thing is not so much that this ought to happen as that it will certainly happen. For if it is vital to the social institution to remain integral, and if it is the proclivity of that esoteric box to be highly stable, then integrity and stability will be supported and reinforced by the highest ethical codes where professions are concerned, and by commercial self-interest where they are not. Each esoteric box will identify its own vested interest in solving these problems; and in solving them it will increase its own stability and survival power. Then these systems will become more involuted, and yet more esoteric; they will become more stable, and more resistant to change; in many cases it will be

literally impossible to assess the information they contain without a special electronic key.

As the solutions begin to emerge from the studies which institutions are already making, it can be expected that legislative force will be asked for the implementation of any provisions which repeatedly occur as proposing matters of principle. For example, it already looks likely that legislation will be sought to permit the citizen access to his own computer files, or at least to permit him the knowledge that an entry has been made therein. Even so, there will be many difficulties for legislators, and especially difficulties of definition. After all, many records have been kept in the past, records made up with quill pens, of which the citizen had no intimate knowledge — and in cases of national security, or even of high-grade employment, perhaps no knowledge at all.

Missing Metasystems

But the point for which we are reaching here really concerns the missing metasystems for the regulation and stabilization of strings and networks of esoteric boxes. If the inexorable trend is toward involution, and toward the isolation of information between esoteric boxes becomes less and less likely (see point 3 in the list). Institutions will not dare to move towards the creation of metasystems, because this would breach confidentiality. As for the legislators, how can they possibly launch bills at one parliamentary sitting intending to keep information inside the box (for the reasons adduced), and then launch bills at the next sitting aimed at better management on the strings-and-network level? For the requirements of the second legislation would be to assemble information more economically for meta-systemic purposes, to enrich the understanding of social needs by synthesizing information within higher-order models of the economy, and in general to seek modes of control which would necessarily diminish participation at lower societal levels to the point of total incomprehension as to what was going on.

This is a king-size dilemma. It has already been encountered in a relatively mild form by government bureaus of statistics, all of whom operate under legislation which guarantees the privacy of the individual firm by statistical aggregation. But in situations where large firms dominate sparsely populated localities, real skill may be needed to avoid betrayal of this rule by sheer accident. And perhaps in avoiding such risks the efficacy of the network will be sensibly reduced. The extension of the problem down to the rights of the individual, and up to meta-metasystems, and across to include the whole gamut of socio-economic behaviour, is a daunting prospect. But the difficulty is real; it will not go away.

So here is the meaning of point 4 in the List of Characteristics we set out to elucidate. Strings and networks of esoteric boxes will become less and less cohesive; and the metasystems they represent will become more and more unstable. These are the inexorable trends, and this is the basic reason why (I unhappily suggest) society is falling apart.

The Blurring of Interfaces

We have been seeking to elucidate the meaning of the four final points of the six statements made in the List of Characters. It is time to revert to the first two of those six points. For in our recent discussion we have concerned ourselves primarily with information about the citizen as a product of

either public or professional social institutions. But the argument of points 1 and 2 was that every facet of social control shared in the public and private sector, shared too in knowledge of the world as well as in knowledge of the citizen. Then let us begin a fresh analysis, beginning with the missing pieces of the puzzle, and see where that leads.

Knowledge and its Dissemination in the Course of History

We want to talk in the first place, then, about knowledge of the world, and its dissemination as an entrepreneurial activity to anyone needing knowledge. This whole process began and continued historically in a very distinctive way. There were people — individuals by name — in the time of the ancient Greeks in whom reposed such knowledge as there was. Those wishing to acquire knowledge did so on a personal basis and at great expense. This often meant journeying to sit at the feet of an Aristotle and to learn from him. We might call the process custom-built publishing. We should note that it was a very high-variety process (the cybernetic analysis of a dialogue demonstrates to perfection Ashby's Law of Requisite Variety). And we should note finally that the effectiveness of the process relied on a relative paucity of knowledge compared with the capacity of the human brain and the calls on its time. For nearly two thousand years this situation prevailed. Although writing and its tools were developed, any piece of writing was still custom-built. One's copy of any text was a personal copy, bearing unique imperfections, omissions and additions. Then, five hundred years ago, came printing — a process which remains almost unchanged to this day as the accepted principle of permanent imaging.

The Invention of Publishing

It was the invention of printing that procured the first qualitative change in the management of information and knowledge for mankind. In achieving the massive dissemination of knowledge, Gutenberg and Caxton also destroyed its custom-built character. In mitigation, the publishing industry (as it has become) developed an activity called editing. This critical occupation fulfills almost exactly the same function as naming or diagnosis in our earlier model. It constitutes a crossover point between a high-variety set of clients on the one hand; it selects subsets from each, and attempts to match them. Insofar as the matching succeeds, there is a marketable product. This may be defined as an edited publication, identifying a sufficient number of clients satisfied with the editorial process as between them to pay for the cost of publishing and printing (with of course a profit margin for all concerned).

Informational Overload

The steady development of this whole marketing operation has led, like all other recent developments in the dissemination of human knowledge, to the informational overload mentioned before. Publishers continue to issue more and more printed material, relying specifically on their editorial skill in identifying market subsets willing to pay the price. But increasingly the process depends on mythology. It is easy enough to demonstrate that in fact the overload threshold has already been passed, and that (as we said) the sign has now changed on the stream of data input. No professional man can possibly read more than a fraction of what he would like to read or feels he should read. In some professions, current trends when extrapolated show that the whole population of professionals will shortly be employed in preparing abstracts of papers — whereupon no authors will be left to write them. This shows that insofar as people continue to pur-

chase new publications they are not driven to do so by any residual capacity to convert data into information (meaning: what changes us). One may entertain various theories about the motives which do drive them. Such theories range from feelings of guilt and a sense of threat at one end of the spectrum to a pious belief that the editing process is (hopefully) converging on my special interests at the other. However this may be, no professional man can now cope effectively with the material he is expected to buy; and most would agree that they buy more than they can cope with.

The Need for Less Information

Various mechanisms may operate to put an end to this situation, perhaps quite suddenly and dramatically. Which mechanisms will operate depends on which motives turn out to be most significant. For example, insofar as many publications depend on their advertising revenue for survival, then when the advertisers become aware that their advertisements are not even seen (because the journals are not opened) they may suddenly and disastrously withdraw support en masse. But the more profound threat to the established mores of the whole industry derives from the likelihood that someone will give convincing entrepreneurial effect to the unrecognized but inexorable trends of the situation. These are quite simply that professional people have a need for less and not more information, and therefore — in the long run — are going to pay for less and less, and to refuse to pay for more and more. The publishing industry and government itself continue to regard data as equivalent to information. The metasytem in which this issue can alone be sensibly contemplated, will shortly recognize that any one client is overloaded by any one editor who provides for the needs of a coterie, however small, intended to cover his costs.

Custom-Tailored Information

There is then an inexorable requirement for a return to custom-built publishing directed at individuals, whether private citizens or cabinet ministers. This service must be economically viable, once the necessity for it is generally recognized, because it meets a need which cannot much longer be ignored. Moreover, the new technology is able to supply it. We shall use the power of computers to undertake an editing process on behalf of the only editor who any longer counts — the client himself. It matters not whether the information reaches that client on a computer terminal, or in a custom-built personalized print. Economics and personal preference will decide that issue. What does matter is the inevitable reversion to the age-old principle of publishing based on the finite capacity of the brain to assimilate data, and to convert them to the information which changes the brain's condition. And in all of this we may note the mechanisms already uncovered in this paper: especially obedience to the Law of Requisite Variety, and the vitality of the principle of adaptive feedback.

I here repeat that this kind of prognosis is not to my mind a matter of forecasting, but the detection of an inexorable requirement. There is no need to extend the argument to publication in the field of leisure, important though this is, because the considerations are much more difficult — and I think longer term. But the field of professional publishing, which includes knowledge about the whole of science and technology, and includes knowledge about everything that government may do, is sufficiently significant in itself. Both areas may be treated as their own esoteric boxes. In both cases there has to be a high variety of exposure of the client to the

system, and there has to be fast adaptive feedback. If you will allow that this is possible, then we reach a new dimension of concern in the field of socio-economic management.

We know by now, as a matter of principle, that the increased effectiveness of the service provided inside an esoteric box increases the vulnerability of its clients to intimate revelations — because of Ashby's Law. The case of both commercial and governmental publishing to professional individuals offers no exception. In exactly the same degree, and by exactly the same mechanisms, that custom-built publishing becomes effective at all, so does the increasingly well-served client become a target of exploitation. Insofar, that is, as a particular product of either commercial or governmental publishing is especially meant for me, valuable to me, valued by me ***, so far it is irresistible to me. We encountered this point before.

Nefarious Purposes Too

There is no problem here so long as we continue to speak of professional publishing by reputable publishers (and governments) itself. The matter for concern is of course that if such a system works for this purpose it will work for other and nefarious purposes too. If we can encode an individual's interests and susceptibilities on the basis of feedback which he supplies, if we can converge on a model of the individual of higher variety than the model he has of himself, then we have exactly the situation inside the automated system which was observed to be such a threat in more protected contexts. I think that marketing people will come to use this technique to increase the relatively tiny response to a mailing shot which exists today to a response in the order of ninety per cent. All this is to say that the conditioning loop exercised upon the individual will be closed. Then we have provided a perfect physiological system for the marketing of anything we like — not then just genuine knowledge, but perhaps "political truth" or "the ineluctable necessity to act against the elected government". Here indeed is a serious threat to society.

Now we can see how the first three points in the List of Characteristics about the behaviour of esoteric boxes are indivisible from the last three points. Knowledge of the world and knowledge of the citizen are indissolubly united in systems of the kind we must expect; private and public interests moreover are inseparably involved in each. Then the interfaces between these four major components of information systems become hopelessly blurred. We shall not be able to legislate to keep what is indivisible divided. These arguments are based on realities manifested by situations which cannot be controlled at their own level without interference on a totalitarian scale in the rights and autonomy of our social institutions, the esoteric boxes.

4. METASYSTEM MANAGEMENT

The jigsaw puzzle is complete. We have looked closely at the emergent picture of interacting social institutions, exemplified as esoteric boxes. They are stable, involuted, resistant to change. Their interaction is embodied in strings and networks of complex connectivity, exemplified as metasytems. These are unstable, mercurial, existing more in concept than reality. The problems of information management that assail the boxes will be solved, if with the greatest difficulty. These solutions will themselves inexorably increase the metasytemic instability, threatening to blow society apart.

If all this offers an effective generalization of the problem of data pollution, and if we are to see any possibility of its solution in terms of good cybernetics, practice is needed in applying the model here envisaged. Let us then look at two levels of application, as widely separated as possible, to see how readily the systems concerned map onto each other, and what may be the commonalities of acceptable metasystemic controls.

First Example: Information and Publication at Home

One plausible development of existing capabilities in informational science looks like this.

It is already possible to transmit textual material and the instructions for printing it into a television receiver — during a normal broadcast, and without interfering in any way with the broadcast itself. This is done by utilizing some of the enormous channel capacity available and not used by the flying spot defining the picture. For example, the spot has a "flyback" period, when it returns from the end of one scan to the beginning of the next. One line of scanning on a TV screen contains approximately six hundred bits of information. The flyback takes five lines to return, and is thus capable of carrying three thousand bits of information. If sixty frames are scanned every second (this would be fifty in Great Britain) there is spare capacity to transmit 180,000 bits a second of other information while the broadcast itself is going on. We know how to produce hard copy from the television set, using this input information. If we wish to produce a column of print six inches wide, with excellent resolution at a hundred lines per inch, we need 600 x 100 bits of information to produce an inch of text. It follows from all this that we have a capacity to produce three inches of text every second without interfering with the television broadcast.

Newspapers can be produced in the home like this, as is well known, and experiments continue. But newspapers are not custom-built; they belong to the informational overload. This overload is due to be met by custom-built publishing. Then apply the existing technology to the new publishing concept and see what happens.

Participation in a "Personal Response Program"

Suppose that there are twenty buttons on the side of the television set which can be pressed by the viewer. The broadcaster invites the viewer to participate in a "personal response program". He shows the viewer two pictures, and asks him to press the first button if he prefers the first picture to the second — otherwise not. He then asks a question, and says that the second button should be pressed if the answer is yes — otherwise not. And so on. By the time the viewer has pressed or not pressed all twenty buttons he has identified himself in a high-variety way. For there are 2^{20} ways in which the set of buttons may be pressed, and that means enough patterns to distinguish between more than a million individuals (where each offers a separate pattern). As to privacy, the viewer is at home and alone with his set. So no one knows which buttons he presses (or do they?).

Having completed this exercise, the broadcaster suggests that the viewer should press his "print" button. The television set will then print out, from the vast amount of information being carried on the flyback, a piece of print which is determined by the particular pattern set on the twenty buttons.

