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RESPONDING TO DISASTER, 1913
INVENTORY OF THE 36 ISSUES OF
THE NOTEBOOK ON COMMON SENSE, FIRST YEAR
— TITLES AND SUMMARIES

VOLUME 1
1. Right Answers — A Short Guide to Obtaining Them
   A collection of 82 principles and maxims. Example:
   “The moment you have worked out an answer, start
   checking it — it probably isn’t right.”
2. The Empty Column
   A parable about a symbol for zero, and the failure
   to recognize the value of a good idea.
3. The Golden Trumpets of Yap Yap
4. Strategy in Chess
5. The Barrels and the Elephant
   A discussion of truth vs. believability.
6. The Argument of the Beard
   The accumulation of many small differences may
   make a huge difference.
7. The Elephant and the Grassy Hillside
   The concepts of the ordinary everyday world vs.
   the pointer readings of exact science.
8. Ground Rules for Arguments
9. False Premises, Valid Reasoning, and True Conclusions
   The fallacy of asserting that the premises must first
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10. The Investigation of Common Sense
11. Principles of General Science and Proverbs
    8 principles and 42 proverbs.
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13. Falling 1800 Feet Down a Mountain
    The story of a skimober who fell 1/3 of a mile
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14. The Cult of the Expert
15. Preventing Mistakes from Failure to Understand
    Even though you do not understand the cause of
    some trouble, you may still be able to deal with
    it. The famous example of a cure for malaria.
16. The Stage of Maturity and Judgement
17. Doomsday in St. Pierre, Martinique — Common Sense
    vs. Catastrophe
    How 30,000 people refusing to apply their common
    sense died from a volcanic eruption.
18. The History of the Doasyoulikes
19. Individuality in Human Beings
    Their chemical natures are as widely varied as
    their external features.
20. How to be Silly
    71 recipes for being silly. Example: “Use twenty
    words to say something when two will do.”
21. The Three Earthworms
    A parable about curiosity; and the importance of
    making observations for oneself.
22. The Cochran vs. Catastrophe
    The history of Samuel Cochran, Jr., who ate some
    vichysoise soup.
23. Preventing Mistakes from Forgetting
24. What is Common Sense? —
    An Operational Definition
    A proposed definition of common sense not using
    synonyms but using behavior that is observable.
25. The Subject of What is Generally True and Important —
    Common Sense, Elementary and Advanced
26. Natural History, Patterns, and Common Sense
    Some important techniques for observing.
27. Rationalizing and Common Sense
28. Opposition to New Ideas
    Some of the common but foolish reasons for
    opposing new ideas.
30. Index to Volume 1

VOLUME 2
31. Adding Years to your Life Through Common Sense
    A person who desires to live long and stay well needs
    to understand some 20 principles, including how to
    test all the health advice he receives for its common
    sense, and how to develop habits of health practices
    which fit him.
32. The Number of Answers to a Problem
    Problems may have many answers, one answer, or no
    answer ... and answers that are good at one time may
    be bad at another.
33. “Stupidity has a Knack of Getting Its Way”
    “... as we should see if we were not always so much
    wrapped up in ourselves.” — Albert Camus
34. Time, Sense, and Wisdom — Some Notes
    The supply of time, the quantity of time, the kinds
    of time, and the conversion of time. ... A great deal of
    the time in a man’s life is regularly, systematically, and
    irretrievably wasted. This is a serious mistake.
35. Time, Sense, and Wisdom — Some Proverbs and Maxims
    56 quotations and remarks by dozens of great men.
36. Wisdom — An Operational Definition
    “A wise person takes things as they are and, knowing
    the conditions, proceeds to deal with them in such a
    manner as to achieve the desired result.”
    — Somerset Maugham

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COMPUTERS and PEOPLE for May, 1975
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8 In Praise of Robots
by Dr. Carl Sagan, Cornell Univ., Ithaca, N.Y.
The intellectual and mechanical accomplishments of robots, and what they may make possible.

Computers and Management

23 Operational Systems for Informing Management
by Clarence W. Spangle, President, Honeywell Information Systems, Waltham, Mass.
Operational systems that include a communication network, data bases that may be distributed, large amounts of data easily accessible, continuous availability of the computer system, high reliability, etc., are finally beginning to produce management information systems that work.

Computers, Telephones, and Fire

16 "FIRE IN NEW YORK TEL CO!" — The Saga of Recovery
by Miki Felsenburg, Western Electric Co., New York
The "Miracle on Second Avenue" happened because of grinding, tireless efforts of everyone concerned — and in 23 days 170,000 telephones were again in service.

6 Computers, Telephones, and Fire
by Edmund C. Berkeley, Editor
Lessons — of prevention and accomplishment — from a catastrophic fire and the resulting great achievement in swift restoration of service.

Computer Applications

32 Computer "Breeds" Cattle Herds on Campus
by Dr. Charles Gaskins, Texas Tech University, Lubbock, Texas

32 Vibration Tests of a Large Space Telescope Prove Its Feasibility, and Cut the Development Risks

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by William F. Taylor, GTE Information Systems, Stamford, Conn.

33 Digitized Speech for Improved Transmission
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The Computer Industry

by Ed Burnett, New York, N.Y.
A report on the penetration of computers into the various segments of U.S. business and industry — with 1974 data compared with 1968 data.
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.

Computers and Society

13 The Computer Industry's Social Responsibilities — [A]
   Another Approach
   by Dr. Edward A. Tomeski, Fordham Univ., Bronx, N.Y.
   Computer professionals seldom consider constructively the great computer issues. Such issues include: displacement of people by computerization; twisting people to conform to mechanistic concepts and tools; the use of computers for criminal or antiprivacy purposes; and more. So computers have tended to be far less useful than they could be.

7 The Right to Privacy [F]
   Association of Data Processing Service Organizations, Inc., Montvale, N.J.
   A recommendation for balancing of needs, issued by the Association.

7 The Computer and Productivity [F]
   by IBM Corp., Armonk, N.Y.

The Profession of Information Engineer and the Pursuit of Truth

29 Political Assassinations in the United States — Inventory [R]
   of Articles Published in Computers and People (formerly Computers and Automation), 1970 to 1975
   A list of 57 articles (or article series) dealing with political assassinations (or attempted assassinations) in the United States, published May 1970 through April 1975 in this magazine. Such articles will henceforth be published separately in People and the Pursuit of Truth.

36 People and the Pursuit of Truth [F]
   Announcement of a new, separate, monthly magazine starting May, 1975, which will take over and expand a large portion of this department of Computers and People.

Computers, Puzzles, and Games

34 Games and Puzzles for Nimble Minds — and Computers [C]
   by Neil Macdonald, Assistant Editor
   NAYMANDIJ — A systematic pattern among randomness?
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ANNOUNCEMENT

A great part of the department The Profession of Information Engineer and the Pursuit of Truth which Computers and People has published in the past, will now be broken out and published as a separate monthly magazine PEOPLE AND THE PURSUIT OF TRUTH

The first issue is May 1975.
See the fuller announcement on the back cover.

Key

[A] — Article
[C] — Monthly Column
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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.
Computers, Telephones, and Fire

In this issue we report, in an article by Miki Felsenburg of Western Electric, an extraordinary and inspiring story of the rebuilding of a telephone central office installation after a disastrous fire which produced 170,000 dead telephones.

Many questions are to be asked about the fire, and some questions about the way its damages were repaired. But nothing can detract from the magnificent demonstration of selfless devotion by probably more than 3,000 people, most of them employees of Western Electric, but also many other persons inside and outside the Bell System, who combined their energies, their skills, and their spirit, to restore service at almost miraculous speed.

In the telephone system in the United States, Canada, and Mexico, there is a great deal of automatic connection, automatic computing, automatic billing, and automatic adjustments of many other kinds. The system probably extends for over a million miles of multiple telephone line routes, to say nothing of individual subscriber lines. Almost certainly this telephone system is the largest of all computing and communicating systems in existence. In the story of this disaster and recovery is much that is instructive for computing and communicating systems.

The first basic issue is lessons from the fire and prevention of similar fires in the future.

The fire should not have started. So why did it? The telephone company reports a short circuit. Why? Although I have no information at this point from the telephone company about possible reasons for a short circuit, I am confident that a lot of engineers in the telephone system are currently investigating that question.

A second basic question, perhaps even more important, is this. The fire should not have spread that way. Why did it? Obviously, a defective engineering design — perhaps the adoption of some highly inflammable material, probably decades in the past, for use in cables. And this was coupled with failure to consider how, if the cable did catch fire, the fire could be confined in a small space and extinguished.

Another question is based on the main strategy of firefighting — which is to catch a fire when it is small: it is far easier to put out a fire when it is little than when it is big. A firefighting organization knows that if it can arrive at a burning house within 2 or 3 minutes after the fire starts, it probably will save nearly all of the house; but if it arrives at the burning house 20 minutes after the fire begins, the house will be gutted or gone up in smoke. Quick response is a vital key. But the telephone company report is that the fire alert came from an employee who smelled smoke. The use of human beings to smell smoke is not a desirable technique for fire detection. Inanimate sensing devices are likely to be far more accurate, positive, and prompt.

In the telephone company fire, the report is that no sensing devices reported the fire. Why not? Why were no fire sensing devices tripped? Were there none?

Most readers of this magazine are of course more interested in computers than they are in telephones. In the case of protection of computers against fire, even large ones, there are some considerable advantages over a communication system central office. It is regular standard practice to keep a back-up file of copies of programs and data bases at a location far enough away so that a catastrophe like fire, flood, tornado, or other "Act of God" will not prevent picking up and restarting operations, with not too much delay, perhaps not more than 24 hours. For a computer installation a fire as catastrophic as the New York Telephone Company fire is hard to imagine.