After all, if the sponsor hires one minute of flyback time at the end of his advertisement, he may transmit no less than a hundred and eighty inches of text. The "computer program" set up on the twenty buttons selects (say) six inches of this available text, and the apparatus prints it. This means that the individual concerned receives a very highly directed message. By the arguments used earlier, the viewer is likely to find this message irresistible. For example, the old lady sitting in one house reads "this product is especially suitable for old ladies," while the young man next door reads "this product is especially suitable for young men". (One needs little knowledge of the advertising world to recognize this example as remarkably naive.) Moreover, because the TV set is in a particular location, and can be pre-programmed with that information, the custom-built message and advertisement could well include instructions as to which local supplier will make what special reduction for immediate compliance with the suggestion to purchase. Again, this example is offered for display purposes only: the opportunities are hair-raising. Suppose for instance that the apparatus is able to store previous sets of responses ***.

... That Results in Buying

The viewer lifts the telephone in order to place his order — or perhaps he simply presses a new button on his set labelled "yes". The supplier now has an order, and his system (for he is his own esoteric box) must immediately check the credit-worthiness of the customer. If by this time we have reached the cashless society, it could well be that the whole transaction is finalized and the viewer's bank account debited within the millisecond.

... And Reveals Quantities of Information About the Buyer

This is all entertaining, and something like it will very likely happen. Now consider the esoteric boxes on whose integrity and security he relies, but which he may by now himself have violated. The information he betrays might well include —

- his medical status,
- his educational status,
- his intimate psychological situation,
- the family context (i.e. someone else's privacy is breached),
- the employment context (i.e. commercial security may be breached),
- the economy's view of his credit,
- the state of his bank balance,
- his religious outlook,
- his political outlook,
- his social attitudes at large ***.

Twenty bits, a variety of a million, every time: here is an inexhaustible source of metasystemic information available to anyone who sets out to acquire it. And from this information could be synthesized a new account of society and of the economy, orders of magnitude more powerful and valuable and threatening than any we have hitherto known or countenanced. With this unthinking violation of privacy goes the betrayal of all the mechanisms for protection and security to both the individual and the state which the esoteric boxes themselves have sought to guarantee. And with it go also the distinctions between public and private information, knowledge of the citizen and knowledge of the world.

Second Example: In World Economics

Undertaking now the largest possible change in the scale of this thinking, and leaping over a stag-

gering array of other plausible examples large and small, we turn to the future of mankind itself and the stability of world economics.

A consensus of opinion might define an economy as the observable, quantifiable aspect of the social metasystem. The metric of economics appears to offer the only lingua franca which enables us to talk in figures about strings and networks of esoteric boxes — for typically these have no other commensurable denominator. But it seems to me most important to observe that this circumstance has let us into jejune descriptions of the social weal — which are obsessively treated as merely economic. Surely no-one can believe that the total state of the world with all its pressures, ethnic, religious, lebensraum-oriented, power-gearred, and all its problems of military, societal and environmental crisis, can adequately be discussed in terms of econometric models. Input-output analysis tells us something about the connectivity of esoteric boxes; cash flows say a little about their dynamic inter-relationships; but we may discuss fiscal and monetary policy until we are purple without touching on the major causes of even economic disequilibria, still less of social dysfunction. This contention is relevant at both the national and the international level.

Major Political Entities

Having criticized the metric that is used and the models that are adopted, I may readily claim that the networks linking social institutions at this level are the most tenuous yet discussed. This underlines the fact that major political entities — states and nations — are the ultimately complete exemplifications of the esoteric box. They answer both to the definition of this term and to the behavioural analysis of its operation. I shall risk as your foreign guest a remark about this which I hope will not be regarded as a solecism. We have just entered the decade in which the founding bicentenary of a remarkable interactive network will be celebrated in your country, the metasystem for which is perfectly exemplified in a federal constitution and its law. Is it not fair to say that there are esoteric boxes within this system, some of which are whole States while others are social institutions of other kinds, which maintain to this day those characteristics of the integral, stable, change-resistant box which we have taken much trouble to elucidate? And if there is cause for alarm about national instability, then surely it is metasytemic in nature. Correctives are hard to apply, for reasons we have also uncovered: they lead to involution and even exacerbate the problems.

Sovereign Nations

At the level of world affairs, the case is far more strong. The sovereign nation is the ultimately esoteric box; the interconnective networks between nations are like so much spun silk. All the mechanisms described here clearly operate, and they too are clearly involutory. The problems and threats are the same, but they are writ large. Just as we may identify spurious metasystems purporting to link the esoteric boxes of our own social institutions, so there are spurious international metasystems. All approaches to world government, from the League of Nations onwards, and including market-oriented consortia, speak metalinguistically but do not operate metasytemically. This is why I call them spurious. Hence it is in the network of world economics that we find the ultimately inadequate description and the ultimately incompetent management of the ultimately unstable metasystem.

Multinational Companies

Perhaps the nearest approach to genuinely stable organizations of this kind are the multinational companies. They represent linkages of esoteric boxes, beyond doubt; they certainly have identifiable metasystems. Even so, the cohesive forces required to make them survival-worthy barely emerge — given a potentially hostile environment. Do we have adequate management mores and philosophy, company lore, or international law, to underwrite their responsible self-regulation? It is a serious question, bearing in mind that these companies are in a sense the emergent nations of the next few decades. I mean by this that the gross product of some mushrooming companies already exceeds the gross national product of the smaller historic nations — for whom tradition, constitution, legal precedent and other long-standing regulators provide the cybernetic grounds of stability.

The vision of a small but historic nation in revolt is bad enough. The explosion of knowledge among people whose intellectual horizons are thereby expanded and burst, the extension of personal vulnerability and loss of security through the uncontrolled spread of informational networks, and the political threats let loose by all of this, could turn such revolt into a societal crisis for that nation of unexampled magnitude. It would have to rely very heavily on the propensity to stability of the esoteric box to contain the situation. But what if instability such as this were to assail a multinational company of greater size than this nation, a company that is not itself truly an esoteric box but a network existing at the metasytemic level without a metasystem? This would be a leviathan greatly to be feared, a leviathan obscenely polluted by its own data which it found itself powerless to metabolize.

Outcomes for Action

Action is required. The form of this action is a matter for you rather than for me. My endeavour has been to penetrate the immense complexity of the information management problem, in search of a scientific generalization. This I have tried to define in fairly plain English, to describe and to exemplify. The objective was to aid your endeavour to decide right action.

I suggested before that the problem is to manage complexity itself, complexity considered as the very stuff and substance of modern society. In the end, when all the computers have crushed their numbers to the last intransigent bit, the unquenched spirit of man takes final responsibility for life or death. Even so, this spirit necessarily operates — for ordinary folk and senators alike — through the medium of the human brain. This is one computer among many larger and faster (if so far less flexible) computers.

The Cerebral Computer

The cerebral computer is no more than a three-pound electrochemical device, slightly alkaline, which runs ten thousand million logical elements on the power of glucose at twenty-five watts. Its ability to discriminate is somewhat less than people imagine when they think of the human being in mystical terms as suffused by the divine afflatus. We can in general discriminate on a variety-scale of about nine. To understand an average is our métier. If we then judge that something is slightly, considerably, much or hugely better or worse than the mean, we have done as much discriminatory computing as we can normally manage. That scale of nine points is an output of roughly 3.2 bits of information.

(please turn to page 34)

The Assassination of the Reverend Martin Luther King, Jr., and Possible Links With the Kennedy Murders — Part 4

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"Considering all of the legal difficulties in prosecuting Armstrong, is it any wonder why the FBI, the Memphis police department, and Shelby County Attorney General Phil Canale wanted to forget?"

Was the murder of the Reverend Martin Luther King, Jr., the result of a conspiracy?

Previous installments of this series described the "eggs and sausage" man, later given the code name of Jack Armstrong, who appeared on the scene the day of the murder. The author concludes that this possible connection with the King murder is more probable than a larger conspiracy.*

Americans have linked Martin Luther King with the struggle for domestic civil rights; not as apparent has been his involvement with activities directed against the war in Vietnam.

Does a murder motive exist in relation to one or both of these issues? How does it relate to other political assassinations in the U.S.?

Background

Jack Armstrong was born in the South. He played football at a Southern university after he was discharged from the Army in 1952. He speaks fluent Spanish and has been quite successful at impersonation. Friends have said he delights in "passing himself off as a debonair Latin, or a dumb Mexican" switching from various accents ranging from Tex-Mex — the linguistic melange of Spanish and English spoken along the Texas-Mexican border — to the more euphonious tones of legitimate Spanish spoken in Mexico City and Costa Rica.

This writer has interviewed several of his former college associates and former Army colleagues, as well as current neighbors of his in a rural area of the Southwest where he now resides.

A prosperous attorney, who played football with Armstrong and double dated with him, claimed to be the closest friend Armstrong had while in college. He said:

"I got several letters from Jack after I got out of law school in the middle 1950's. Most of them came from South America. Several of them came on

*Parts 1, 2, and 3 were published in the February, March, and April issues, respectively, of *Computers and People*, and are available from the publisher as back copies at \$2 each.

stationary from one of the swankiest hotels in Mexico City. Jack kept telling me in his letters that he had a good thing going for himself down there and kept begging me to go down there and represent him on a full-time basis. He said he could make me rich. He never gave me any specifics about what he was doing and it wasn't until several years later that I found out — both from the lips of Jack and other sources."

Wayne Chastain of Memphis, Tenn., is a veteran newspaper reporter and southern journalist with experience on several metropolitan dailies in Texas including El Paso, Houston, Dallas and San Antonio, as well as on the St. Louis Globe-Democrat and a Memphis daily. He had traveled with Dr. King's entourage on and off for two years prior to the assassination. He had spent the last two days of King's life covering his speeches in Memphis prior to the shooting. He was on the murder scene within 10 minutes after Dr. King was shot. He interviewed eyewitnesses for one of the first comprehensive news accounts to the nation of Dr. King's death. A native Texan and a graduate of the University of Texas with a bachelor's degree in history and political science, Mr. Chastain also spent several months in early 1964 investigating and researching the assassination of President Kennedy, Jack Ruby's link with Lee Harvey Oswald and a group of pro-Cuban arms runners, and other activities related to Kennedy's death. Months before The Warren Commission's report, which was published in the fall of 1964, Mr. Chastain — after exhaustive interviews with hundreds of witnesses — had reached the conclusion that President Kennedy's death was the result of a plot involving paramilitary professionals financed by a group of wealthy, right-wing Texans with the Central Intelligence Agency as well as lower echelon CIA personnel still assigned to the bureau. The present installment is an excerpt from a forthcoming book entitled: Who Really Killed Dr. King — And the Kennedys? A Disturbing View of Political Assassinations in America.

Gentleman Farmer

Today, Armstrong is 42. Ostensibly, he is a wealthy gentleman farmer in the Southwest. He plants cotton, soybeans, and raises cattle. He delights in attending cattle auctions and bidding high for prize livestock. He never pays by check, but sends a teletype wire and pays the auctioneer in cash.

He apparently acquired his affluence in the past eight or nine years. He once told some friends in Miami that he made his money in the middle sixties in the computer business in Dallas, Tex. He gave the name of his firm to one person, who later checked, only to learn there was no computer firm by that name in Dallas. Despite a dozen listings in the Dallas city directory of names that are the same as Armstrong's real name, an individual check of each listing indicated that none belong to Armstrong.

Armstrong frequently takes long trips away from home. One lasted as long as six months, the longest lasted a year. Letters addressed to an apartment he maintains in a small town near his ranch came back from the U.S. Post Office with unconventional notations: "Not Deliverable in the U.S. At This Time".

Armstrong's Anti-Racist Attitudes

"Jack always espoused a hard-line, anti-Communist ideology," the attorney friend recalls. "Unlike most persons I knew in college that were addicted to right-wing thinking, Jack was not a racist — he was always defending the rights of Negroes — a radical idea in the deep South in 1954 before the U.S. Supreme Court declared school segregation was unconstitutional. Jack was saying that before the high court ruled, and that was the cause of at least two fights he had in college. He won them both. Also, Jack identified with the Indians and always defended them."

Armstrong, however, began associating with wealthy right-wing militarists after his discharge from the Army. He partied with many of them who were visiting the U.S. for American military training. He was also a friend — as well as personal pilot — for Castillo Armas, the right-wing dictator of Guatemala, who himself, was mysteriously assassinated in 1955.

Armstrong's Right-Wing Philosophy

Armstrong's fervent right-wing philosophy and ardent anti-Communism were so well-known by his friends that they became perplexed in later years when they learned he had gone to work for Fidel Castro in Mexico City in early 1957. He first worked only as a highly paid gun runner, personally piloting the weapons from black market sources near Philadelphia and St. Louis via a secret airfield near Houston, Texas, then southward to Mexico City. Later, however, he accepted a top command position in the revolutionary army Castro was organizing for the eventual overthrow of the hated Batista regime in Cuba.

Thus, the period between 1957 and 1961 created an anomalous and incongruous chapter in the life of Jack Armstrong. Note this is about the same time his prosperous attorney friend was receiving letters from Mexico City.

"Dinero," Armstrong would reply in later years when friends asked him why he went to work for the

revolutionary Castro, who was aided by the Communists.

The right-wing, anti-Communist Armstrong, working for a revolutionary with a Russian trained Communist for a brother, never made much sense for friends who knew Armstrong in college.

One staunch defender of Armstrong — an "Army buddy" who served with him in Korea — theorized that Armstrong became a paid agent of the Central Intelligence Agency, who assigned him to penetrate Castro's increasingly effective underground. Should the contingency that Castro hoped for — namely, the uprooting and toppling of the Batista regime — ever materialize, the CIA would have a plant right under Castro's nose. This type of contingency planning and infiltration is normal CIA procedure, so goes the theory of Armstrong's Army buddy.

Armstrong cultivated a close friendship with Castro, but developed a deep-seated animosity toward Raoul, Fidel's brother.

American Adventurer in Brazil

In early 1958, the Miami Herald reported an embarrassing incident for the U.S. State Department in Brazil. This was about six months before the overthrow of Batista's regime. The incident arose in Rio de Janeiro when State Department officials discovered the presence of an American adventurer in that city without any evidence of his legally entering the country. The adventurer told an implausible story — unconfirmed to this day — of how two companions and he survived a plane crash in the dense jungles of the immense Brazilian interior. After the crash, he disagreed with the two companions on the proper route to take out of the jungle, so they split the aircraft supplies consisting mostly of champagne and canned goods.

"I ingratiated myself with the Indians I met on the way by sharing my champagne with them," the adventurer said. "I walked out of the jungles drinking champagne and eating canned goods."

Why would such an amusing, but implausible story, create any embarrassment for the state department? Normally it wouldn't, but it seems that the adventurer's presence in the country coincided with the assassination of a Batista dignitary who was visiting Brazil.

Fearing an international diplomatic debacle, the State Department ordered their security agents to take the adventurer into custody. The agents were rushing him to an American ship in a Brazilian port in an embassy limousine when the vehicle collided with a Brazilian taxicab. In the confusion that ensued, the taxicab — with the adventurer inside — fled the scene.

Evidence based on photographs and other information gleaned from the Miami police intelligence division files indicate the adventurer was none other than Jack Armstrong.

A few months later, after the successful overthrow of Batista, Armstrong surfaced again — both in Havana and Miami. Reports indicated he fought beside both Fidel and Raoul in the last days of the crumbling Batista regime. Captured Batista records also indicated that Batista himself had placed a price on Armstrong's head as early as 1957. The right-wing dictator had ordered Armstrong's death by firing squad because of a confidence caper Armstrong had pulled in an elegant gambling casino. The trick

netted Armstrong several thousand dollars at the expense of one of Batista's top lieutenants. Although Armstrong was taken into custody shortly after the incident, there was no explanation as to how he eluded the firing squad and escaped to Mexico. More about the confidence caper later.

A CIA Infiltrator?

In the first few months after Castro established control in Cuba, Armstrong had his own plane. He flew from Havana to Miami almost daily and his movements attracted the attention of the Intelligence Division of the Miami Police Department. The Intelligence Division is probably one of the most sophisticated of all city police departments in the nation (see "Computers and Automation" issue of May, 1970 and Richard Sprague's article on how the unit penetrated a plot to assassinate President Kennedy in Miami in early November, 1963 — three weeks before Kennedy was assassinated in Dallas).

Evidence began to mount that Armstrong was not what he appeared to be, that is, a dedicated, loyal supporter of Premier Castro. Perhaps, the old Korean War buddy was right — Armstrong was a CIA infiltrator into the Castro camp.

Or an alternate theory, the one supported by Armstrong's own explanation, is the "disillusionment theory" — that is, that Armstrong went to work for Castro because he thought he would replace Batista's dictatorship with an American-style democracy, and that he broke with Castro when he saw the Communist elements of Castro's underground take over the regime.

At any rate, the Miami police intelligence unit, working with the Florida Attorney General's office, began rounding up groups of active Castro agents in Miami, including Armstrong, when evidence emerged that suggested a massive kidnapping plot of several escaped Batista officials from the Miami area. The scenario called for transporting the kidnapped victims back to Cuba for the benefit of Castro's firing squads.

In the massive investigations that followed, Florida officers discovered Armstrong had strong ties with both the FBI and CIA. For policy reasons, they dropped charges against him, especially after one strange incident in a Dade County courtroom where Armstrong was literally and bodily seized from state officers by FBI agents as Armstrong was being carried before a state judge for arraignment on a conspiracy to kidnap charge.

A Con Artist

Another paradoxical facet of Armstrong's dossier during these years is that interspersed with his activities as a gun-running soldier of fortune are several incidents in which he was accused of swindling wealthy persons out of large sums of money by bogus "get rich schemes".

Two significant facts emerge concerning these series of alleged confidence games: one is that Armstrong was never convicted; and second, the indictments were always the products of seemingly aggressive U.S. Attorneys who, somehow, always lost interest in the cases once the indictments were publicly announced. Thus, the cases never came to trial.

These facts led one Miami police intelligence agent to suspect that the indictments were brought

for one singular purpose — to create a cover whereby Armstrong could penetrate Castro's underground as a soldier of fortune discredited by his own government. Also, recall Batista's charge of swindling against Armstrong, and death sentence that was never carried out. Was Armstrong really an anti-Batista man?

It is important for the reader to remember Armstrong's alleged predilections for confidence capers and his ideological leanings.

What Role did Armstrong Play in King's Death?

Assuming Lloyd Jowers, his waitress, Thompson, and the two ministers properly identified Armstrong as the man they encountered in the episodes related in Parts 2 and 3, the questions naturally emerge:

- What was a man with a penchant for international exploits doing in Memphis on the day King was killed?
- Did his presence suggest he played a role in King's death — either as a conspirator or a principal actor?

Let's first explore a theory that would absolve Armstrong of any complicity in the planning and execution of King's death, but would nonetheless assign him a role — perhaps a collateral one — in the drama that culminated with King's assassination.

I alluded in Part 2 to a high ranking police official who told me in confidence that Armstrong was acting as an undercover informer for both the FBI and Army counter-intelligence. I never divulged the identity of this police official — either in print or orally to anyone else — but later he denied, again in private, ever making any such statement to me.

Let's explore a theory that would assign Armstrong such a role. If Jowers properly identified Armstrong as the "eggs and sausage man," then we know Armstrong was in Memphis on the day King was killed. We would know he was within a half block of the Lorraine Motel where King was killed, at least an hour and a half before the fatal bullet was fired.

If Armstrong were an informer for the FBI and Army counter-intelligence, then this might mean he had been assigned to follow King and remain undercover as a way of ferreting out any plans to kill King. Thus, knowing King was staying at the Lorraine, Armstrong's presence in Jim's Cafe would not be hard to understand.

His return trip the next morning and his subsequent arrest could be explained this way. Rather than overtly sever his relation to the underworld by going directly to either the Memphis police department and the Federal building where the FBI offices were located, Armstrong had to create a subterfuge where he would be arrested — similar to the ruse used by Lee Harvey Oswald in New Orleans when he was arrested by police in 1963 during a pro-Cuba demonstration in the Latin Quarter¹ so he could confer with his FBI agent-baby sitter at a private room in the New Orleans jail. While in custody at the Memphis police station, Armstrong could pass on information to whoever was his FBI baby sitter in Memphis. (Baby sitter denotes the agent who has several paid informers assigned to him and it is his duty to collect their messages and confer with them from time to time.)

The reason the two plainclothesmen seemed interested in the "eggs and sausage man" after King was killed, and asked Jowers to call him if he returned, was that they needed to confer with him to see if he had any information as to the identity of King's slayer.

Also, this may have explained the personal irritation of the "eggs and sausage man" when he went to the wall where the telephone was installed, and never used it.² Could he have been looking for a number that was supposed to have been left there for him to call?

This interpretation may absolve Armstrong of any complicity in King's death, but it does not explain the re-appearance of Armstrong in Memphis five days later as Benavides and Bonnevecche. How could Armstrong — by making these impersonations — be aiding law enforcement officers in the investigation of King's death?

No, this theory has to be rejected unless one would ascribe a more sinister duty to the role of undercover agent — such as an "agent provocateur". One would have to adopt the theory this writer rejected in Part 2 — namely, the FBI planned and carried out the assassination of King.

A compromise theory would have been that Armstrong indeed was acting as a bona fide agent of both the FBI and Army intelligence, and exploited his clandestine and convenient status — without authority from either agency — to assassinate King upon orders of a third superior.

The Decoy Theory

Another theory is that Armstrong served as a decoy — either with or without knowledge of the identity of King's actual assassin. According to this theory, Armstrong's role was to scatter false clues and drag red herrings across the investigative trail while the real assassin escaped the country.

Also, Armstrong's role was to implant the idea of either a racist or mafia-like motive in the minds of his listeners. Note, Benavides' almost casual reference to Thompson of his visit to Doyle Ellington, grand dragon of the KKK in Tennessee; and Bonnevecche's theory that Mafia had killed King under a murder contract let by a jealous husband.

Also, it could have served a second purpose of setting the stage for a Mafia motive behind the impending assassination of Robert F. Kennedy six weeks later, after the California Democratic Primary.

Why would these motives want to be implanted in the public's mind?

If one returns to the third conspiracy possibility on the right — a thesis thoroughly explored in Parts 2 and 3 — then one can understand why it would be paramount that a racist or Mafia motive had to be implanted in the public's mind to distract from the "national security" motive of the professional paramilitarists — an establishmentarian clique³ that cuts across the military-industrial complex, including the State Department, the Central Intelligence Agency, and powerful private interests that have a vested stake in continuing the cold war mentality in the nation.

But what if the decoy tactic backfired? What if it were so successful, it led to the arrest of Armstrong and his subsequent indictment as King's killer?

Wouldn't Armstrong — much like James McCord as one of the Watergate defendants — be tempted to blow the whistle on his co-conspirators and perhaps name some higher-ups?

When one studies Armstrong's psychological profile, one perceives a daredevil streak in Armstrong — a perverse pleasure in setting himself up in physical situations that threaten him with danger.

Recall the Brazilian caper and the subsequent involvement in the conspiracy to kidnap Batista supporters in Miami and fly them to the Castro firing squads in Cuba. (Recall also the fact that Armstrong played a probable role as FBI and CIA informant in exposing the kidnap plans.)

Also, observe that Armstrong — if he did play both the role of Benavides and Bonnevecche — had astutely constructed an almost impregnable defense along the way of implanting racist and mafia motives in his listener's mind.

If Thompson became a prosecution witness, Armstrong's attorneys could attack Thompson's testimony on three grounds:

1. Inadmissibility of testimony that would breach the attorney-client privilege. If this ruse failed, then:
2. Armstrong could not have been the man who visited Thompson because his physical description did not fit a "blond Latin". Benavides was also a man of Latin American characteristics: the name, the accent, etc. Armstrong, on the other hand, was 100 per cent American, no accent, etc.
3. Even if the jury were to believe Benavides was Armstrong, then Thompson's testimony itself would tend to exonerate Armstrong because Benavides vehemently insisted that he did not kill King, but that his friend Pete did. Besides, Benavides said he "never hired his gun out to kill Niggers".

If the two ministers were witnesses for the prosecution, their testimony also could be attacked as inadmissible because of the "privileged communication" defense accorded to professional-client relationship. Again, if the court ruled that such a defense was not applicable under those circumstances, they would attack the ministers' testimony as failing to incriminate Armstrong on two grounds:

First, Bonnevecche said he was in St. Louis on the day King was killed.

Second, Bonnevecche said his friend Nick killed King, not himself.

If Thompson and both ministers were all prosecution witnesses, note how a successful and skilled defense attorney could pit their testimony against one another. Thompson would say Benavides was a blond. The two ministers would say he was dark, of Italian-Portuguese lineage.

Considering all of the legal difficulties in prosecuting Armstrong, is it any wonder why the FBI, the Memphis police department, and Shelby County Attorney General Phil Canale wanted to forget that Tony Benavides or J. Christ Bonnevecche ever visited Memphis?

Location and identification of Benavides-Bonnevecche — and subsequent indictment of Armstrong as a co-conspirator in the slaying of King — loomed as a Pandora's Box for the prosecution. Once that box was opened, an apparent open and shut case against James Earl Ray would become less perfect.
(Part 5 next month: "Conspiracy clues the FBI forgot or ignored")

Footnotes

1. Harold Weisberg. Oswald in New Orleans: Case for Conspiracy with the CIA (New York: Canyon Books and Book Distributing Co.), pp. 46-51. Weisberg convincingly develops the thesis that Oswald was not only on the payroll of the CIA at the time of John F. Kennedy's death, but also on the FBI payroll as a secret informer. Thus, this explains how Oswald had the private number and license plate number of a key FBI agent written in his notebook at the time he was apprehended.
2. Warren Smith. Saga Magazine (October, 1969). Smith purports to have an inside version from Ray himself that Ray was supposed to go to Jim's Cafe and write a room number down — the room he would be in upstairs. Ray, however, his penchant for blunders still intact, went to Jim's Place, two blocks down the street, and wrote the room number on the wall by a telephone number there. The real Raoul was supposed to go to Jim's Cafe, get the room number off the wall, and go up to the room where Ray would have left the rifle to kill King. According to Smith's theory, Ray was only a delivery boy for the murder weapon and was supposed to have left the room after he delivered the bundle. Raoul then killed King, and left the bundle outside to "frame" Ray, according to the Smith thesis.
3. Col. Fletcher Prouty. The Secret Team (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), p. 2.