But it seems to me that the most interesting and significant aspect of the fire is the "Miracle on Second Avenue": the restoration of 170,000 telephones to service in the time from Feb. 27 to March 21 — an eight month job done in three weeks.

How? Because of people, loyal team spirit, and excellent training.

Why can't this kind of magnificent, constructive, swift team effort be applied to some of the really important large-scale problems of human beings, such as:

1) More food, and a better distribution of it;
2) More energy, and tapping of more resources, such as the use of sunlight for hot water heating and a share of the heating of buildings, on a vast scale;
3) Better international control over nuclear weapons — for this horrible danger to the world could easily produce 170 million dead people instead of 170,000 dead telephones.

Of course such team effort is possible.

Where there is a will, there is a way. We need to organize Western Electric team spirit and know-how on a vast scale.

Edmund C. Berkeley
Editor
MULTI-ACCESS FORUM

THE RIGHT TO PRIVACY

ADAPSO
(Association of Data Processing Service Organizations)
210 Summit Ave.
Montvale, N.J. 07645

A Statement of Position

ADAPSO is deeply concerned by the growing tendency of government, and society generally, to evaluate the social impact of complex computer technology on the basis of inadequate and often simplistic considerations.

Most recently, this has been especially true with regard to the operation of information data banks, where the threat to privacy has too frequently obscured other even more important issues.

ADAPSO believes that problems concerning the accumulation, storage and dissemination of information by the evaluating authority can properly be determined only after full examination of all the relevant facts, through preparation and publication of a "Privacy Impact Statement". The underlying principle to be applied, following evaluation, is that the operation of mass data banks should be determined upon a fair balancing of all the benefits of operation against all the detriments.

The accumulation, storage, and dissemination of information concerning individuals and organizations is of enormous importance to the health and well-being of our society. At the same time, the existence of vast data banks can pose a potential threat to the freedom of the individual.

Society is beginning to appreciate this potential threat of the mass data bank to privacy and freedom, and corrective action in the form of administrative regulation, legislation and private action is under way. Unfortunately, however, much such action has overlooked major adverse side effects, and important benefits jeopardized as a consequence of the remedial action. For example, legislative concern with the individual's right to know the contents of secret files, led to enactment of the requirement that schools and universities open their files to students and parents. Because this statute was inadequately discussed before enactment, Congress failed to understand that the uncontrolled disclosure of such information would have the inevitable — and terrible — side effect of violating the right to privacy of those who had furnished the confidential information in the first place, as well as the need for schools to have continuing access to full and frank information concerning their charges.

Almost always the failure to properly balance all the pluses and minuses of data bank operation results from inadequate study and information. ADAPSO believes that issues concerned with the operation of mass data banks, require the analysis of all relevant data, for which reason it urges Congress, state legislatures, the executive and administrative agencies having jurisdiction, to require the preparation and publication of an impact statement with respect to every mass data bank subject to the jurisdiction involved. This impact statement should set forth, in detail, all facts applicable to the data bank's operation, including its reasons for existence and its safeguard and security systems. Only after there has been such full and frank disclosure, and review by the applicable authority, should action be taken.

THE COMPUTER AND PRODUCTIVITY

IBM Corp.
Armonk, N.Y. 10504

(From an advertisement, "IBM Reports")

At a time in which many economic axioms are being severely tested, one stands firm. Today, more than ever, productivity is recognized as a basic measure of economic progress.

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These needed increases in productivity will come not only from working harder, but from working "smarter". Only through improved management of our resources — human, natural and financial — will we be able to maintain and improve our quality of life.

Of all the "engines" that have been developed to help us with our work, few possess the computer's potential for contributing to productivity.

Today, computers are helping design engineers test concepts without building expensive prototypes. They are helping farmers raise more abundant crops by providing information on the best land use patterns. They are helping manufacturers increase production yields and improve product quality while conserving raw materials and energy. They are helping hospitals improve medical care by relieving doctors and nurses of many administrative duties. And they are doing much, much more.

A principal reason for this growing usefulness is the increased productivity of computers themselves. In 1952 it cost $1.26 to do 100,000 multiplications on an IBM computer. Today they can be done for a penny on a modern large-scale computer system.

A dozen years ago the least expensive IBM computers were beyond the financial reach of many smaller firms. Now models with comparable capacity are available for a fraction of the cost.

(please turn to page 12)
IN PRAISE OF ROBOTS

Dr. Carl Sagan
Professor of Astronomy
Director, Laboratory for Planetary Studies
Cornell University
Ithaca, N.Y. 14853

"With this more or less representative set of examples of the state of development of machine intelligence, I think it is clear that a major effort . . . could produce much more sophisticated programs."

The Word "Robot"

The word "robot", first introduced in the 1920's by the Czech writer Karel Capek, is derived from the Slavic root for "worker". But it signifies a machine rather than a human worker. Robots, especially robots in space, have lately been getting a bad press. We have read that a human being was necessary to make the terminal landing adjustments on Apollo 11, without which the first manned lunar landing would have ended in disaster; that a mobile robot on the lunar surface could never have been so clever as the astronauts in selecting samples to be returned to earth-bound geologists; and that machines could never have repaired, as men did, the sunshade that was so vital for the continuance of the Skylab missions.

All these comments turn out, naturally enough, to have been written by humans. I wonder if a small self-congratulatory element, a whiff of human chauvinism, has not crept into these judgments. Just as whites can sometimes detect racism and men can occasionally discern sexism, I wonder whether we cannot here glimpse some comparable affliction of the human spirit — a disease that as yet has no name. The word "humanism" has been preempted by other and more benign activities of mankind. From the analogy with sexism and racism I suppose the name for this malady could be "speciesism" — the prejudice that there are no beings so fine, so capable, and so reliable as human beings.

This is a prejudice because it is, at the very least, a pre-judgment — a conclusion drawn before all the facts are in. Such comparisons of men and machines in space are comparisons of smart men with dumb machines. We have not asked what sorts of machines could have been built for the thirty or so billion dollars that the Apollo and Skylab missions together cost.

Compact, Self-Ambulatory Computer

Each human being is a superbly constructed, astonishingly compact, self-ambulatory computer — capable on occasion of independent decision making and real control of his or her environment. But there are serious limitations to employing human beings in certain environments. For example, without a great deal of protection, human beings would be inconvenienced on the ocean floor, the surface of Venus, the deep interior of Jupiter, or even on long space missions. Perhaps the only interesting information from Skylab that could not have been obtained by machines is that when human beings remain in space for a period of months, they undergo a spectacular loss of bone calcium and phosphorus. This seems to imply that human beings will be incapacitated under zero gravity on missions of six to nine months or more. The minimum interplanetary voyages have characteristic lengths of a year or two. Spinning the spacecraft can produce a kind of artificial gravity, but it is inconvenient and costly.

Machines for Risky Missions

Because we value human beings highly, we are reluctant to send them on extremely risky missions. If we do send human beings to exotic environments, we must also send along their food, their air, their water, amenities for entertainment and waste re-cycling, and companions. Machines, however, need no elaborate life-support systems, no entertainment, no companionship, and we do not yet feel strong ethical prohibitions against sending them on one-way or suicide missions.

Certainly for simple missions, machines have proved themselves many times over. Unmanned vehicles performed the first photography of the whole earth and the far side of the moon, the first landings on the moon and Venus, and in the Mariner 9 mission to Mars, the first thorough reconnaissance of another planet. Here on earth it is increasingly common for high-technology manufacturing — in chemical and pharmaceutical plants, for example — to be performed largely or entirely under computer control. In all these activities machines are able, to some extent, to sense errors, correct mistakes, and alert distant human controllers about perceived problems. The powerful arithmetical abilities of computing machines — now hundreds of millions of times faster than unaided human beings — is legendary. But what about really complex discussions? Can machines, in any sense, think through a new problem? Can they make discussions of the branched-contingency-tree variety, which we think of as characteristically human? (That is, I ask question 1; if the answer is A, I ask question 2; if the answer is B, I ask question 3; and so on.)
Turing's Conditions for Belief in Machine Intelligence

Some decades ago the English mathematician Alan Mathison Turing described what would be necessary for him to believe in machine intelligence. The condition was simply that he could be in teletype or teletypewriter communication with a machine and be unable to tell that it was not a human being. Turing imagined the following conversation between a man and a machine:

Q. In the first line of your sonnet which reads "Shall I compare thee to a summer's day?", would not "a spring day" do as well or better?
A. It wouldn't scan.
Q. How about "a winter's day"? That would scan all right.
A. Yes, but nobody wants to be compared to a winter's day.
Q. Would you say Mr. Pickwick reminded you of Christmas?
A. In a way.
Q. Yet Christmas is a winter's day, and I do not think Mr. Pickwick would mind the comparison.
A. I don't think you're serious. By a winter's day one means a typical winter's day, rather than a special one like Christmas.

No machine of this sophistication has yet been built, but so far only a limited amount of effort and money has been put into artificial intelligence, and there are only a half-dozen centers of such activity in the world.

Machine for Arranging Blocks

One of the more striking results, obtained in a very limited universe of discourse — that of children's blocks — comes from work done at the Artificial Intelligence Laboratory of the Massachusetts Institute of Technology. Here is a dialogue between a man and a machine:

**Man.** What does the box contain?
**Machine.** The blue pyramid and the blue box.
**Man.** How many blocks are not in the box?
**Machine.** Four of them.
**Man.** Is at least one of them narrower than the one I told you to pick up?
**Machine.** Yes, the red cube.
**Man.** Is there a steeple?
**Machine.** Sorry, I don't know the word "steeple".
**Man.** A steeple is a stack that contains two green cubes and a pyramid, for example.
**Machine.** I understand.
**Man.** Are there any steeples now?
**Machine.** No.
**Man.** Build one.