Unsettling, Disturbing, Critical . . .

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

- The reliability and social significance of pertinent input data;
- The social value and truth of the output results.

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

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

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

BURNSIDE — Continued from page 9

services at our busy check-out terminals. Additional terminals are being installed by area as rapidly as training and marking status permit. We completed the installation by January 15, 1974, and thereby, are in a position to record the fiscal inventory through the system. For us, the much heralded gamble was not a gamble at all, because: (1) we were ready and knew what we wanted; (2) Sweda and Kimball were ready and willing and able to deliver it; and (3) our people and theirs worked well together and understood one another.

Management Information System

We do not know much about the widely discussed question of merchandiser attitudes or resistance re usage of management information. The kinds of information generated for merchandisers by our system through the logging and inquiry print-out capacity of the powerful Novas, and the speeded-up main frame massaging and reporting are pretty difficult to resist or fail to use to advantage. If we have one weak link in the system, it is the teletypewriter inquiry and reporting, which is being worked to death. But we have substantially completed the design of the total merchandising data base; with key punching relieved of the daily sales input chore, we will not be long in having the whole system up on the main frame configuration, for scope inquiry and purchase order generation and calculated replenishment, with daily updating from the P.O.S. logging tapes.

We would do it over again the same way tomorrow. Our magnetics are working well — our people and our customers both like them. We are not unduly impressed by the Systems Specification Committee opting for an optical font standard. If optics were so superior, it is hardly likely that the major national credit cards and airlines would be using magnetics for localized customer identification, or that IBM (who has probably forgotten more about optics than most others know) would have magnetized Delta Distance for its retail applications. An optical font may help solve the problems of source marking discipline of the big three catalog houses. But they are still going to have an expensive big bad time reading it at the point-of-sale, and in our opinion it is no solution for the universe of general merchandise retailers and suppliers. In this climate, its low density is an insufferable weakness. We, of course, need a computer-activated magnetic encoding and marking device for merchandise identification. After waiting eight years for the P.O.S. system we wanted, we can probably get along while that is being developed.

The Cost Appears Competitive

We have pretty much covered the "why and when" as we lived it. The "how much" we have scarcely touched on except to say we considered our cost competitive. The question is complicated, of course, by considerations such as how ready you are in-house, in terms of system and people, what your marking practices and costs are, how you are handling credit authorization, how much sophistication and back-up you require and what frills you would like et cetera.

For what we did, including telephone communications, but not including cost of marking or offsets from economics in main frame, key punching or paper saving, figures about \$4,200 per terminal. But don't figure on getting very much for a bunch of 1950 mechanicals. Sears are giving them away. □

GAMES AND PUZZLES for Nimble Minds – and Computers

Edmund C. Berkeley
Editor

COMPMEANO

The following was “picked up from the floor of a computer laboratory”. The characters were printed by a computer output device.

Is it a random number sequence? or does it have meaning? If so, what does it say?

The answers to these questions will be published next month.

COMPMEANO PUZZLE 745

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

Regarding Compmeano Puzzle 744, and the way in which the solution can be deduced (with much help from a computer program), we plan to publish an article in the next issue.

ALGORITHMMO

In this puzzle, the objective is to express a procedure for going in a given situation from given input to given output. The following conditions apply: the situation is a little off the beaten path and is interesting; the procedure is fairly evident and fairly short; the procedure is to be expressed in precise English words, with perhaps defined terms in addition; the procedure is to be completely and accurately expressed, i.e., the calculating procedure must work. (In addition the procedure may, if desired, be expressed in a common computer programming language such as BASIC, LISP, FORTRAN, or APL, together with complete translation into precise English words and satisfactory evidence, in terms of several examples run, that the program works correctly.)

For the following puzzle, we hope to publish in the July issue the best solution received before June 10 from a reader of *Computers and People*.

ALGORITHMMO PUZZLE 745

Problem: ORDINALS TO CARDINALS. Express a procedure for going from ordinals to cardinals. *Input.* A string of characters consisting of any single ordinal number in

English, from “1st” or “first” to “300th” or “three hundredth”. *Output:* the corresponding cardinal number in decimal digits, from “1” to “300”. *Examples: Input:* second, seventh, 17th, 33rd, two hundred fifty-first. *Corresponding Output:* 2, 7, 17, 33, 251.

GIZZMO

The problem is to grasp relations between things that are not identified in the usual way – their names cannot be looked up in the dictionary – and then solve a problem involving them. A case could be argued that this is an extension of Lewis Carroll’s poem, “Jabberwocky”.

For the following puzzle, we hope to publish in the July issue the best solution received before June 10 from a reader of *Computers and People*.

GIZZMO PUZZLE 745

Problem: A DULONG is solid and has isometric symmetry. It has 14 sides of two kinds. Take 8 of the sides all of the same size and shape, and assemble them into a solid KIFIT. Take the other 6 sides of the DULONG which are also all of the same size and shape, and make them into a solid DRIST. Rest the KIFIT on top of the DRIST. Measure or calculate the combined height. How much higher is the resulting height than the height of the original DULONG? (*Hint:* A rectangular room 9 feet long, 9 feet wide, and 9 feet high has isometric symmetry.)

ESSENTIALO

The problem is to understand the essential meaning of a long sentence filled with unnecessary words, and to express that meaning in a much shorter sentence by omitting words that say little or nothing. The second shorter sentence is limited to a stated number of words.

A solution to the following puzzle will be published in the next issue.

ESSENTIALO PUZZLE 745

Express the essential meaning of the following sentence of 67 words in a sentence of not more than 20 words.

Technical information will also be made available to the Center and its staff, both members and associates, on both an organized and an *ad hoc* basis, since a rotating advisory group of technical personnel – electrical engineers, computer technologists, physicists, metallurgists, and so forth – will scan scientific, engineering, and other literature for ideas, developments, and other information that may be applicable to the Center’s general program and specific needs.

ARGUMENTO

The problem is to understand the argument being asserted in a passage, and (1) say whether the argument is valid or invalid, and (2) state the reasons why or why not, within the number of words allowed for the answer.

A solution to the following puzzle will be published in the next issue.

ARGUMENTO PUZZLE 745

Problem: Jones put 3 and 3 together and made 6. *Therefore,* 6 is the result of putting 3 and 3 together. Robinson put 3 and 3 together and made 33. *Therefore,* 33 is the result of putting 3 and 3 together. *Axiom:* Entities equal to the same entity are equal to each other. *Therefore,* 6 is equal to 33. (Answer in 13 words or less.)

NAYMANDIJ

A "naymandij" puzzle is a problem in which an array of random or pseudorandom digits ("produced by Nature") has been subjected to a "definite systematic operation" ("chosen by Nature") and the problem ("which Man is faced with") is to figure out what was that operation.

A "definite systematic operation" meets the following requirements: the operation must be performed on all the digits of a definite class which can be designated; the result displays some kind of evident, systematic, rational order and completely removes some kind of randomness; the operation must change at least six digits from their original random value; all other digits must remain unchanged in value and position; and the operation must be expressible in not more than four English words. (But Man can use more words to express it and still win.)

The solution to the following puzzle will be published in the June issue.

NAYMANDIJ PUZZLE 745

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

The solution for Naymandij Puzzle 744 in the April issue is: Make diagonal of 7's.

PICTORIAL REASONING

The following pictorial reasoning test is a test to see how carefully you can observe and reason. It is not timed.

1. In each row find the four pictures that are alike in some way and find the one that is *not like* all the others and write its letter, A, B, C, D, or E as your answer.

2. If you become convinced that no picture is essentially unlike the others, write F for "fatally ambiguous" as your answer.

"A solution with reasons" will be published in the next issue.

PICTORIAL REASONING TEST 745

	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

PICTORIAL REASONING TEST 744 – A SOLUTION

(If a better solution is received, we will publish it.)

- C – A, B, E are alike in dots; D and E are alike in orientation of square U; therefore, C.
- A – B, C, D, E have vertical or horizontal symmetry; A has neither.
- E – A and C are alike; B and D are alike.
- F – they are all alike.
- B – B has the most symmetry.
- B – B is the only one containing only one kind of object.
- E – B and C contain convex objects; A and D contain approximately flat-sided objects; E contains a concave object.
- C – C is the only one with two C-like curves.

9. D – B, C, E are alike; A and D are alike but D has a cusp.
 10. D – A and C are alike; B and E are alike.

NUMBLES

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 deliberate (but evident) misspellings, or is otherwise irregular, to discourage cryptanalytic methods of deciphering.

NUMBLE 745

$$\begin{array}{r}
 \text{O N E} \\
 \times \text{G E T S} \\
 \hline
 \text{N R G S} \\
 \text{F S T G} \\
 \text{T T S H} \\
 \text{S I H O} \\
 \hline
 = \text{S S E I S O S}
 \end{array}$$

49720 59637 20597 5261

The solution for Numble Puzzle 744 in the April issue is: C = 0; K = 1; T = 2; H = 3; E = 4; N = 5; L = 6; A = 7; G = 8; Y = 9.

The message is: Lay the egg, then cackle.

SIXWORDO PUZZLE 744 – A SOLUTION

(If a better solution is received, we plan to publish it.)

(1) The university is Eastern Illinois University. It is in Charleston, Illinois. It has over 820 faculty members. Over 8600 students are enrolled. (2) It is a state university. It provides many programs of study. Some programs are in liberal arts. Some are in professional fields. Some are in teacher training. Some are in library science. (3) Booth Library holds about 300,000 volumes. These are cataloged. (4) Student enrollment has steadily increased. The library has increased accordingly. It has tried to keep pace. It has added over 20,000 volumes. This figure applies yearly. (5) Consider volumes per student. This number is 35. Compare it with the national average. This average is 45. (6) The book collection is being reclassified. The old classification system is Dewey. The new system is Library of Congress. (7) Booth Library has a circulation system. This system is automated.

About 115,000 volumes were circulated. This figure applies to 1970-71.

Comment: In this case it seems as if all of the original meaning has been kept and the limit of 6 words per sentence has been feasible. The style of course is still obnoxious.

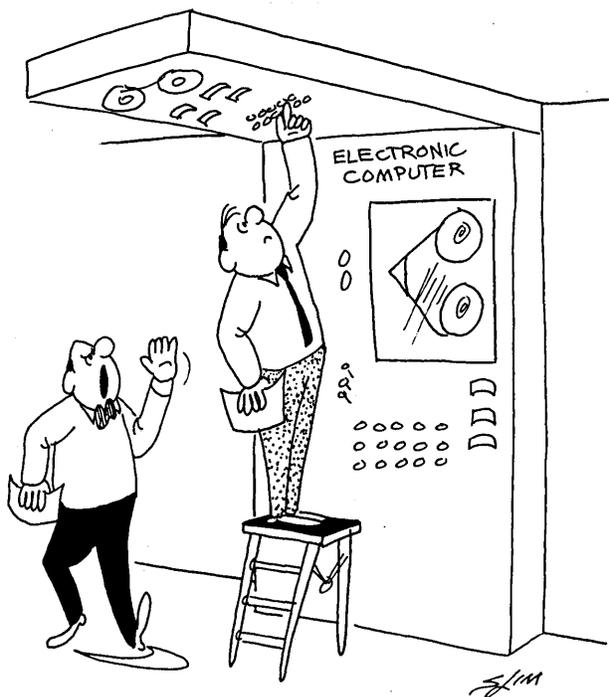
But if a future computer is programmed to understand all English sentences of six words or less, then we have in sight a solution to the problem of a computer understanding a great quantity of ordinary English.

WUNSILLABO PUZZLE 744 – A SOLUTION

(If a better solution is received, we plan to publish it.)

(1) Jones has said to me that he has long sought to train Smith in the art and work of cooking. (2) No one whom Jones had tried to teach in the past to be a good cook, Jones said to me, had been so hard for Jones to teach as Smith. (3) Jones said loudly and firmly he would surely stop teaching Smith for he was sure he would fail in that task. (4) Jones said it was true that Smith could wash dishes well, but that Jones thought that Smith could do no more than that at all well.

Our thanks to the following individuals for submitting their solutions to – **Naymandij Puzzle 743:** A. Hugh Argabrite, Sunnyvale, Calif. – **Numble 743:** T. P. Finn, Indianapolis, Ind.; Jean Robbins, Pasadena, Calif.; Major Gus Strassburger, Ft. Meade, Md. – **Sixwordo 743:** Gertrude Coates, Chicago, Ill.



“No, no, Dunlopp! – That’s only for top-level decisions!”

FORUM — Continued from page 7

placement of each digit in turn. I then turn to tabulations of the number and occurrence of digits in the columns.

I enjoy working this type of puzzle the most of all the ones you publish. Keep up the good work.

Professional Certification of Computer People

*Paul M. Pair, Secretary
Institute for Certification of Computer Professionals
P.O. Box 1442
Chicago, Ill. 60690*

The computer industry's first (and so far the only) program for professional certification has been the Certificate of Data Processing (CDP) begun by the Data Processing Management Association (DPMA) in 1961.

That program has been officially turned over to the Institute for Certification of Computer Professionals (ICCP). Officials of DPMA and ICCP on March 15, 1974 formally signed an agreement under which ICCP assumes the CDP examination program and also the Registered Business Programmer examination program originated in 1970.

John K. Swearingen, ICCP president, said "For the first time since the introduction of the computer, there exists an organization established for the sole purpose of evaluating, developing, and promulgating professional certification programs in the information processing industry. ICCP, a non-profit, educationally oriented corporation, was founded by the major computer societies so that certification efforts will have concerted, industry-wide acceptance and support."

The charter members of ICCP include the DPMA, the Association for Computer Machinery (ACM), the Association of Computer Programmers and Analysts, Association for Educational Data Systems, Automation 1 Association, Canadian Information Processing Society, The Computer Society of IEEE, and The Society of Certified Data Processors.

From 1962 to 1973, nearly 14,000 out of 27,500 applicants have passed the examination held under DPMA sponsorship in colleges and universities in the U.S.A. and Canada.

Technological Innovation Opportunities

*Peter Schwartz
Center for the Study of Social Policy — 203B
Stanford Research Institute
333 Ravenswood Avenue
Menlo Park, Calif. 94025*

Stanford Research Institute is currently engaged in research for the National Science Foundation to identify opportunities for technological innovation in the delivery of public services at the local level (e.g., waste disposal, education, parks, transit, health, housing, etc.). This program is part of a much larger federal government attempt to stimulate technological development and to provide technology, wherever useful, to meet our many social problems. I am writing to ask for your assistance in our work.

Part of our effort is aimed at working with people in local governments to identify the needs they feel are most critical. However, opportunities may go entirely unrecognized because the people most directly involved are unaware of new opportunities made possible by the most recent technological developments. Therefore, we are asking a small number of people in a broad range of disciplines who are intensively aware of the state-of-the-art to help us identify some of these new opportunities.

We would very much appreciate your taking the time to complete the following brief survey form. Please feel free to include more information if you wish.

SURVEY OF TECHNOLOGICAL INNOVATION OPPORTUNITIES

1. Do you think of any technology which has not yet been developed, which if it were, would either solve a problem or would result in a significant improvement in the delivery of public services?
2. Please identify one or more existing technological innovations, which to your knowledge have not yet been applied to public services, but you feel are "hot prospects" for improving the delivery of public services. In each case it would be helpful to have some idea how that innovation would improve public services and if possible, some source for further information.

Zoonayman — A Game That Is Enjoyed

*John A. White
8 Persimmon Court
Doncaster, Victoria
Australia*

Could you supply my friends and me with three sets of "Zoonayman" dice as per your offer in the September 1973 issue of "Computers and Automation"?

We really enjoy articles of this type — some form of masochism, I suppose — and also the annual art contest. I hope the enclosed amount will be sufficient for the dice and for airmailing.

Conspiracy To Kill Leaders of Blacks, and FBI Involvement In It

*A UPI dispatch in
The Commercial Appeal
Memphis, Tenn.
March 24, 1974:*

CHICAGO — Rev. Jesse Jackson said on March 23 that FBI documents allegedly ordering the surveillance and neutralization of black nationalists support charges that the FBI conspired to murder Dr. Martin Luther King, Jr. Jackson is the leader of Operation PUSH, a black self-help organization.

One, a directive with an October, 1967, date, Jackson said, called for surveillance of black leaders and issued instructions for agents to "disrupt, misdirect, discredit, or otherwise neutralize the activities of black nationalists."

He said another directive dated March 4, 1968, called for the prevention of the "rise of a 'messiah' who could unify and electrify the military black nationalist movement" as a "mandate to commit murder".

The documents, reported this week by "The Chicago Tribune," "constitute a body of substantial evidence to support the charge that it was the FBI who conspired to murder Dr. Martin Luther King, Malcolm X and Fred Hampton," Jackson said.

According to Jackson and the "Tribune," the documents called for the establishment of a network of undercover agents to report on activities of black nationalists along with extensive personnel files, under the code name Cointelpro-Black Extremists.

The newspaper said FBI Director Clarence Kelly confirmed the existence of black extremist intelligence operations but said it was discontinued in 1971.

The Title "Computers and People"

1. From D. Lyman Sorrell
613 Hollis St.
Kingsport, Tenn. 37660

Thank you, thank you, thank you, for the new title of your publication. Your content was ill-matched with your old title. Your new title more adequately describes the continuing technical-social issues discussed. If you had changed your title sooner, I would have been reading your magazine routinely rather than passing it on without reading it to the next person on the circulation list.

Why didn't you do it sooner?

2. From the Editor

The change of title from "Computers and Automation" to "Computers and People" probably should have been made earlier. But sometimes those closest to a situation see it less clearly than those further away. A case of the old story of not being able to see the forest because the trees were in the way.

BEER — Continued from page 24

Improvement in Requisite Variety

Improvement in requisite variety is possible, since we enrich the dimensions of our comprehension by inter-relating several scales of discrimination. Even so, our human capability is geared at this general level. So when data processing systems offer us millions of bits of data, we dare not believe in a mythical metabolic process which could convert these data into information within our personal ken. There are ineluctable limits to the assimilation of knowledge, set by the finite size of the sugar-furnace in our heads. These facts to my mind determine the sorts of action which count as both feasible and effective. I have refined my ideas about this to offer a final set of specific postulates.

Some Recommended Actions

1. We may reasonably assume that esoteric boxes can take care of themselves, since that is what they are for.
2. They can be aided: their actions can be facilitated or inhibited by government. Any intervention, however, interferes with autonomy, denies participation, and may prove ineffectual (by Le Chatelier's principle).
3. Then legislation directed into particular boxes is unlikely to be much help. In any case, there is probably no time to tackle the problem at this level.

4. Then the focus of attention should always be at metasytemic level. This is the locale of societary instability; here then reside the massive threats.
5. First, the relevant metasytem must be identified, and in some sense institutionalized. Otherwise, who is to act or who can be held accountable? This primary task can be undertaken only by those holding the constitutional mandate.
6. The purpose of a metasytemic social institution is precisely, and only, to embody the nerve-centre for metasytemic affairs. Its function is precisely, and only, to identify situations of dangerous and therefore explosive instability, and to identify trajectories leading to stability.
7. The recommended methodology is the construction of metamodels, continuously innervated by data effectively filtered through a cybernetically designed hierarchy of systems.
8. The implementation of conclusions might be vested in the metasytemic social institution; if it is, however, there will be problems about autonomy (see 2).
9. Insofar as legislation may be needed, the need can be pinpointed by these means. Directing either legislation or central executive action at strings and networks in the absence of metamodels is likely to increase instability rather than reduce it.
10. The kinds of model needed operate necessarily at a high level of abstraction: this makes almost everyone impatient. Consciously identify, then, the barrier to progress as anti-intellectualism.

Metasytemic Institutions Already Existing

Some metasytemic institutions already exist. The World Health Organization and the Food and Agriculture Organization are examples at international level, as are several international economic bodies; government departments handling whole sets of esoteric boxes are examples at national level. The questions I leave with you are these: Have such institutions been correctly identified? Do they at all map onto the dynamic structure of viable systems as understood by cybernetics? What other such institutions would be required in a stable society?

The Dangers of Anti-Intellectualism

As to the warning in Point 10 about anti-intellectualism, it seems that the arguments used here would themselves predict this self-defeating syndrome in a society newly faced with the need to manage overwhelming complexity. If the brain is eclipsed in terms of variety by the computer milieu, it may itself revolt. Then panic-stricken attempts at the highest and most responsible level to quell forces that are not understood are as dangerous as the irresponsible cavorting of hooligans. One may already detect at either end of the scale of social responsibility a response equivalent to laying about with the jawbone of an ass.

Designing a Stable Society

The alternative is to design a stable society, and to treat our complexity-control capability through computers as offering a nervous system for the body politic. This involves the deployment of a political science to new ends, in the recognition that our difficulties have gone beyond anything that can be grasped by a slogan. We should recognize a cybernetic issue for what it is. But when the unthinkable is already happening it is indeed difficult to think about, and we are robbed of our semantic strength.

□

ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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APPLICATIONS

PATIENTS PREFER MACHINES TO PHYSICIANS

*Thomas Land, London Correspondent
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England*

Computer scientists at a Montreal university are erecting a data processing programme to provide doctors with a reliable instant consultative aid — a "second opinion" in case of doubt, at the push of a button. The computer programme developed over the past two years at Sir George Williams University may yet eliminate the need for exploratory surgery.

The programme is based on an analysis of simple questions. Corresponding research in Britain confirms that patients tend to prefer medical interrogation by a chatty computer rather than doctors. The reason: they don't get shy when questioned by a machine.

The success rate of the Canadian research team has been encouraging. Out of 300 cases tested, their programme has been correct 92 per cent — a success rate more than 10 per cent above that of most other groups working in the field. The researchers admit that computer diagnosis won't replace doctors just yet, but it promises a useful and inexpensive consultative service in case of doubts.

So far, the researchers have confined themselves to the field of gastro-enterological disorders — hiatal hernia, duodenal ulcer, cancer, gallstones and functional disease. Patients need merely to answer questions regarding such symptoms as headaches, back pains, irregularity, weight loss, and food aggravation to give the computer enough information to draw its own conclusions.

Specialists forecast an immense expansion of medical diagnosis by computers in the foreseeable future. They believe that it could be used for almost any physical disorder. Hospitals in New York City are already using a computer to diagnose and prescribe in the area of poison control; and scientists at the Massachusetts Institute of Technology

and the Tufts-New England Medical Centre in Boston are working, with more than fair success, on the computerised diagnosis of kidney diseases.

People's response to interrogating machines is therefore of growing interest to the medical profession.

Patients complaining of gastric disorders were recently interviewed at the Southern General Hospital in Glasgow, Scotland, by a teletype terminal of a commercial time-shared computer. Although the measure of agreement between computer and consultant was less than that between consultants, the results were good enough for routine use of the terminal.

"Nobody disliked it," comments a specialist, "and a significant minority preferred the computer to a doctor." The reason could well be that "normal communications between doctor and patient (are) affected by the class difference between the two and because an interview with a machine causes no embarrassment."

Further experiments have been carried out at the Western Hospital in Fulham for respiratory diseases and at Guy's Hospital, London, for psychiatric disorders. Again, patients found the interview pleasant and very few were intimidated by the machinery.

EXPERTS TO USE COMPUTER TO CHART WISCONSIN'S LONG RANGE ENERGY NEEDS

*Mary Ellen Bell
University News & Publications Service
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Madison, Wisc. 53706*

Today's decisions will determine how much energy the state of Wisconsin will need in the future. For example, if people begin buying small gas-saving cars now, when 80 per cent of all automobiles on the road are small ones, we will need less gasoline than we now use, even if the number of miles people drive continues to increase at the current rate.

Six University of Wisconsin-Madison professors are working on a computer program that can make predictions about how much energy will be required in the next three to 30 years, depending on population growth, changes in the economy, fuelprices, environ-

mental standards, lifestyles and any other variable that might affect energy demands.

Prof. Wesley K. Foell, a nuclear engineer, is director of the project, sponsored by a National Science Foundation grant. He said the project marks the first time adequate information has been made available to the people who make policy decisions about energy. Previously, the only source of information about future energy needs has been the utility companies. "Energy decisions now are made piecemeal, without any accurate information, on a very short term basis," Foell said. "We are trying to provide information for looking at the consequences of energy decisions. Now we're finding that depending on the decisions we make, there can be a tremendous range of energy demands in the future."

Foell and his associates have looked at the energy resources being used for air conditioning, household appliances, industry, heat for houses, transportation systems, and dozens of other uses of power. They project increased energy demands if current use patterns continue and compare what would happen if those patterns on energy use were changed. Changes in the economy would also have an effect on energy use and the computer program can predict the results of things like price fluctuations as well as show the effect of different energy use policies on the economy. Another part of the program predicts the environmental impact of various decisions.

Each of these components in the program is being worked out separately. When the entire program is complete, Foell said it will be possible to combine the components to get a realistic prediction of the results of a total energy use policy. The predictions are expected to be a valuable aid for policy makers in agencies like the Public Service Commission and the Department of Natural Resources. Information from the computer could be used to verify the environmental impact statements required for all state approved programs under the Wisconsin Environmental Protection Act, and provide evaluation of the long range plans for power plants required by the Power Plant Siting Bill.

Other members of the faculty group developing the computer program are Profs. Charles J. Cicchetti, economics; John W. Mitchell, mechanical engineering; James L. Pappas, business; Arne Thesen, industrial engineering, and Donald Frey, visiting professor in the Institute for Environmental Studies.

CITIES UNDER 200,000 CAN AFFORD EXCLUSIVE POLICE COMPUTERS

*Varian Data Machines
2722 Michelson Drive
Irvine, Calif. 92664*

The City of Little Rock Police Department (Arkansas) now operates an online criminal information system, a feat unrealized by most municipalities under 200,000 in population. In addition the multi-processing system automatically provides access in seconds to local, state and national criminal data bases. Little Rock's system is controlled by back-to-back V 73 central processing units, each with 64,000 bytes of core memory. The system provided by Varian Data Machines of Irvine, California, is exclusively used by police.