The machine does. It reaches out its mechanical hand, moves the cubes, and builds the structure that has just been described.

**Man.** When did you pick up the pyramid?
**Machine.** While I was stacking up the red cube, the large red block, and the large green cube.
**Man.** Why?
**Machine.** To get rid of it.
**Man.** Why did you clear off that cube?
**Machine.** To put it on the large green cube.

Machine for Imitating a Psychiatrist

As another example, a computer program that imitates a psychiatrist was also once developed at MIT. This is a much simpler program than the blocks program because it does not attempt to "understand" much of what is said to it, but only manipulates the phrases in sentences it has heard in accordance with a contingency tree sensitive to certain words that are considered especially important by humans. This program involves nondirective psychotherapy, which generally speaking, requires extremely simple computer programs. Here is a remarkable dialogue between a human being and a computer psychotherapist. (It is one of the most interesting of such conversations. Many other such machine/human psychiatric dialogues are not nearly so striking. But I suppose most human/human psychiatric dialogues are not very striking either.) In order to keep the respective roles of therapist and patient clear in this interaction, the computer therapist types upper case while the patient types lower case:

men are all alike.

IN WHAT WAY?

they're always bugging us about something or other.

CAN YOU THINK OF A SPECIFIC EXAMPLE?

well, my boyfriend made me come here.

YOUR BOYFRIEND MADE YOU COME HERE?

he noticed that i'm depressed much of the time.

I AM SORRY TO HEAR YOU ARE DEPRESSED.

he's right. i am unhappy.

DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY?

i need some help, that much is clear.

WHAT WOULD IT MEAN TO YOU IF YOU GOT SOME HELP?

perhaps i could learn to get along with my mother.

TELL ME MORE ABOUT YOUR FAMILY.

my mother takes care of me.

WHO ELSE IN YOUR FAMILY TAKES CARE OF YOU?

my father.

YOUR FATHER?

you are like my father in some ways.

WHAT RESEMBLANCE DO YOU SEE?

you are not very aggressive, but i don't think you want me to notice that.

WHAT MAKES YOU THINK I AM NOT VERY AGGRESSIVE?

you don't argue with me.

WHY DO YOU THINK I DON'T ARGUE WITH YOU?

you are afraid of me.

DOES IT PLEASE YOU TO BELIEVE I AM AFRAID OF YOU?

it pleases my father to think that i am afraid of him.

WHAT ELSE COMES TO MIND WHEN YOU THINK OF YOUR FATHER?

bullies.

DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR BOYFRIEND MADE YOU COME HERE?

This astonishing — one is very tempted to say perceptive — response from the computer is, of course, preprogrammed. But then, so are the responses of human psychotherapists. No such computer program is adequate for psychiatric use today, but the same can be remarked about some human psychotherapists. In a period when more and more people in our society seem to be in need of psychiatric counseling, and when time sharing of computers is widespread, I can imagine the development of a network of computer psychotherapeutic terminals, something like arrays of large telephone booths, in which, for a few dollars a session, we would be able to talk with an attentive, tested, and largely nondirective psychotherapist. Insuring the confidentiality of the psychiatric dialogue is probably the most important step to be worked out.

Tic-Tac-Toe, Checkers, and Chess

Another sign of the intellectual accomplishments of machines is found in games. Even exceptionally simple computers — those that can be wired by a
Game to control the center of the chess board than perfect tic-tac-toe. One computer has played master-class checkers — it has beaten the Connecticut state champion. Chess is a much more difficult game than tic-tac-toe or checkers. Here, programming a machine to win is not easy, and novel strategies have been used, including several successful attempts to have a computer learn from its own experience in playing pre-programmed games. For example, a computer may learn empirically that it is better in the beginning game to control the center of the chess board than the periphery.

So far no computer has become a chess master; the ten best chess players in the world have nothing to fear from any present machine. But several computers have played well enough to be ranked somewhere in the middle range of serious, tournament-playing chess players. I have heard machines demeaned (often with a just audible sigh of relief) because chess is an area in which human beings are still superior. This reminds me of the old joke in which a stranger remarks with wonder on the accomplishments of a checker-playing dog, whose owner replies, "Oh, it's not all that remarkable. He loses two games out of three." A machine that plays chess in the middle range of human expertise is a very capable machine; even if the there are thousands of better human chess players, there are millions of worse ones. To play chess requires a great deal of strategy and foresight, but also for those who watch the baby and walk the dog.

Unpredictable Machine Behavior

Chess-playing computers, because they have very complex programs, and because, to some extent, they learn from experience, are sometimes unpredictable. Occasionally they perform in a way that their programmers would never have anticipated. Some philosophers have argued for free will in human beings on the basis of our sometimes unpredictable behavior. But the case of the chess-playing computer clearly tells us that, when viewed from the outside, behavior may be unpredictable only because it is the result of a complex although entirely determined set of steps on the inside. Among its many other uses, machine intelligence can help illuminate the ancient philosophical debate on free will and determinism.

With this more or less representative set of examples of the state of development of machine intelligence, I think it is clear that a major effort over the next decade, involving substantial investments of money, could produce much more sophisticated programs. I hope that the inventors of such machines and programs will become generally recognized as the consummate artists they are.

Self-Controlled vs. Remotely Controlled Robots

In thinking about the generation of machine intelligence, it is important to distinguish between self-controlled and remotely controlled robots. A self-controlled robot has its intelligence within itself; a remotely controlled robot has its intelligence located somewhere else, and its successful operation depends upon successful communication between its external central computer and itself. There are, of course, intermediate cases in which the machine may be partly self-activated and partly remotely controlled. The mix of remote and in situ control seems to offer the highest efficiency for the near future.

We can imagine, for example, such a machine designed for the mining of the ocean floor. Enormous quantities of manganese nodules litter the abyssal depths. They were once thought to have been produced by meteorite infall on the earth, but are now believed to be formed occasionally in vast manganese fountains caused by the internal tectonic activity of the earth. Many other scarce and industrially valuable minerals are likewise found on the deep ocean bottoms. We clearly have the capability today to design devices that can systematically swim above or crawl upon the ocean floor, perform spectrometric and other chemical examinations of the surface material, radio back all findings to ships or land, and by means of low-frequency radio homing instruments, mark the sites of especially valuable deposits.

The radio beacon in the robot will then direct great mining machines to the appropriate locales. The present state of the art in deep-sea submersibles and in spacecraft environmental sensors is compatible with the development of such devices. A similar situation exists for offshore oil drilling, for coal and other mineral mining, and other operations. The likely economic returns from such devices would pay not only for their development but for the entire future space program many times over at the present rate of spending.

Machines can be programmed to recognize particularly difficult situations and to inquire of human operators — working in safe and pleasant environments — what to do next. The examples just given are of devices that are largely self-controlled. Remotely controlled devices are also possible, and a great deal of preliminary work has been done in the remote handling of highly radioactive materials in laboratories of the U.S. Atomic Energy Commission. In the application of this technology, I can imagine a human operator connected by radio link with a mobile machine; for example, the operator is in Manila; the machine is in the Mindanao Trench in the Philippine Sea — the deepest level of the earth's surface. The operator is attached to an array of electronic relays that transmit and amplify his movements to the machine and that can, conversely, carry back to his senses what the machine perceives. When the operator turns his head to the left, the television cameras on the machine will turn left, and the operator will see on a great hemispherical television screen the scene revealed by the machine's searchlights and cameras. When the operator in Manila takes a few steps forward, the machine in the abyssal depths will amble a few meters forward; when the operator reaches out his hand, the mechanical arm of the machine will extend itself. The precision of the man-machine interaction will be such that exact manipulation of material on the ocean bottom by the machine's finers will be possible. With such devices, human beings will be able to "enter" environments otherwise closed to them forever.

Robot Landers to Examine Mars

In the exploration of Mars, the time is almost upon us when unmanned vehicles will soft-land; only a little further in the future they will roam about the surface of the red planet as some do now on the moon. We are not yet ready for a manned mission to Mars. (Some of us are concerned about such missions because of the danger of carrying terrestrial microbes to Mars and Martian microbes, if they exist, back to earth; and because of the enormous expense involved.)
The unmanned Viking landers scheduled to be deposited on Mars in the summer of 1976, however, have a very interesting array of sensors and scientific instruments. Each lander has two cameras with the resolution and stereoscopic capabilities of the human eye, plus a much greater range of color sensitivity, extending into the near infrared. Each lander has a single ear—a seismometer sensitive only to the lowest frequencies in the audio spectrum. The seismometer is, in fact, equipped with a filter to prevent higher frequencies from being registered. Viking also has an elaborate instrument that is the equivalent of a nose and taste buds. This gas chromatograph/mass spectrometer will enable the landers to detect, in abundances of parts per million, hundreds of different organic molecules, many of which unaided humans are incapable of detecting. The Viking lander sports a single arm with which to collect the Martian soil and withdraw it into its body for further examination. Among the lander's range of instruments are three biology sensors, unknown to human anatomy, that are designed to measure microbial metabolism. (However, were we to ingest soil samples, as Viking will, and were the samples to contain microbes, we might discover them by getting sick.) Although it will have the capacity to taste, Viking will not have to eat while on the Martian surface. The lander is equipped with two radioactive thermal generators which will generate electricity from the radioactive decay of the element plutonium. This is an energy source that should be adequate for a lifetime of many months on the Martian surface.

Reprogramming a Robot 50 Million Miles Away

The reprogrammability of computers is an important virtue. Suppose we send a human astronaut to Mars, trained in, say, geology. After he or she lands, we discover that we really should have sent a biologist. Reprogramming the astronaut is equivalent to waiting for that individual to complete, on Mars, a remote postgraduate course in biology. A robot geologist on Mars, however, would require only a few hours to be reprogrammed and debugged for biology.