Problems commonly associated with shared police department computerization, often cost-justified as an appendage to larger general purpose municipal computers, are virtually non-existent with a dedicated system. Little Rock's police department has not relinquished control of its computer security,

does not suffer delays in response time from an overloaded system nor downtime from testing and debugging, all realistic possibilities in a shared system.

Little Rock's Varian V 73 system, purchased from Automated Systems under specifications developed by Ultrasonics, the system contractor, consists of: 2 Varian 73 central processors; 4 disc storage drives; a card reader; a line printer; 2 magnetic tape drives; 2 data communications multiplexers; 5 video display keyboard units (one with optional hard copy printout); and 2 KSR-35 teletypes. The Varian Associates system also includes controllers which interface the CPU's with the video display terminals and line switching equipment, which permits operation of the terminals from either CPU.

Besides allowing back-up in the event of a CPU failure the second CPU is made available to other city departments on a non-conflict basis. Thus the entire city is able to benefit without a sacrifice to the police system.

The Little Rock system incorporates extensive security procedures to preclude unauthorized access or mutilation of its sensitive data base. Only specific types of transactions are program-allowed from terminals. Terminal operators must properly identify themselves when initiating a transaction. Security keys restrict access to specific files. A computer log lists transaction activity, allowing transactions to be traced, as the need arises.

The system will support the department in four major functional areas:

- (1) Field requests — rapid response to officers checking on warrants, vehicles and missing persons;
- (2) Investigations — providing investigators with the means of quickly accessing and correlating facts; source data includes data on previous burglaries and known criminals;
- (3) Record keeping — maintaining a parking and traffic ticket system, including statistical by-products; and
- (4) Management controls — tracing crime patterns in order to more efficiently allocate resources.

The planned initial applications are now operational. Consideration is now being given to computerizing the index to microfilmed records and programs to assist in dispatching emergency vehicles. Also, patrol car-mounted video display terminals are being considered.

MINICOMPUTERS SPEED PRODUCTION OF BRITISH COLOR TELEVISION SETS

*Dennis Rossiter
Digital Equipment Corp.
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A pair of minicomputers is helping to reduce the six-month backlog of orders for color television sets in Great Britain. The computers, Digital Equipment Corporation PDP-8s, monitor production of glassware for television picture tubes at the Ravenhead Works of the Pressed Glass Division of Pilkington Bros. Limited, (St. Helens, Lancashire, England) — one of the world's top ten producers of glass, and manufacturer of approximately 50 per cent of all British TV tube glassware, both monochrome and color.

Production of a perfect color TV cathode-ray tube (CRT) involves several critical operations — contouring of the screen itself; the delicate placing

of pins to hold the interior shadow mask, which defines the pinpoint patterns of red, blue and green phosphors; and the fusion of the lead glass funnel to the screen.

In order to meet the necessary fine tolerances, in 1970 Pilkington Bros. installed a PDP-8/1 as part of a Ferranti-Cordax measuring system to perform three-dimensional checks upon precision components. More recently, a PDP-8/E running Digital's new IND 8 industrial software was added, providing dimensional quality control information on each tube as it passes through various stages of production. This control is effective through both hot and cold states, and assures that drifts in tolerances are detected much earlier than previously possible with batch-sampling methods. Digital's standard UDC-8 and AFC-8 industrial interfaces are linked to gauges which measure the deviation of the screen contour from designed specifications. The PDP-8/E processes this data immediately and provides information, via datalinks, to press operators at the machine. Future enhancements of the system will provide direct control of the most critical press operations.

EDUCATION NEWS

THE AIR POLLUTION EPISODE GAME (ARPEGE)

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Use of a computer-based game created at Carnegie-Mellon University to train students and aid government agencies and industries in heading off air pollution disasters is expanding rapidly across North America. The Air Pollution Episode Game (ARPEGE), completed just last August, is already in service at 15 U.S. and Canadian universities from coast to coast, as well as in several pollution control agencies and private firms. Playing instructions have been forwarded by request to Columbia and Mexico. Representatives of a Spanish scientific center plan to visit CMU soon to examine the game, and the university is getting a steady flow of requests for information about it. Numerous demonstrations of ARPEGE have been given in secondary schools such as Turtle Creek High School, just to the east of Pittsburgh, where students found it particularly relevant after a serious air pollution episode claimed a classmate's life.

"ARPEGE is a special educational activity," says Professor Anthony S. Walters, Assistant Dean of the School of Urban and Public Affairs (SUPA). The game was created by Walters and Professor Matthew J. Reilly with the aid of several CMU students. Reilly is associate director of the Environmental Studies Institute at CMU, and is now on leave to the National Academy of Engineering. "ARPEGE uniquely considers short-term episodes," says Walters. Other games treat only long-term air pollution problems and are not similar to ARPEGE. "The beauty of ARPEGE is that it is easily adapted for a particular geographic region. Each region has its own problems environmentally, politically, and economically," Walters said.

ARPEGE began in early 1971, resulting from a joint project between CMU's Environmental Studies Institute and the Air Pollution Control Board of Allegheny County. The project addressed the county's

needs for a real episode-avoidance system. A preliminary version was developed and tested with undergraduate students in 1972; a full version was tested with participation by actual industrial managers, bureau personnel, environmental leaders and educators. The finishing touches were made last summer.

The major uses of the game are: classroom work as a supplement to lectures and source material; for professionals in air pollution episode control; for pollution source managers with economics as a consideration; and for research scholars as a tool for behavioral and administrative studies.

Conflicting objectives characterize the behavior and decisions by each player. Players are given roles as managers of the major pollution sources, as members of the regional air pollution control agency, or as a judge who rules on disputes among them. Computer implemented models simulate industrial operations, weather and meteorology, atmospheric dispersion of pollutants, and resulting air quality and associated adverse effects.

The game is divided into three phases: episode planning and preparation, simulation of an episode, and later analysis and evaluation of players' roles and strategies. The last phase provides government officials and pollution source managers with "mutual understanding that can be valuable in ameliorating air pollution problems," Walters says.

The EXXON Education Foundation provided initial funding in 1971 to design the game. The Office of Environmental Education in the U.S. Department of Health, Education and Welfare continued financial support in 1972 to permit completion of the game as an educational tool.

COMPUTERIZED INSTRUCTION BEGINS IN DOWNSTATE'S MEDICAL LIBRARY

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The Medical Research Library of Brooklyn at Downstate Medical Center (State University of New York) is now offering computer-assisted courses of instruction. On February 22, the library installed a computer terminal (Hazeltine 2000 video display terminal) which enables Downstate students, faculty, and staff to "attend classes" conducted on remote computers, and receive programmed instruction in the diagnosis and treatment of conditions ranging from jaundice to gynecologic oncology. Downstate's five-story library houses 346,643 volumes, the combined collections of Downstate and the Academy of Medicine of Brooklyn. The \$5,000 electronic "teacher" is a gift from Downstate's Alumni Association, Dr. Ralph M. Sussman, Class of 1932, president of the association, and Dr. Benjamin Zohn, Class of 1925, chairman of the board of trustees of the Alumni Fund.

The terminal, which consists of a typewriter-like keyboard with a small television screen about it, is located on a small table near the entrance to the main reading room. Alongside it is another small box of equipment, a "printer", which can provide the student with a typed transcript of any part of the lesson. Several manuals kept near the terminal list available courses, outline some of them, and explain how to use the computer equipment.

(please turn to page 42)

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Sperry Univac Div., Sperry Rand Corp., Blue Bell, Pa.	McDonnell Douglas Automation Co. (MCAUTO), St. Louis, Mo.	New nationwide teleprocessing network called MCAUTOnet; it will consolidate and expand several existing processing networks	\$18 million (approximate)
Norsk A/S Philips, Eindhoven, The Netherlands	IDA (Integrert Databehandling A/S) Norway	A bank terminal system PTS 6000, including 370 terminal computers (P 800 series of mini computers), about 1100 teller and enquiry terminals, plus display screens	\$10 million (approximate)
Sperry Univac Div., Sperry Rand Corp., Blue Bell, Pa.	Tokyo Marine and Fire Insurance Co., Kunitachi, Tokyo, Japan	A UNIVAC 1110 computer system to handle processing of automobile insurance in a real-time operation	\$5 million (approximate)
Information International, Los Angeles, Calif.	The U.S. Navy	An automated Input and Document Update System (AIDUS) for technical manual updating and republishing	\$4 million
Centronics Data Computer Corp. (OTC), Hudson, N.H.	Business Machines Div., The Singer Co. (NYSE), San Leandro, Calif.	Impact printers designed to Singer specifications, for marketing as part of data processing systems, including 1500 Intelligent Terminal System, System Ten computer and Point of Sale Systems	\$3.5 million (approximate)
Electronic Systems Div., Bunker Ramo Corp., Westlake Village, Calif.	Delco Electronics Div., General Motors, Santa Barbara, Calif.	Designing, developing, producing, installing on-shore electronics instrumentation and portable sonic transmitters for underwater weapon and vessel tracking operations for Navy's Barking Sands Underwater Range Expansion (BSURE) program	\$2.25 million
Olivetti Corporation of America, New York, N.Y.	Manufacturers Hanover Trust Co., New York, N.Y.	250 teller terminals to be installed in 173 branch offices	\$2.1 million
Incoterm Corp., Natick, Mass.	Bureau of Motor Vehicles, State of Ohio	Intelligent terminals for use in 210 driver license issuance offices state-wide	\$1.8+ million
Conrac Corp., New York, N.Y.	N.V. Luchthaven Schiphol, Amsterdam, Holland	A comprehensive Flight Information Display System; includes design and installation of complete control system	\$1.2 million
Datacrown Limited, Willowdale, Ontario, Canada	Canada Cement Lafarge Ltd., Montreal, Canada	A five-year agreement to handle firm's computer requirements	\$1 million
Computer Sciences Corp. (CSC), El Segundo, Calif.	Electronic Systems Div., U.S. Air Force Systems Command, Hanscom Field, Mass.	Engineering development of automated information system for Armed Forces Examining and Entrance Stations (AFEES)	\$974,000
Sycor Inc., Ann Arbor, Mich.	The Keebler Co., Elmhurst, Ill.	63 Model 340 intelligent communications terminals and printers for use in distribution centers, and corporate headquarters in Elmhurst, Ill., to poll and gather data from branch office Model 340s for process on Company's Burroughs 4700 computer	\$720,000 (approximate)
Litton Systems (Canada) Ltd., Rexdale, Ont., Canada	The Turkish Air Force	Automated test equipment for LN-12 inertial navigation systems used in the F-4 Phantom and LN-13 systems in the F-104 jet aircraft	\$500,000
Incoterm Corp., Natick, Mass.	The First National Bank & Trust Co., Lincoln, Neb.	75 intelligent terminals and related peripheral equipment for use in statewide on-line commercial banking system	\$420,000+
Educational Data Systems, Newport Beach, Calif.	KMS Industries, Technology Center Div., Irvine, Calif.	Purchase of EDS-8 Multiplexers	\$250,000
Philips Telecommunications Industrie B.V., Hilversum, The Netherlands	Royal Netherlands Army	Military transmission equipment of some 500 Deltamux units and ancillary equipment to be used in combination with crypto equipment in Army's mobile tactical telephone network	\$111,940 (approximate)
Scientific Time Sharing Corp., Bethesda, Md.	U.S. Army, Harry Diamond Labs., Washington, D.C.	APL*PLUS computer time sharing services	\$50,000
Ampex Corp., Redwood City, Calif.	Carleton University, Ottawa, Canada	A Television Identification System (TVID) for classroom instruction as part of research project designed to study various educational techniques	\$36,500
Bunker Ramo Corp., Trumbull, Conn.	Pershing & Co., Inc., New York, N.Y.	Desk top quotation units and other market data services	—
Informatics Inc., Canoga Park, Calif.	Sundstrand Corp., Aviation Div., Rockford, Ill.	Installing PRODUCTION IV, a complete computer oriented manufacturing management system, utilizing all five modules of the manufacturing planning and control system	—
Lockheed Electronics Co., Inc., Los Angeles, Calif.	Realty Computing Corp. Westwood Village, Calif.	Quantity purchase of LOCKHEED SYSTEM III small business minicomputer; RCC will add proprietary real estate application software and market a complete turn-key system to real estate industry	—
Recognition Equipment, Dallas, Texas	National Cash Register Co., Dayton, Ohio	Up to 50,000 hand-held OCR Wands to be used with NCR electronic terminals	—
Rexnord Material Handling Div., Chico, Calif.	Holly Stores, Inc., Carson, Calif.	A computer-controlled carton conveyor system for new apparel distribution center	—
University Computing Co., Dallas, Texas	First National Bank, Elkhart, Ind.	5-year data processing contract to be handled in two separate but interconnected computer centers — one center at the bank, the other at UCC's facility in Troy, Mich.	—