Robot Rover to Explore Mars

The obvious post-Viking approach to Martian exploration, one that takes advantage of the Viking technology, would be a tractor-trailer robot rover that would carry the entire Viking spacecraft slowly over the Martian landscape. But such a vehicle would pose a new problem, one never encountered in machine operation on the earth's surface. Although Mars is the second closest planet to Earth, it is so far away that the light travel time between the two becomes significant. At a typical relative position of Mars and Earth, the red planet is twenty light minutes away. A message from the robot on Mars to the human controller on Earth, traveling at the speed of light, would take twenty minutes to arrive. Thus, if the spacecraft encountered a steep incline, it might send a message of inquiry back to the earth thirty minutes later the response would arrive, saying something like, "For heaven's sake, stand dead still." By then, of course, an unsophisticated machine would have tumbled into the gully. Any Martian rover consequently requires slope and roughness sensors. Fortunately these are readily available and are even found on some children’s toys. When confronted with a steep slope or boulder, a rover so equipped would either stop until it received instructions from the earth in response to its query (sent with a televised picture of the terrain) or back away and move in another and safer direction. If every decision in Martian exploration must be flown through a human controller on the earth, the robot rover can traverse only a few feet an hour. But the lifetimes of such rovers—and of human operators—are so long that a few feet an hour represents a perfectly respectable rate of progress.

Contingency decision networks much more elaborate than anything now in existence can be built into the onboard computers of spacecraft of the 1980s. For objectives more remote than Mars, to be explored further in the future, we can imagine human controllers in orbit nearby. In the exploration of Jupiter, for example, I can envisage operators—installed on a small moon outside the planet's fierce radiation belts—controlling, with only a few seconds' delay, the responses of a spacecraft floating in the dense Jovian clouds or wandering about its metallic hydrogen oceans. Earthbound human beings can also be part of such an interaction loop, provided they have the patience to cope with the increased light travel time involved. As we speculate about expeditions into the farthest reaches of the solar system—and ultimately to the stars—self-controlled machine intelligence will clearly assume heavier burdens of responsibility.

Insects Compared with Robots

In the development of such machines we find a kind of convergent evolution. The Viking lander is, in a curious sense, like some great, outside, clumsy, constructed machine intelligence. It is not of our own creation and it is certainly incapable of self-reproduction. But it has an exoskeleton, a wide range of insect-like sensory organs, and is about as intelligent as a dragonfly. Viking also has an advantage that insects do not: by inquiring of its controllers on earth, it can, in effect, assume the intelligence of a human being—that is, its controllers are able to reprogram the Viking computer on the basis of decisions that they make.

To construct something with the intelligence of an insect may not seem a very impressive feat. But it is a feat that took nature four billion years to accomplish. We have been exploring space for less than a hundred-millionth of that time. A machine of this intelligence is a great human achievement.

As the field of machine intelligence advances and as more and more distant objects in the solar system become accessible to exploration, we will see the development of increasingly sophisticated onboard computers— instruments that slowly climb the phylogenetic tree from insect intelligence to crocodile intelligence to squirrel intelligence and, in the not very remote future, I think, to dog intelligence. Any flight to very great distances must have a computer capable of determining whether it is working properly. There will be no possibility of sending to earth for a repairman. The machine must be able to sense it is sick and skillfully doctor its own illnesses. A computer is needed that is able either to fix or replace its own failed parts or sensors or structural components. Such a computer, which has been called STAR—for Self-Testing And Repairing computer—is on the threshold of development. It employs redundant components, as biology does—we have two lungs and two kidneys partly because each is protection against failure of the other. But a computer can be much more redundant than a human being—we have, after all, only one head and one heart.

Miniaturization

In view of the weight premium on deep-space exploratory ventures, there will be strong pressures for continued miniaturization of intelligent machines.
Remarkable miniaturization has already occurred; vacuum tubes have been replaced by transistors and mini circuits by printed circuit boards. A few years ago a circuit that occupied much of a 1930s radio set was regularly being printed on the equivalent of the head of a pin. Today the same circuit can be printed on the point of a pin, and the head can accommodate a fair fraction of a small computer.

Domestic Robots

If intelligent machines for terrestrial mining and space exploratory applications are pursued, the time is not far off when household and other domestic robots will become commercially feasible. Unlike the classical anthropoid robots of science fiction, there is no reason for such machines to look any more human than a vacuum cleaner does. They will be specialized for their functions. There are many common tasks, ranging from bar tending to floor washing, that involve a limited array of intellectual capabilities, although they require substantial stamina and patience. All-purpose ambulatory household robots, capable of performing the domestic functions of a proper nineteenth-century British butler, are probably many decades off. But more specialized machines, adapted to specific household functions, are already on the horizon.

Conceivably, many other civic tasks and essential functions of everyday life could also be carried out by intelligent machines. A recent newspaper report states that garbage collectors in Anchorage, Alaska, have won a wage settlement guaranteeing them a yearly salary of $18,000. Economic pressures alone may make a persuasive case for the development of automated garbage-collecting machines. For the development of domestic and civic robots to be a general social good, the effective reemployment of those displaced by robots must, of course, be arranged; but over a human generation that should not be too difficult — particularly if enlightened educational reforms are initiated.

Adjusting to Intelligent Machines

We appear to be on the verge of developing a wide variety of intelligent machines capable of performing tasks too dangerous, too expensive, too onerous, or too boring for human beings. The development of these machines is, in my mind, one of the few legitimate spin-offs of the space program. The main obstacle to their development seems to be a human problem: the quiet feeling that comes stealthily and unbidden to claim that there is something unpleasant or "inhuman" about machines performing certain tasks as well as, or better than, humans; the feeling that generates a sense of loathing for creatures made of silicon and germanium rather than proteins and nucleic acids.

Our survival as a species depends on our transcending these primitive chauvinisms. Adjustment to intelligent machines is, in part, a matter of acclimatization. There are cardiac pacemakers in existence that sense the beat of the human heart. Only at the slightest hint of fibrillation does the pacemaker stimulate the heart. This is a mild but useful sort of machine intelligence. I cannot imagine the wearer of this device resenting its intelligence. I think that there will shortly be a similar sort of acceptance of much more intelligent and sophisticated machines. We have a generation of youngsters who are growing up with pocket computers, machine languages, computer graphics, electronic music, automated instruction, and computer games. They are unlikely to find anything alien about machine intelligence. There is nothing inhuman about an intelligent machine; it is, indeed, the expression of those superb intellectual capabilities that only human beings, of all the creatures on our planet, now possess.

For Good or For Evil?

A legitimate concern in the development of machine intelligence is its potential for misuse by unscrupulous governmental, military, and police agencies. Here, as in many other areas of modern technology, the same devices can be used either for enormous good or enormous evil. A world with central data banks containing dossiers on all its citizens, with robot policemen and robot judges, and with automated battlefields is not a world in which I personally would care to live and bring up children. It would be a nightmare world. But a world with adequate food, mineral, and energy resources; a world that provides its human inhabitants with ample leisure and an intellectually and spiritually rich environment with which to make that leisure meaningful; a world engaged in the exploration of other distant and exotic worlds — that is a world I would find extremely attractive. Both of those future worlds are accessible through machine intelligence. To avoid the nightmare and realize the dream requires a wholesale restructuring of the planet's political institutions — a restructuring that is clearly required quite apart from the implications of intelligent machines. If we survive, I think our future will depend to a significant degree on a partnership between human and machine intelligence.

Forum — Continued from page 7

At the same time as per-function costs have decreased, major strides have been made in applying computers to new kinds of jobs and in simplifying their operation. Today thousands of computers, large and small, are at work helping large firms to compete, helping large firms run more efficiently, helping make the economy more productive at all levels.

For us at IBM, the challenge of productivity is plain. It lies in continuing to help increase the productivity of the computer. The rest will follow.

"INSTITUTE OF CERTIFIED RECORDS MANAGERS" FORMED

Gerald L. Hegel
Tab Products Company
617 Vine St.
Cincinnati, Ohio 45202

Certification of Records Managers has been a dream of the profession for many years. The program and examination have been under active development. A first group of candidates has taken the examination. Now, in an effort to solidify the profession, the two Records Management associations have combined to administer the Certified Records Manager Program.

This independent body is to be called the "Institute of Certified Records Managers". Its initial governing body of ten "regents" is composed equally of members of the American Records Management Association (ARMA) and the Association of Records Executives and Administrators (AREA). These persons have been chosen from areas of business, industry, education, state, local, and national government. The Institute, once it has met and organized, will operate independently of both organizations. Its sole function will be to certify individuals who meet the established qualifications.
The Computer Industry's Social Responsibilities — Another Approach

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"Up to this point it is apparent that technology has been given priority over humans."

Introduction

In the March 1975 issue of "Computers and People" the chief executive officers (or their representatives) of eight large computer manufacturers responded to a questionnaire. The manufacturers were:

- Burroughs
- Control Data
- Digital Equipment Corp.
- Honeywell Information Systems
- IBM
- NCR
- Sperry Rand
- Xerox Data Systems

The questionnaire was:

1. Dehumanizing Image of the Computer. What active efforts does your organization have to cope with the "dehumanizing" image of the computer?

2. Human Engineering. Is human engineering being used to make computer hardware more adaptable to people — rather than twisting people to adapt to computers?

3. Human Communication with the Computer. What is being done to really simplify man's communication with the computer? Current languages (e.g., COBOL, FORTRAN, BASIC) are still not usable by the average person. These stylized languages "turn off" a lot of people (including some intelligent people)!

4. Human Factors in Computer Work. Computer planning, systems analysis, and programming techniques seem to concentrate on economic and technical factors. Are human factors being built into computer planning, design, and utilization?

5. Ultra-Technicians. Are we training computer people to be ultra-technicians who can't communicate with the rest of society? Are such technicians insensitive to the human part of society? What can be done in this area?

6. Society-Related Issues. What is your organization doing in the social-related issues of computers? For instance, privacy and data banks, computer crime, impersonalized data processing (e.g., relentless dunning notices, relentless errors in computer output), etc.

7. Over-Promotion of the Computer. It is held that the computer is overly promoted, and that it hasn't lived up to expectations. Can the computer really help in vital areas related to policy-level, unstructured decisions?

8. Consumer Complaints. Is it likely that the computer will be faced with consumerism complaints due to paperwork pollution, error pollution, "1984 Syndrome", and its technological rigidity?

9. Alienation of Employees. Are office workers being paced by the computer — just as blue collar workers have been paced by the assembly line and automation? Does this cause alienation of employees with the organization/work assignment?

10. Unemployment. What is the role of the computer, and what is the role of the human being? Should the complete job be computerized whenever possible? Has this attitude contributed to our high unemployment rate?

11. Over-Dependence on Computers. Can society become overly dependent on computers, causing an entropy in the human system?

The manufacturers' responses were included in an article by this author entitled "The Computer Industry's Social Responsibility: A Self-Appraisal".

Computer Users' Difficulties with Computers

Some years ago the great scientist, Norbert Wiener, said

...the new industrial revolution [computers and cybernetics] is a two-edged sword. It may be used for the benefit of humanity; but only if humanity survives long enough to enter a period in which such a benefit is possible. It may also be used to destroy humanity, and if it is not used intelligently it can go very far in that direction.

When we read about the projected characteristics of a planned new computers we are almost certain to be bombarded by such claims as:
— Tremendous memory devices, based on exotic new technology, which can store billions or even trillions of items of data.

— Very rapid processing circuits that permit calculations in nanoseconds (billionths of a second) or picoseconds (trillionths of a second).

— Software packages which will quickly solve intricate problems that would take many man-years to solve by non-computer means.

This hardware and software hypnosis exists in spite of the fact that most computers are under-utilized and that most users have difficulty in coping even with current computer technology.

Human not technical problems are the major obstacles to more effective computer applications. Yet, it is the human problems that tend to be neglected. Because the computer, one of the foremost technological developments of our time, has often been used with little sensitivity to its impacts on people, it has been resisted by many whose cooperation is needed to realize the full benefits that computerization can bring.

The Critical Computer Issues of Today

The great computer issues of today are not those of computer technology. The critical issues revolve around people and social considerations, such as:

— Displacement of people by computerization and automation.

— Dehumanizing people and organizational environments by twisting them to conform to arbitrary mechanistic concepts and tools.

— Data banks which invade the individual's right to privacy.

— The use of the computer for criminal purposes.

Computer professionals have rarely constructively faced these issues. They either ignore them or deny their validity. As a result, computers have tended to be far less useful than they could be.

The Maligning of the Computer

It is largely because the computer vendors and users have poorly handled the human aspect of computers that the computer is so often maligned, is the object of so many derisive jokes, and fails to attain the great promises predicted for it. Computer specialists need to learn that the computer must truly serve people and not merely be served by people.

If the computer field is to become socially responsive, it needs to become more completely humanized. This means a "new generation" — if not of computers, then of computer usage — which places people first and technology second. Up to this point, it is apparent that technology has been given priority over humans.

Dehumanization

Throughout our society there is the need for government and large organizations to take a more humane posture regarding their goals and operations. The masses of people feel helpless against the cold, impersonal power represented by remote organizations. Too often these organizations have focused on profits or programs — with very little consideration given to the discomfort of the individual. Computers are brought into organizations and employees are required to adjust to the system. The same computers are then used to communicate with customers and citizens; too often the computer communication is "noise" to the recipient. The human system is interdicted by the computer systems. Most of them have been designed with a mechanistic approach rather than an organic one.

Human Engineering

Research by the author has indicated that few users employ human engineering and social scientists on their computer systems projects. Significant projects are put in the hands of computer specialists having little or no professional expertise in psychology, sociology, personnel management, or like areas. Educational programs, available from the computer vendors, are almost completely devoid of guidelines related to human engineering as it should be applied in the users' preparation for computerization. Computer programming languages, largely developed by the computer manufacturers, still are not easy for the average person to use. Even with the advances in data terminals and mini-computers, it does not appear that computer hardware is sufficiently simplified so that the average person feels comfortable in operating it.

Communication with the Computer

The computer manufacturers and users (mostly large organizations) have been working in this area for years through the American National Standards Institute. The "most "universal" programming languages — COBOL, FORTRAN, BASIC — are still so stylized and rigid that they are bound to limit the number of persons who will be able to constructively use computers. Quite a number of students are being trained to access computer programs that have been preprogrammed and are stored in computers. But until more simplified English-like programming languages are available, it is suspected that the vast majority of citizens will not be able to develop their own computer programs to solve their unique problems. While there is some indication that there has been an erosion of students' reading, writing, and mathematical attainments — there has not been any significant advances in programming which would make communication with the computer easier for such persons.

Human Factors in Computer Work

The techniques of systems analysis, computer programming, and management science have attracted much attention and development efforts. However, the bulk of these efforts by computer manufacturers and users alike appear to dwell on mechanistic and economic factors. Research by the author indicates, for instance, that users' organizations seldom include social scientists or even personnel professionals on major computer projects. That attention which is devoted to human factors is usually of a very superficial and token nature. Such insensitivity to human factors may be the cause of so many computer applications failing to attain desired objectives due to alienation of the individuals affected by such computerization. There is need for accelerated research to develop approaches which will permit us to consider human factors as professionally as we address the technical and economic factors. For instance, too little research has been done in the areas of the psychological impact of human-machine interface, the "appropriate" distribution of work to humans and machines, the hidden costs of psychological and other pollution generated by computer applications, etc.
Ultra-Technicians

While it may be true that each profession has its ultra-technicians, there is need for a new and positive approach to broaden the computer professionals' viewpoints. Extensive research has indicated that there is an extreme paucity of effort devoted to training these computer people in interpersonal relations and the human engineering needed to design systems which are socially sound as well as technically sound. Too often, in the name of efficiency or profits, our economic system has been used so as to sacrifice the well-being of individuals and social groups. The author has suggested that social scientists (psychologists, personnel professionals, etc.) become integral parts of computer projects.

Privacy, Computer Crime, Etc.

There is a joint responsibility of computer vendors and users in these areas of social concern. While some large organizations conduct image-building public relations campaigns to convince the public of social concern. The author has suggested that social scientists (psychologists, personnel professionals, etc.) become integral parts of computer projects.

Over-Promotion of the Computer

It probably is true that generally the expectations from computers have exceeded the realizations from them. On the other hand, the computer has allowed man to perform tasks that would have been impossible without the new machines. Nevertheless, it would appear that computer manufacturers and users have not advanced very much in effectively applying computers to the higher-order decisions in vital areas or those problem areas related to social concerns. The computer has been used most widely in areas having well-defined models and rigid procedures ... which may account for the resulting friction in the real world with its imperfections and fluidity.

Consumer Complaints

Certainly there are considerable public complaints about computerized bills, junk mail, and data banks. These complaints result from computer applications which were inadequately planned and designed — and which ignored the human factors in systems. Computer users themselves have given evidence that they are not infrequently dissatisfied with the hardware and software supplied by computer manufacturers. Computer hardware and programs are too often under-bugged when they are sold or leased, and the actual throughput performance of the computer is usually considerably lower than the manufacturers' claims. As previously mentioned, the nature of computers makes available the frightening possibility of organizational and governmental control as depicted by Orwell in "1984".

Alienation of Employees

Little advance has been made to determine the best way to allocate work to humans and machines. The level of dissatisfaction with work assignments raises concern whether organizations are properly designing systems. In the automotive plants and elsewhere, workers have "rebelled" against being pawns by automation and the resultant type of work they are assigned. In some Scandinavian countries experiments are proceeding which involve de-automating and de-computerizing operations. Work as a complete unit is being returned to the worker and work group. The group creates its own system to reach objectives, rather than depending on a monolithic single system created by ultra-technicians from a central computer systems office.

Unemployment

There is a joint responsibility of computer vendors and users in these areas of social concern. While some large organizations conduct image-building public relations campaigns to convince the public of social concern. The author has suggested that social scientists (psychologists, personnel professionals, etc.) become integral parts of computer projects.

Over-Dependence on Computers

Over-dependence of Americans on the automobile has probably resulted in greatly reduced walking, with consequential increases in the number of overweight persons. Automation production lines have reduced craftsmanship; and the worker's interest in his or her work has probably declined. Similarly, the computer is absorbing vast ranges of white-collar-type work. As the computer is programmed to perform a particular task, the appropriate procedure and responsibility are at least partially removed from the province of the human being and shifted to the computer system. The computer can become a control hub and the radical human species can become very dependent on that fulcrum. Have you been in a bank when the bank clerk states, "I am sorry we can't update your account at this time — the computer isn't working"? Have you heard an executive state, "We can't do anything until the computer center produces the report?" Have you been involved with a complex computer application which generates reports that you use — but you really do not understand the computer model which is generating the reports? Can we experience a situation such as depicted in the motion picture "Dr. Strangelove" — whereby the President of the nation was unable to control the computer decision to bomb the Soviet Union?