NEW INSTALLATIONS

OF	AT	FOR
Burroughs B 1712 system	King's Markets, Inc., Lynchburg, Va.	Payroll, inventory control, expense distribution and general ledger, accounts receivable and payable (system valued at \$90,000)
Burroughs B 6700 system	Remote Computing Corp. (RCC), Palo Alto, Calif.	Increased computer capacity required to support its terminal-based national financial planning service (system valued at \$1.5 million)
CDC Cyber 70 Model 72 system	Centro Nacional de Calculo (CENAC), Mexico City, Mexico	General office and administrative applications; student access to selected instructional data; engineering and mathematical computations; systems analyses; and scientific research; replaces a CDC 3100 system (system valued at \$1.2 million)
Datsaab D5/30 system	Tatabanyai Szenbanyak, Hungary	Testing different ADP routines designed to deal with future requirements (system valued at \$125,000)
Honeywell Model 2040A system	Ayr County Council, Ayr, England	A wide variety of Council's financial and non-financial applications; also service to Ayrshire River Purification Board (hydrological and biological analyses); Ayrshire Constabulary; and Ayrshire and Bute Water Board (system valued at more than \$557,000)
Honeywell Model 6060 system	Maritime Administration, U.S. Department of Commerce, Wash- ington, D.C.	Maritime-oriented and administrative applications; manpower statistics maintenance for all shipyard production workers and merchant seamen; time-sharing services for research and development efforts (system valued at nearly \$2.3 million)
Honeywell Model 6080 system	The Illinois Secretary of State's Office, Springfield, Ill.	Maintaining records on drivers' licenses, auto registrations, corporations, uniform commercial code, state library and administrative functions; will also supply state-wide police network with necessary driver and vehicle information (system valued at \$8.1 million)
IBM System/3 Model 15	Peachtree Door, Norcross, Ga.	All business areas including ordering, cost system, product structures, routings, truck loading and scheduling and all accounting operations
IBM System 370, Model 158	Brandon Applied Systems, Inc., San Francisco, Calif.	Systems and program conversion; replaces a smaller Model 155
NCR Century 50 system	Williams Energy Company, Tulsa, Okla. (2 systems)	Customer dealer billing procedures; encoders, to be located in district sales offices around the nation, will communicate with a computer in one of firm's regional accounting offices
NCR Century 101 system	Babygro Limited, Kirkcaldy, Fife, Scotland Berkey Photo, New York, N.Y. (2 systems) Delyn Local Council, England Dewksbury & West Riding Building Society, England Zurel N.V., Amsterdam, Holland	Production control, stock control and sales ledger applications Preparing invoices to accompany completed work orders; also to keep track of orders for resale merchandise; perform general accounting applications Rate collection and billing, payroll, expenditure ledger and rent collection for government units Mortgage and investment account processing
NCR Century 251 system	Board of County Commissioners of Lake County, Crown Point, Indiana First National Bank, Allentown, Pa. Hospital Data Systems, Kansas City, Mo.	Preparation of 350,000 tax bills yearly, county payroll, voter registration, and law-enforcement and criminal court data processing tasks Processing transaction data from own operations and eleven branches; general banking applications including mortgage loans and trust operations are covered Remote processing for client hospitals in Iowa and Ohio; includes general office applications, patient and post-discharge billings
Univac Series 70/6 system	United Press International, New York, N.Y. (2 systems)	Hub of UPI's new regional Information Storage and Retrieval System which will link all major domestic news bureaus to a central data bank in New York; long-range plans call for linking foreign bureaus directly to computers in New York
Univac 1110 system	Pacific International Computing Corp., San Francisco, Calif. Taisho Marine & Fire Insurance Co., Business Center at Nakano, Tokyo, Japan	Providing computing service to Bechtel Group of Companies; primary applications include project management, engineering and business data processing Integrating processing of various types of insurance policies now handled separately by several medium-sized, batch-oriented computers; will be core of on-line, real-time inquiry and answer system
Univac 9480 system	Cargotrainer Div., Tri-State En- gineering Co., Washington, Pa.	Inventory control, creating and processing bills of material, and general accounting; also scheduling work orders and allocation to proper work centers
Xerox 530 system	Illinois Central Gulf Railroad, Chicago, Ill.	General engineering and cost estimating tasks for the Engineering Department (system valued at \$83,000)

MONTHLY COMPUTER CENSUS

Neil Macdonald
Survey Editor
COMPUTERS AND PEOPLE

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

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

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

The following abbreviations apply:

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

SUMMARY AS OF APRIL 15, 1974

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL \$(000)	NUMBER OF INSTALLATIONS			NUMBER OF UNFILLED ORDERS
				In U.S.A.	Outside U.S.A.	In World	
Part 2. United States Manufacturers I-Z							
IBM	305	12/57	3.6	40	15	55	-
White Plains, N.Y.	650	10/67	4.8	50	18	68	-
(N) (D) (April 1974)	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	416	148	564	-
	7010	10/63	26.0	67	17	84	-
	7030	5/61	160.0	4	1	5	-
	704	12/55	32.0	12	1	13	-
	7040	6/63	25.0	35	27	62	-
	7044	6/63	36.5	28	13	41	-
	705	11/55	38.0	18	3	21	-
	7020, 2	3/60	27.0	10	3	13	-
	7074	3/60	35.0	44	26	70	-
	7080	8/61	60.0	13	2	15	-
	7090	11/59	63.5	4	2	6	-
	7094-I	9/62	75.0	10	4	14	-
	7094-II	4/64	83.0	6	4	10	-
	System/3 Model 6	3/71	1.0	8	-	8	-
	System/3 Model 10	1/70	1.1	10	-	10	-
	System/3 Model 15	-	-	1	-	1	-
	System/7	11/71	0.35 and up	19	-	19	-
	360/20	12/65	2.7	7161	6075	13236	1780
	360/22	9/71	4.6	1000	300	1300	-
	360/25	1/68	5.1	1112	759	1871	1287
	360/30	5/65	10.3	5487	2535	8022	-
	360/40	4/65	19.3	2454	1524	3978	1363
	360/44	7/66	11.8	109	57	166	39
	360/50	8/65	29.1	1137	445	1582	662
	360/65	11/65	57.2	604	144	748	562
	360/67	10/65	133.8	65	6	71	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	-
	360/91	-	-	1	-	1	-
	360/190	-	-	13	2	15	-
	360/195	4/71	232.0	-	-	9	48
	370/115	-	-	-	-	-	-
	370/125	4/73	8.2-13.8	1	-	1	-
	370/135	5/72	14.4	14	-	14	-
	370/145	9/71	23.3	4	-	4	-
	370/155	2/71	48.0	4	-	4	-
	370/158	-/73	49.5-85.0	3	-	3	-
	370/165	5/71	98.7	3	-	3	-
	370/168	-/73	93.0-170.0	2	3	5	-
	370/195	6/73	190.0-270.0	-	-	-	-
Interdata	Model 1	12/70	3.7	244	75	319	-
Oceanport, N.J.	Model 3	5/67	13.1	-	-	200	X
(A) (Oct. 1973)	Model 4	8/68	8.5	274	115	389	32
	Model 5	11/70	X	70	20	90	X
	Model 7/16	-/74	-	-	-	-	-
	Model 7/32	-/74	-	-	-	-	-
	Model 15	1/69	20.0	40	24	64	X
	Model 16	5/71	X	1	6	7	X
	Model 18	6/71	X	2	7	9	X
	Model 50/55	5/72	-	75	10	85	115
	Model 70	10/71	-	466	116	582	107
	Model 74	2/73	-	41	8	49	126
	Model 80	10/72	-	15	3	18	20
	Model 85	6/73	-	1	-	1	-

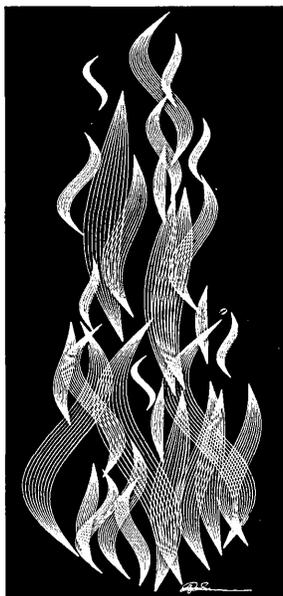
NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIPST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL \$(000)	NUMBER OF INSTALLATIONS			NUMBER OF UNFILLED ORDERS	
				In U.S.A.	Outside U.S.A.	In World		
Microdata Corp. Irvine, Calif. (A) (March 1974)	Micro 400/10	12/70	0.1-0.5	141	0	141	-	
	Micro 800	12/68	0.2-3.0	2712	1100	3812	-	
	Micro 1600	12/71	0.2-3.0	1593	300	1893	-	
	Microdata 32/S Reality	2/74 11/73	- -	1 11	0 0	1 11	- -	
Modular Computer Systems Ft. Lauderdale, Fla. (A) (March 1974)	MODCOMP I	8/71	2-25	(S) -	-	413	-	
	MODCOMP II	11/72	4-150	(S) -	-	230	-	
	MODCOMP II CP	6/73	4-150	(S) -	-	10	-	
	MODCOMP III MODCOMP IV	12/70 5/74	X 15-500	- (S) -	- -	77 -	X -	
NCR Dayton, Ohio (R) (April 1974)	304	1/60	X	5	0	5	X	
	310	5/61	X	8	0	8	X	
	315	5/62	7.0	255	200	455	-	
	315 RMC	9/65	9.0	55	35	90	-	
	390	5/61	0.7	100	500	600	-	
	500	10/65	1.0	1100	1200	2300	-	
	Century 50	2/71	1.6	650	0	650	-	
	Century 100	9/68	2.6	850	850	1700	-	
	Century 101	12/72	3.7	350	50	400	-	
	Century 200	6/69	7.0	600	400	1000	-	
	Century 251	1/73	20.5	5	5	10	-	
	Century 300	2/72	21.0	15	15	30	-	
	Philco Willow Grove, Pa. (N) (Jan. 1969)	1000	6/63	X	16	-	-	X
200-210,211		10/58	X	16	-	-	X	
2000-212		1/63	X	12	-	-	X	
Raytheon Data Systems Co. Norwood, Mass. (A) (April 1974)	250	12/60	X	115	20	135	X	
	440	3/64	X	20	-	-	X	
	520	10/65	X	26	1	27	X	
	703	10/67	12.5	(S) 179	33	212	-	
	704	3/70	7.2	(S) 500	150	650	150	
706	5/69	19.0	(S) 75	17	92	-		
Singer, Bus. Machines Div. San Leandro, Calif. (A) (March 1974)	System Ten*	9/70	0.3 and up	1172	560	1732	-	
Standard Computer Corp. Los Angeles, Calif. (R) (March 1974)	IC 4000	12/68	9.0	9	0	9	2	
	IC 6000-6000/E	5/67	16.0	3	0	3	-	
	IC 7000	8/70	17.0	4	0	4	1	
	IC-9000	5/71	400.0	(S) 1	0	1	-	
Systems Engineering Laboratories Ft. Lauderdale, Fla. (A) (March 1974)	SYSTEMS 810A/810B	6-66/9-68	1.8/2.6	394	34	428	-	
	SYSTEMS 71/72	8-72/9-71	0.9/1.0	24	8	32	-	
	SYSTEMS 85/86	7-72/6-70	6.0/10.0	66	8	74	-	
Texas Instruments Inc. Houston, Tex. (A) (June 1973)	960	6/70	X	-	-	-	X	
	960A	11/71	0.2-2.7	-	-	-	-	
	980	5/68	X	-	-	-	X	
	980A	8/72	0.3-2.7	-	-	-	-	
UNIVAC Div. of Sperry Rand Blue Bell, Pa. (A) (Aug. 1973)	9200	6/67	1.5	1360	616	1976	-	
	9300/9380	9/67	3.4	795	675	1470	-	
	9400/9480	5/69	7.0	212	228	440	-	
	9700	-	-	3	11	14	-	
	418 III	6/63	11.0	40	77	117	-	
	494	-	-	62	46	108	-	
	1106	-	-	61	143	204	-	
	1108	9/65	68.0	163	92	255	-	
	1110	-	-	11	17	28	-	
	I & II	3/51 & 11/57	X	23	-	-	X	
	File Computers	8/56	X	13	-	-	X	
	LARC	5/60	135.0	2	0	2	-	
	1107, UIII, 490/1/2, 418II, 1004/5, 1050, SS80/90	-	X	2063	1442	3505	X	
	UNIVAC - Series 70 Blue Bell, Pa. (R) (April 1974)	301	2/61	7.0	143	-	-	-
		501	6/59	14.0-18.0	17	-	-	-
		601	11/62	14.0-35.0	0	-	-	-
		3301	7/64	17.0-35.0	74	-	-	-
		Spectra 70/15, 25	9/65	4.3	18	-	-	-
		Spectra 70/35	1/67	9.2	95	-	-	-
		Spectra 70/45	11/65	22.5	265	-	-	-
Spectra 70/46		11/68	33.5	30	-	-	-	
Spectra 70/55		11/66	34.0	10	-	-	-	
Spectra 70/60		11/70	32.0	18	-	-	-	
Spectra 70/61		4/70	42.0	7	-	-	-	
70/2		5/71	16.0	63	-	63	-	
70/3		9/71	25.0	7	-	7	-	
70/6		9/71	25.0	26	-	26	-	
70/7		12/71	35.0	7	-	7	-	
EMR 6020		4/65	5.4	15	2	17	0	
EMR 6040		7/65	6.6	7	1	8	0	
EMR 6050		2/66	9.0	16	3	19	0	
EMR 6070		10/66	15.0	7	8	15	0	
EMR 6130		8/67	5.0	34	21	55	0	
EMR 6135	8/67	2.6	36	8	44	4		
EMR 6140	6/72	-	-	-	-	0		
EMR 6145	6/72	7.2	-	-	-	8		
Varian Data Machines Newport Bench, Calif. (R) (March 1974)	620	11/65	X	-	-	75	X	
	620i	6/67	X	-	-	1300	X	
	R-620i	4/69	-	-	-	80	-	
	520/DC, 520i	12/69;10/68	-	-	-	500	150	
	620/f	11/70	X	-	-	207	X	
	620/L, 620/L-00C	4/71;9/72	-	-	-	740	101	
	620/f-100	6/72	-	-	-	100	43	
	620/L-100	5/72	-	-	-	200	235	
	Varian 73	11/72	-	-	-	40	39	
	Xerox Data Systems El Segundo, Calif. (N) (R) (April 1974)	XDS-92	4/65	1.5	43	4	47	-
XDS-910		8/62	2.0	170	10	180	-	
XDS-920		9/62	2.9	120	12	132	-	

NAME OF MANUFACTURER	NAME OF COMPUTER	DATE OF FIRST INSTALLATION	AVERAGE OR RANGE OF MONTHLY RENTAL \$(000)	NUMBER OF INSTALLATIONS			NUMBER OF UNFILLED ORDERS
				In U.S.A.	Outside U.S.A.	In World	
Xerox (con't)	XDS-930	6/64	3.4	159	14	173	-
	XDS-940	4/66	14.0	33	4	37	-
	XDS-9300	11/64	8.5	25-30	4	29-34	-
	XDS-530	8/73	7.6	8	-	8	-
	Sigma 2	12/66	1.8	163	36	199	-
	Sigma 3	12/69	2.0	21	1	22	-
	Sigma 5	8/67	6.0	32	14	46	-
	Sigma 6	6/70	12.0	4	-	4	-
	Sigma 7	12/66	12.0	31	7	38	-
	Sigma 8	2/72	18.0	5	-	-	-
	Sigma 9	10/71	35.0	9	-	9	-

IF YOU ARE INTERESTED IN COMPUTER ART,
YOU ARE INVITED TO ENTER OUR

12th Annual Computer Art Exposition

This is a *special feature* of the August 1974 issue of
*Computers and People (formerly
Computers and Automation)*



One of the entries will be selected to appear on the cover of our August issue. More entries will be published inside; other entries will be published later in other issues. The 1973 cover selection — "Fire" — is shown at the left.

FIRE
© Lloyd Sumner

GUIDELINES FOR ENTRY

1. Any interesting and artistic drawing, design, or sketch made by a computer (analog or digital) may be entered.
2. Entries should be submitted on opaque white paper in black ink for best reproduction. Color entries are acceptable; however, they will be published in black and white.
3. The preferred size of entry is 8½ x 11 inches (or smaller); the maximum acceptable size is 12½ x 17 inches.
4. Each entry should be accompanied by an explanation in three to five sentences of how the drawing was programmed for a computer, the type of computer used, and how the art was produced by the computer.
5. There are no formal entry blanks; any letter submitting and describing the entry is acceptable.
6. We cannot undertake to return artwork; and we urge that you NOT send us originals.
7. Entries should be addressed to: Computer Art Contest Editor, *Computers and People*, 815 Washington Street, Newtonville, Mass. 02160.

DEADLINE FOR RECEIPT OF ENTRIES IN OUR OFFICE IS
TUESDAY, JULY 2, 1974

ACROSS THE EDITOR'S DESK — *Continued from page 37*

The system is connected by telephone to the central computer facility of the City University of New York and to Tymshare, Inc., the central node in this region of the Lister Hill National Center for Biomedical Communications, the National Library of Medicine's network of institutions exchanging computer-assisted instruction programs. (Downstate is a participant in the Lister Hill Center). The computer terminal is available to members of the Downstate community and members of the Kings County Medical Society during library hours and whenever the computers offering the courses are in operation.

Learning by computer is a simple procedure, Dr. Herbert S. Diamond explains. Dr. Diamond, associate professor of medicine, is also program monitor for the Lister Hill network. Using a terminal-connected data phone (Model Number 103A) in the reference librarian's office, the student relays the appropriate code identification to either Tymshare or CUNY to contact the computer carrying the course he wants. When he hears a high-pitched sound, he knows that the computer is on. In some of the courses, the computer flashes "Welcome" and the user's name on the screen. Once the three-way connection from telephone to computer to terminal has been established, the student follows the manual's step-by-step directions for the particular course he is taking. The student communicates with the computer via the typewriter keyboard, and the computer responds by flashing the answer on the screen.

With the assistance of an evaluation team directed by Dr. Max Weiner, director of the graduate program in educational psychology at the Graduate Center of the City University of New York, CUNY's central computer is offering three computer-assisted courses developed by Downstate faculty. These include: "Computer Assisted Instruction in Diagnosis and Treatment of Rheumatic Diseases," "Computer Assisted Instruction in Diagnosis and Treatment of Respiratory Diseases," and "Computer-Assisted Instruction in Gynecologic Oncology". According to Dr. Diamond, the Downstate courses simulate actual encounters with patients. As in all programmed instruction, the lessons are sequential — the student cannot go on to the next case or the more advanced lesson until he has successfully completed the preceding one. Since Downstate computer-assisted courses can take 10 hours or more to complete, the computer is programmed so that the student can stop at any point and pick up exactly where he left off after he identifies himself to the electronic device.

Through Tymshare, the Downstate student can take Ohio State University's two-hour course in juvenile diabetes and 11 courses, some as short as 10 minutes, on such subjects as hypertensive emergencies and idiopathic respiratory distress syndrome in the newborn, from Massachusetts General Hospital. Dr. Diamond says that new courses will be offered when they are available.

CALENDAR OF COMING EVENTS

- May 13-17, 1974:** European Computing Congress (EUROCOMP), Brunel Univ., Uxbridge, Middlesex, England / contact: Online, Brunel Univ., Uxbridge, Middlesex, England
- May 13-17, 1974:** International Instruments, Electronic and Automation Exhibition, Olympia, London, England / contact: Industrial Exhibitions Ltd., Commonwealth House, New Oxford St., London WC1A 1PB, England
- May 14-17, 1974:** 6th Annual APL International Users Conference, Sheraton Hotel, Anaheim, Calif. / contact: John R. Clark, Orange Coast College, 2701 Fairview Rd., Costa Mesa, CA 92626
- May 20-24, 1974:** Computer Week IV: DPMA, ASM, ACM, TIMS, SCYL, Statler Hilton Hotel, Buffalo, N.Y. / contact: William P. Hanley, Erie County Department of Health, Buffalo, NY 14202
- May 22-24, 1974:** Am. Inst. of Industrial Engineers' 25th Annual Conf. and Conv., Braniff Place, New Orleans, La. / contact: Conf. Dept., AIIE, 25 Technology Park/Atlanta, Norcross, GA 30071
- June 4-6, 1974:** Symposium: Simulation of Computer Systems, National Bureau of Standards, Gaithersburg, Md. / contact: Paul F. Roth, National Bureau of Standards, U.S. Dept. of Commerce, Room A265-Technology Bldg., Washington, DC 20234
- June 11-13, 1974:** 1st Annual Automotive Electronics Conference and Exposition, Cobo Hall, Detroit, Mich. / contact: Robert D. Rankin, Rankin Exposition Management, 5544 E. La Palma Ave., Anaheim, CA 92807
- June 17-19, 1974:** Design Automation Workshop, Holiday Inn, Denver, Colo. / contact: Nitta P. Donner, IBM T. J. Watson Research Center, P.O. Box 218, Yorktown Heights, NY 10598
- June 23-26, 1974:** 1974 DPMA INFO/EXPO (22nd Annual Data Processing Conference and Business Exposition), Auditorium & Convention Hall, Minneapolis, Minn. / contact: Data Processing Management Assoc., 505 Busse Highway, Park Ridge, IL 60068
- June 24-26, 1974:** 5th Conference on Computers in the Undergraduate Curricula, Washington State Univ., Pullman, Wash. / contact: Dr. Ottis W. Rechard, Computer Science Dept., Washington State Univ., Pullman, WA 99163
- June 24-26, 1974:** Society for Industrial and Applied Mathematics 1974 Annual Meeting, California Institute of Technology, Pasadena, Calif. / contact: SIAM, 33 S. 17th St., Philadelphia, PA 19103
- July 9-11, 1974:** Summer Computer Simulation Conference, Hyatt Regency Hotel, Houston, Tex. / contact: M. E. McCoy, Martin Marietta Data Systems, Mail MP-198, P.O. Box 5837, Orlando, FL 32805
- July 15-19, 1974:** 1974 Conference on Frontiers in Education, City University, London, England / contact: Conf. Dept., Institution of Electrical Engineers, Savoy Place, London, England WC2R 0BL
- July 23-26, 1974:** Circuit Theory & Design, IEE, London, England / contact: IEE, Savoy Pl., London WC2R 0BL, England
- July 23-26, 1974:** International Computer Exposition for Latin America, Maria Isabel-Sheraton Hotel, Mexico City, Mexico / contact: Seymour A. Robbins, National Expositions Co., Inc., 14 W. 40th St., New York, NY 10018
- July 29-Aug. 1, 1974:** 2nd Jerusalem Conference on Information Technology, Jerusalem, Israel / contact: Prof. C. C. Gottlieb, Dept. of Computer Science, University of Toronto, Toronto, Ontario, Canada M5S1A7
- Aug. 5-10, 1974:** IFIP Congress 74, St. Erik's Fairgrounds, Stockholm, Sweden / contact: U.S. Committee for IFIP Congress 74, Box 426, New Canaan, CT 06840
- Aug. 5-10, 1974:** Medinfo 74, St. Erik's Fairgrounds, Stockholm, Sweden / contact: Frank E. Heart, Bolt Beranek and Newman, Inc., 50 Moulton St., Cambridge, MA 02138
- Aug. 12-14, 1974:** International Conf. on Computer Communication-74, Stockholm, Sweden / contact: Mr. J. Borje Hansson, Sec. Gen. of the Conf., Program Exec. Committee, Central Administration of Swedish, Telecommunications (Gdk), S-123 86 FARSTA, Sweden
- Aug. 13-15, 1974:** Assoc. for the Development of Computer-Based Instructional Systems' Summer 1974 Conference, Western Washington State College, Bellingham, Wash. / contact: Ms. Ruann Pengov, 076 Health Sciences Library, The Ohio State Univ., 376 W. Tenth Ave., Columbus, OH 43210
- Aug. 21-23, 1974:** Engineering in the Ocean Environment International Conf., Nova Scotian Hotel, Halifax, Nova Scotia / contact: O. K. Gashus, EE Dept., Nova Scotia Tech. Coll., POB 100, Halifax, N.S., Canada
- Sept. 1974:** 2nd Symposium IFAC/IFIP/IFORS, Cote d'Azur, France / contact: AFCET, Secretariat des Congres, Universite Paris IX, Dauphine 75775 Paris Cedex 16, France
- Sept. 8-10, 1974:** 6th International Conference on Urban Transportation, Pittsburgh, Penna. / contact: John W. Besanceney, Pittsburgh Convention & Visitors Bureau, P.O. Box 2149, Pittsburgh, PA 15230
- Sept. 9-12, 1974:** INFO 74, Coliseum, New York, N.Y. / contact: Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017
- Oct. 14-16, 1974:** 15th Annual Symposium on Switching and Automata Theory, New Orleans, La. / contact: Prof. Fred Hosch, Dept. of Computer Science, Louisiana State Univ. at New Orleans, Lake Front, New Orleans, LA 70122
- Oct. 31-Nov. 1, 1974:** Canadian Symposium on Communications, Queen Elizabeth Hotel, Montreal, Quebec / contact: George Armitage, IEEE Canadian Region Office, 7061 Yonge St., Thornhill, Ontario L3T 2A6, Canada
- Nov. 13-15, 1974:** 13th International Automation and Instrumentation Conference, Milan Fair Ground, Milan, Italy / contact: Secretariat, Federazione delle Associazioni Scientifiche e Techniche, Piazzale R. Morandi, 2, 20121 Milano, Italy

ADVERTISING INDEX

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

- COMPUTERS AND PEOPLE** / Computers and People, 815 Washington St., Newtonville, MA 02160 / page 44
- THE NOTEBOOK ON COMMON SENSE, ELEMENTARY AND ADVANCED** / published by Berkeley Enterprises, Inc., 815 Washington St., Newtonville, MA 02160 / page 3
- RIDE THE EAST WIND: Parables of Yesterday and Today**, published by Quadrangle/New York Times Book Co. / Berkeley Enterprises, Inc., 815 Washington St., Newtonville, MA 02160 / page 2

WILL YOU HELP?

Yes, *you*. It may come as a surprise that you'd be asked . . . but as a reader of *Computers and People* (formerly *Computers and 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 *Computers and People*.

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 *Computers and People*.

****** reprint from
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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)

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815 Washington Street
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