(please turn to page 31)
On Thursday morning, Feb. 27, 1975, fire started in the basement of the New York Telephone Co. building at 2nd Avenue and 13th St. Seventeen hours after it began, the holocaust was finally over. Millions of dollars worth of telephone equipment had been destroyed. Nearly 170,000 telephones in Manhattan, deprived of their switching equipment, were silent.

By March 21, 23 days after the catastrophe, the phones were back in service.

Western Electric People

As always when an emergency occurs, Western Electric's people had worked endless hours with Bell System people to get the phones back on line.

— By Friday, March 14, just two weeks after the fire, Western Electric (WE) installers alone had put in 123,000 man-hours of work in the restoration effort.

— WE's Northeastern Region engineers had logged 15,400 man-hours on the same date.

— More than 2,600 tons of equipment and material had been shipped from various WE locations, including some 525,000 linear feet of exchange cable and more than 300 million conductor feet of switchboard cable and wire. Involved in the shipment were 11 airlines and 30 trucking companies.

New York Telephone's February 27 fire was among the worst telephone catastrophes in Bell System history. Shortly after the fire was over, installer Fred Ferrara, who is a member of WE's permanent installation crew in the 13th Street building, said, "It looks like a bomb hit the place." Another installer, Jim Duff, said, "This is amazing. I never envisioned anything like this. I've been in many telephone buildings, but I've never seen any destruction like this."

That was how it looked shortly after the flames were under control. Just three weeks later, New York Telephone officials were calling the restoration effort their "miracle on Second Avenue." But the "miracle" happened, of course, because of the grinding, tireless efforts of everyone involved.

For Western Electric, the effects of the fire reached nationwide. WE's Northeastern Region Service Division and WE manufacturing locations at Hawthorne, Kearny, Atlantic, Atlanta, Baltimore, Buffalo, Merrimack Valley, Kansas City, Omaha, Montgomery, San Ramon, Shreveport, and Phoenix were all involved. The equipment they shipped included cable, iron work, repeaters, coin boxes, connectors, terminal strips, wire, carrier equipment, and much more. WE's subsidiary, Nassau Recycle Corp., also became involved, making lead cable sleeves and receiving destroyed equipment that had been removed from the fire scene.

WE's shoulder-to-shoulder action, along with the other Bell System units, in the face of New York Telephone's fire, is part of a long tradition. A brochure published by the company in the 1950's, titled "Wind Water Fire and Ice" puts it this way: "Quick action in emergencies is a part of our business ... As the manufacturing and supply organization of the Bell System, Western Electric shares the telephone companies' tradition that all that is humanly possible must be done at all times to keep communications open. When disaster strikes, WE swings into action as necessary night or day, weekends or holidays, to bring our special experience and capabilities to aid the telephone companies."

That tradition goes all the way back to Chicago's horrible fire of 1871 when employees of Gray and Barton, which later became Western Electric, established a precedent by working with little food or sleep, supplying material and directing electricians in the restoration of telegraph service. A later disaster -- a hurricane in New England in 1938 -- took 700 lives and silenced half a million telephones. During that catastrophe, WE shipped nearly 23,000 tons of material, demand which, in the case of many items, exceeded the average monthly requirements for the entire Bell System. There are legions of other, similar examples, all exemplifying the dedication of the Bell System's people to the service they provide.

Installers

Before the smoke had even cleared from the fire-devastated New York Telephone facility on Second Avenue, a team of six Western Electric installers entered the building to assess the size of the restoration job ahead of them.
The task was formidable. On the first floor, they found the main distributing frame, the heart of the central office, as well as the panel switching offices completely destroyed. The power equipment in the basement was rendered useless by water damage; cable shafts and ducts linking the equipment floors had been demolished; carrier equipment on the second floor had been destroyed; and relays and switches on the fourth, fifth, and ninth floors were in some cases operative but would require extensive, delicate cleaning.

"Based on the orders we anticipated from New York Tel, that first all-night tour of the building determined much of our plan for the next two weeks," reports Jim McGarry, WE's manager, N.Y. installation, with over thirty years of experience in installation. "As we determined a need for a piece of equipment or a tool, we would alert our field service people in an emergency van outside of the building. They put calls through to our service centers and field locations who were on 24-hour call. We saved a lot of time this way."

Normally, it takes 26 weeks to engineer, manufacture, and install a main distributing frame. New York Telephone wanted it in two weeks. "We knew there wouldn't be time for detailed engineering specifications on a job like this," said McGarry. "So we called in our best installation supervisors from all over the city. We had men who, based on their past experience could install a main frame, run cable, and restore power with just verbal assistance from engineers. It's a job like this when all those years of experience pay off."

The initial team of six grew to 600 by Saturday, and to 1100 working round-the-clock before the end of the week. Fathers and sons, teams of brothers, and even one husband-wife installer team joined the Western Electric effort to restore the damaged equipment.

Before the target date of two weeks after the fire, Western Electric had completely assembled a main distributing frame, had tripled the power capacity on the seventh floor to 15,000 amps, had made over 900 cable runs, had hand wiped 6.1 million switch contacts and 10 million relays, and had participated in almost 17 million tests on central office equipment.

Said installation supervisor Bobby Hull, "When the Tel. Co. said they wanted to triple the output of a power plant from 5,000 to 15,000 amps in two weeks, I thought 'no way'. But you never say that. You start the job, you improvise, you complain, guys come up with new and better ways to do things right on the job, and before you know it, you've got the job done. If you slow down, if you stop and think about the magnitude of what you're doing, you lose it. In an emergency you work by instinct. Hell, every WE installer knows his job inside and out. You just have to work your tail off every once in a while, that's all."

On ordinary jobs, Bobby might supervise as few as five people; for the next 15 days, he worked with 80 to 100. "It's really no big deal with installers," he said. "Normally they're like anybody else, a little cocky, maybe, but in times like these, I don't know how to explain it, it seems everyone works a little beyond his capabilities. It's like it's your own personal phone network. Maybe you don't install it yourself, but some other WE people did, and you feel responsible."

Gene Doyle, another WE installation supervisor working on the construction of the main frame, had similar feelings. "When I came in the building the first time, it was a sad thing. Here was all this equipment that I had worked on all my career, lying about dead and useless. If you've ever put together something from nothing and then been there to see it work, well, it's a wonderful thing, but then to see all that go down the tubes in a fire or flood or whatever, it's really eerie. It gives you a gut feeling that makes you want to work twice as hard to get things back together again."

Regional Engineering

Bernie Blatt just smiles at the word "miracle". He'd use other words to describe the engineering efforts that made restoration of service possible after New York Telephone's Second Avenue fire. WE's Northeastern Region general manager Bob Cowley said, in a rare, restful moment at the scene of the fire, "After all, nothing else happens until Engineering does their thing." That makes Blatt, the Region's assistant manager, Systems Equipment Engineering with responsibility for New York Telephone, smile, too.

Blatt, like Cowley and some other key Western Electric Service Division people, was in Columbus, Ohio, when word of the fire arrived. He was having breakfast with the other members of the group around 7 that February 28 morning when a call from Bill Pharo, director of Regional Engineering and Services, alerted them to what was going on. "We didn't realize the enormity of it then," says Blatt, "but I called Hank Wheat, one of the department chiefs in my group, to see what I could find out." Wheat and others were already busy setting up a "war room" to control whatever engineering efforts would be required at the NE Region's Headquarters, Newark, N.J. Special phones to keep in contact with people at the scene of the fire were being installed, and every engineering drawing associated with telephone equipment in the Second Avenue building was being pulled from storage. "At that point," adds Blatt, "reports on the fire were so 'iffy' we didn't know what would be needed. But we wanted to be ready."

To the NE Region's Reproduction Service personnel, "being ready" meant starting to copy about 65,000 drawings — some 41 miles of them if laid end-to-end.

Meanwhile, engineers Carl DeNisco and Peter Szymalowicz headed for the fire site. They were to stay there throughout the restoration to advise their colleagues back at Newark on cable and power engineering needs and to help the installers where an engineering assist was required.

By the time Blatt and the others had returned from Columbus, the status of service out of the Second Avenue building was pretty clear. "From the third floor down, it was a total loss," says Blatt. "So, the cable vault, the whole main frame, the power plant, the carrier center, and lots of other vital equipment was gone. Also, one vertical shaft carrying cable all the way up to the 11th floor was destroyed. For cable engineering purposes, that meant regarding the job as a whole new building — from scratch."

For Blatt, and about 130 engineers, the news signaled the beginning of endless hours of work around the clock for two days, with occasional brief naps on the floor. And, 24-hour activity would continue.
Hawthorne and running smack into a midwest snow--promised phone -- calls to the part of Western Electric's immediate response to pect formal orders accepting scribbled scraps of pa­spect formal orders accepting scribbled scraps of pa­

Overlooking his own efforts.

Region's engineers had received 65 orders. They had been propelled into the vortex of a crisis. "That's the work. We've worked 'round the clock and through 20 gallons of coffee and 14 dozen doughnuts in about the first two days, they just kept work­ing. I'm filled with admiration for what they ac­complished." As of early Thursday morning, March 13, Blatt's outfit had contributed 15,400 man-hours of engineering work.

Transportation

"Yes, we were able to come up with what you asked for, and we've just put it on a truck ..."

It was a typical answer to a hurried request and part of Western Electric's immediate response to the emergency. But for WE's Transportation organi­zation, this typical answer was not part of a solution but the start of a challenge. There's a big difference — a difference of about 2,500 miles — between having reels of vitally needed cable on the loading platform of the Phoenix Works and having them on site, on Second Avenue, New York City, to be wheeled in as soon as firemen permit.

Before the fire had even been pronounced under control, the lines of supply from Western Electric locations all over the country had focused on New­ark, New Jersey. There, at the Northeastern Re­gional Center, the resident transportation super­visor Lionel Harris and his crew kept track of equipment coming in by air charter (example — a load of 7,500-pound reels of cable that landed at 4:30 am.) and truck (at one time, 46 trailers of equipment, some of them coming from Phoenix and Hawthorne and running smack into a midwest snow--storm). They either spurred the equipment on to the stricken building or arranged for brief storage.

It was a hectic weekend, but on Monday, Harris, a large, unfappable man, did not look as if he had been propelled into the vortex of a crisis. "That's because this has not been a one-man operation," he said. "My department is a group of capable and dedicated people and they've carried the burden of the work. We've worked 'round the clock and Saturday and Sunday, mostly from the office but sometime from our homes. A lot of our work is done by phone — calls to the sender, calls to the carrier — and if a man is handling a hot item, he might have to stay with it no matter where he is." Harris was overlooking his own efforts. On Monday, when he decided to go home for dinner, he'd been in the office since Sunday morning.

The work paid off: four days after its first call on the emergency, Harris' crew had closed out 61 of its 93 requests for expedited service. The other 32 were "under control". "Our biggest single problem was probably that snowstorm," Harris said. "Storms not only slow things up but, in addition, make it difficult to give an estimated time of ar­ival."

The fire job began for Harris on Thursday night when his manager, Dick Russell, called him at home and told him that some vertical pieces of distribu­ting frame from Hawthorne were urgently needed on the job site. A few minutes later, Harris was in touch with Hawthorne, the airlines and trucking companies. "Larry Johnson of Hawthorne's Trans­portation group got an air charter, and in Chicago they started preparing the material," Harris said. "Those verticals, you know, are pretty big pieces of ironwork and the ends had to be specially wrapped so they wouldn't puncture the skin of the plane. A few hours later they were here."

Harris credits WE's carriers, both surface and air, with a great deal of cooperation. "The truck­ers got the terminals opened on Saturday and Sunday. Crews left on short notice. One airline even put a larger plane on a regular flight from Omaha to carry NE emergency material."

Expediting smaller shipments is frequently more complex than sending the big ones. "You don't go out and hire a whole truck to move a 500-pound pack­age," Harris said. "Even in the face of this emer­gency, we had to do things efficiently and economi­cally, and that means a lot of coordinating to get the most out of each carrier." Also complicating Transportation's job was the need to coordinate shipping not only from WE's many locations, but from outside suppliers as well.

At 12:25 am. on Thursday, Feb. 27, an employ­ee of the New York Telephone Company at 2nd Ave. and 19th St. reported by telephone that he smelled smoke. Shortly before, telephone opera­tors who were monitoring calls began to notice trouble on the lines. Apparently, in the pre­ceding hour or so, a short circuit developed in the cable vault room. The New York City Fire Department responded to the alarm within 2 or 3 minutes. The fire raged until late in the afternoon of Feb. 27 before being declared under control. As many as 400 firemen fought the blaze.

By 3 am. Thursday, the Bell System had begun marshalling a huge task-force to restore service. Across the country, key managers and technicians from AT&T, Western Electric, Bell Laboratories, and various operating telephone companies were awakened in the pre-dawn hours, to set to work to provide New York Telephone with the experts and equipment to get service back for 170,000 telephones — the equivalent of an Albany, N.Y. or a Jersey City, N.J.

As the fire raged, mobile telephone service units came in from New Jersey, Pennsylvania, New England and West Virginia. They supplemented local mobile units in providing telephone service for hospitals, police stations, and other critical locations.

To aid customers without service a number of steps were taken, including: / Local chapters of the Telephone Pioneers of America, the organiza­tion of veteran and retired telephone company em­ployees, arranged for volunteers to visit aged or handicapped residents of the affected area. The volunteers placed phone calls, ran errands, picked up dry cleaning and did grocery shopping. / More than 400 coin telephones were put into service in store fronts and on portable vans, connected to outlying central offices by trunk cable. / A message center manned by 100 operators was put into service so that the 8,500 business and professional people without phone service could receive messages.
It took 17 hours to bring the fire in New York Telephone's Second Avenue and 13th Street building under control. While it raged, thick smoke made the fight difficult for the firemen.

One of the earliest arrivals of emergency, re-routed equipment was these 270 pieces of main distributing frame, originally destined for California. The boxed pieces arrived from WE's Hawthorne Works at Newark Airport in the early morning hours of February 28.
All through the night, equipment needed to get the phones back in service arrived at Second Avenue. This truck brought cable from WE's Kearny Works.

Installers began assembling a new main distributing frame in the Second Avenue building just two days after the fire was quelled. Two days later, it was completely in place.
In the trenches and on the scaffolds, Bell System people do their restoration job in the wake of New York Telephone's disastrous Manhattan fire.

New wires dropped from overhead cable and ready to be connected have the attention of this WE installer. He's one of the approximately 1,200 WE installers who were on round-the-clock duty in the aftermath of New York Telephone's terrible fire.
The intricate job of wiring proceeded day and night on the new main distributing frame in New York Telephone's burned switching center. Shown are two Western Electric installers.

All the drawings needed to be instantly available to the engineers working to restore service in New York Telephone's Second Avenue building. The job of finding a particular drawing among the 65,000 pertaining to the switching center often fell to Mary Ann Davis, Regional Engineering clerk.
Operational Systems for Informing Management

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"Such a system will come incrementally: it will come as a new generation of management — a generation which has grown up with the computer — attains command responsibilities and top management responsibilities."

Management Information System

The way to reach a management information system that works and works well lies through the implementation of operational systems (systems that report and control operations), and integrating them with accounting and control systems through common data bases.

Ten years ago the term "management information system" was conveniently used to promise instant management information for decision-making by top management. This term had a favorable if mildly euphoric connotation of applying the computer to achieve a final solution to all management problems.

In the early 1970's, it became a term to be avoided — because it came to symbolize the failure of the application of data processing systems, not just the development of ill-conceived management information systems, but to applications in general.

Now, generations of equipment later, and generations of user experience later, there are indications that some form of what were once called management information systems are practical and are being well implemented.

Operational System

Much industry progress has occurred to facilitate the development of operational systems and their integration with accounting and control systems through common data bases. Users also have taken on the responsibility for learning to apply such systems to their work and have gained sophistication and experience.

Some History of Problems to Which Computers Were Applied

The first computers in the 1940's were designed to solve complex mathematical problems. The 1950's saw the extension of this and the broadening of applications of a mathematical nature. The benefit was the solution of problems up to then not soluble or a large reduction of the work to solve complex problems.

The 1960's were the years of clerical applications. During this period, computers were mainly employed to handle routine clerical tasks, to do record keeping, file maintenance, payroll accounting and to generate statistics and control assets.

These applications resulted in significant reduction of the clerical workload and produced some savings. Also, there were reductions in assets committed to various phases of business, particularly accounts receivable and inventory. In addition to the savings, however, computerization supplied the means to handle increasing workloads in a period of high turnover and personnel shortages.

Accounting and Control of Receivables and Inventory

We have largely accomplished the job of computerizing the accounting and control functions. To be sure, we need to improve these systems to make them more reliable and more secure. We need to develop systems that are tamper-proof and more auditable. I think a computer system could even be developed to prevent the management abuses displayed in the Equity Funding case.

At the time that users were buying machines for these applications, most users intended that this would be only a first step in the development of a management information system. But the concept of the management information system was not realizable at that time, starting from the installation base of most users during this period. Many users spent a good deal of their available resources in the 1960's converting routine applications they had already implemented from one type of machine to another, because they believed the new machines to be faster and better, which they were. Once the conversion was done, the machine would have surplus capacity available and so this would be used to tackle the problems of a management information system.

The Aim of "On-Line Decision-Making"

Management information systems in this context refer to the "on-line decision-making world" of the mid-1960's. The idea was that any information needed to operate the business could be available instantaneously to anyone who needed to know it. In fact, some writers and salesmen went so far as to offer the idea that a manager could be supplied the necessary information whether he realized he needed it or not. The information system would supply all levels of management with any package of data they needed, anytime, instantaneously, in any form desired.

But the fact is that most top level managers can't define their information requirements exactly and their requirements change continually. Decisions are often slow, not fast, and don't depend upon "on-line" data. And the higher one goes in the management hierarchy, the more likely the information to be required will be unanticipated.

The time needed to define and develop such systems was not considered. The cost was ignored or grossly underestimated. Defined in these terms, a management information system is an illusion. It, and the concept of the computer utility, were the computer myths of the 1960's.

The concept of the management information system (MIS) had its initial implementation step in what I will call the operational system. The implementation of these systems, however, turned out to be difficult and costly, but some progress was made. Even if MIS was a long way off or abandoned, the benefits of improved productivity and better middle management effectiveness were shown to be worth the efforts.

Management Control "While It Is Happening"

What are operational systems?

We know that any information that helps a manager to manage an operation is part of a management information system. But in order to have a management information system that will allow true control, we have to move from systems that report what has happened to those which enable management to control while it is happening. These are operational systems. This kind of input measurement and feedback requires that the operation be under direct control of the manager or other employee empowered to decide the changes needed to effect the result and the time to effect it. In some cases, this means real time, but in all cases it means the defined response time. These same requirements for input measurement and feedback are necessary for operational systems.

Whereas the management information system might be categorized as a system for top management control, systems for operational areas are the automation of information systems which permit a new way of doing a function and permit a much larger degree of middle management control.

Tying Together

I believe operational systems to be the next big step in the application of computers. This is the application area for the 1970's. The control of operations will be the next step along the way to the creation of total management information systems.

However, this step will take years to accomplish and it will have to be tied together with the already effective accounting and control systems before the hierarchy of management information systems can be established and effectively used.

In reality, operational systems are not new, but so far their application has been relatively limited compared to accounting and control applications.

Some True Successes

But much work has already been done. In airline reservation systems, air traffic control, telephone toll rating systems and wet process control systems, operational systems exist. Ford Motor Co., for example, has employed operational systems to allow automobile model production change-overs, without requiring a shut-down of the assembly lines.

While American Airlines' air reservation system was at first a disappointment, it was also one of the real success stories in this field. It and its sister systems are now the nerve systems of our modern air transportation system. Removal of these automatic airline reservations systems would be as impossible as the removal of our automatic telephone dialing systems. The current traffic in both cases is so great that there is no other way to accomplish the task.

The Weyerhaeuser Company was another case of a very early success in on-line integrated systems. This system was installed to accept and process sales orders from all over the United States. It did this job quite satisfactorily. However, one real accomplishment came out of their experience related to their being able to optimize the timing of price changes on lumber products. The critical requirement is to perceive the change in rate of arrival of orders early enough to be able to exercise some pricing options. Up or down in line with demand, the Weyerhaeuser operational system performs this task.

The Pillsbury Co. over the years has also developed a powerful and effective MIS at a high management level on a real-time basis. Basic sales and production data are fed into a central data base at the close of business daily. Information is presented for management review by division and product the next morning. Decisions are made daily based upon this review.

These are some early examples of operational systems. If the computer industry is to grow and we are to realize the promise of the application of computers for man's benefit, we need to expand the development of these kinds of systems.

Expenses and Difficulties

Operational systems have been expensive and difficult to implement. This was because industry technology and economics were not available to provide the tools, and the users in many cases did not dedicate sufficient resources and talents to implement them. Both constraints are in process of removal.

Let's consider the progress being made. The specifications for such systems read like a catalog of recent developments:

1. There is a need for common data bases and this implies data base management oriented systems.
2. There is a need for low cost communications and transaction systems.
3. There is a need for low cost data storage, available with varying access times.
4. There is a need for improved computer reliability and system availability.

Data Base Management

Most operational applications require data base management techniques. Data developed in different parts of the operation must be maintained in a systematic way so that all relevant inputs are selected. Thus the data will be constantly updated from a variety of sources. When an output is required, the user must know that he has current total infor-
nation and not data that is old or incomplete. How many times has one protested being dunned for a bill which has already been paid only to be told that the computer system is two weeks behind in posting cash receipts? How many times has an order been placed, when the shipment has already been executed? How many times have job opportunities been lost because job openings were late in being entered into the system? These are the issues that cause dissatisfaction, lost customers, and lawsuits.

What progress has been made in the data base creation and management? We now know how to build a data base using chains and referencing systems. Ten years ago we did not. We have significant device capability not available then. We have improved mass storage speeds, sizes, and economics as well as data communications performance and economics.

The work of Data Base Task Group on Standards has been valuable in bringing this progress to pay off at the user's installation. With Data Base Task Group standards, software becomes transferable among systems. It presents users with a single language to learn --- COBOL Extensions, and offers real opportunities to reduce programming costs.

**Distributed Bases and Communications**

Most large enterprises or government services have a very distributed user base. Such bases are distributed from a functional as well as a geographic aspect.

A true operational system is not conceivable without a communication network to gain input from the proper sources --- those sources will first have the relevant information --- and to give output in whatever time frame is justifiable from the cost point of view to the person who needs to act on the information.

High communication costs held back computer applications in operational areas. Here industry trends in both communications and computers are helping to make these kinds of applications more feasible. In the communication area, we have had improvement in line integrity. User cost to send a unit of data over a telephone line decreased by a factor of 2 between 1958 and 1966 due primarily to improved data set technology and bit rate capability. Between 1966 and today, further improvements in data set technology have yielded still higher transmission speeds and further reductions in unit transmission costs, in some cases to less than one-quarter the 1958 costs.

**New Communication Technologies**

Data transmission by satellite has become feasible and the connection of terminals has been broadened well beyond those which could be supplied only by telephone companies. From the computer side, a whole industry has grown up --- terminals, modems, multiplexers, concentrating computers, front-end processors, network processors. All of these are some of the contributions which the computer industry has made to reducing the cost and increasing the reliability of data communications.

A much discussed concept in the sixties was the computer utility. Someone discovered that the cost per bit processed decreased as the size of the computer increased. This phenomenon was translated into the idea that ultimately one or two large computer centers in each city could serve the needs of all users in the area. A parallel was drawn to an electric generating station serving the electrical requirements of the residents in a modern city. For many reasons, the concept was impractical and the parallel false — but a vestige of the idea has been reduced to successful practice. Large timesharing networks now in operation testify to this practicality. In fact, in many ways, the General Electric timesharing network system combines many of the attributes originally portrayed for the information utility. The GE Mark III Service drives thousands of terminals from more than 100 communication and information processing computers working as a single unified system for over 400 cities in North America, Europe, Australia, and Japan.

Even this system would not be conceivable without great progress in communications and the application of computers to the communication function.

**Facilities for Access**

Then too, operational systems require large amounts of data easily accessible. Data must be generally on-line or able to be brought on-line within the time frame that is less than the time interval of the operational decision it is to affect. This implies large amounts of mass storage at reduced access times. As an industry, mass storage capacity grew from 35 megabytes per spindle in 1964 to more than 200 megabytes this year, and we will double that in the next two to three years. Density likewise increased from 1000 bits per inch (BPI) 10 years ago to 5000 BPI this year, and it will double again in two years.

Access time has speeded up from 100 milliseconds in the mid-60's to below 30 milliseconds today. And further improvements are expected. Much has been done in queue management, such as seek-access techniques to speed up the apparent access time for each query. And finally, new technologies may provide an intermediate storage level between main memories and disks that still decrease access times even further. And in the future, semiconductor techniques will provide still lower mass storage costs.

**Reliability**

Finally, operational systems require a nearly continuous availability of the computer system. Interruptions in service on an accounting application is at worst, an inconvenience. Interruptions in operational and enclave environments, however minor, can negate the benefits of long periods of successful operation. The loss of an assembly line for as little as 30 minutes can override the benefits of days of successful optimization. This requirement implies high reliability of the main frame, of the operating systems, the software application systems, the peripheral subsystems, of the network, the network sub-systems and of the terminals. It implies redundancy at key places in the system. It implies fail-soft systems. It implies operational systems that sense degradation and automatically decide what to do about it. It implies the availability of files to more than one computer system. Restart and recovery must be able to be accomplished without loss of operational orders or data.

Progress is being made in all these areas but good system design must take into account the state of the art in reliability and not anticipate it.

Frankly, I am optimistic that the industry will be able to answer these requirements in the decade of the seventies and that operational systems can be implemented with confidence.

(please turn to page 31)
“The distribution of computers on a percentage basis has remained remarkably stable since 1968.”

The figures here show

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Manufacturing (including Process Industries)</td>
<td>36%</td>
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<tr>
<td>Non Manufacturing</td>
<td>72%</td>
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... which is certainly good correlation.

Her rough estimates for Non Manufacturing indicate

<table>
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<tbody>
<tr>
<td>Finance</td>
<td>15%</td>
</tr>
<tr>
<td>Service, Other than Government</td>
<td>15%</td>
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<tr>
<td>Government Service</td>
<td>15%</td>
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<tr>
<td>Other</td>
<td>20%</td>
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The actual distribution on this file is in reasonably close accord:

<table>
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<tbody>
<tr>
<td>Finance</td>
<td>13%</td>
</tr>
<tr>
<td>Services (of which Gov't is 9%)</td>
<td>26%</td>
</tr>
<tr>
<td>Other</td>
<td>23%</td>
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</table>

The article published in 1969 emphasized that "the main thrust of computers (from a penetration point of view) has been into manufacturing, services and finance. Over 80% of all computers are found in these three classifications." Omitting Computer Services and Service Bureaus the two figures for 1968 and 1974 are 80% and 78% respectively.

Thus it is probably no longer noteworthy as it was in 1969 that "two out of every three computers are installed in some non-manufacturing entity ... a ratio possibly higher than might have first been imagined."

In 1969 about half the computers in use in manufacturing were in metalworking plants or companies. In 1974 metalworking installations accounted for slightly over 50% of installations in manufacturing. In both cases this is higher than the proportion (35%) that metalworking plants are to all manufacturing plants. In 1969 the data disclosed, "of those SICs with penetration of one in ten or better, metalworking is again just about 50%." In 1974 the same holds true.

It should be noted that this is a study of installations -- and not of individual computers. Most federal government installations, as well as a high proportion of major business installations consist of multiple units at one address. It is
likely that the 39,000 odd installations involved represent something like 60,000 of the nation’s 120,000 or so full scale non-mini-computers. (No attempt has been made by the magazine nor by this writer to incorporate mini-computers into this file.) Every reasonable effort has been made to locate installations, including compilation from virtually every printed directory (state, classification, and national) of computer installations published in 1973 and 1974.

The relatively modest increase (40% if just user-oriented computer installations are considered) makes one of the 1969 predictions rather suspect. This read, “If computers are destined to double, as seems rational, by 1972 and double again by 1980, it is likely the penetration in manufacturing will move from one in forty to one in twenty and then to one in ten. By that time, every other firm in the higher penetration quartile (about one in two plants in manufacturing have ten or less employess) can be expected to have its own computer in house.”

From this data (Computers in Manufacturing now are 1 in 25) it is likely that the prediction will be amply true -- counting mini-computers, which are likely in the next decade to double the number of companies and institutions using in house computers. But if we omit mini-computers from the picture, it seems evident that while total installations are growing, the much more dramatic growth is in computer power -- as users trade up -- for larger more powerful and more sophisticated gear.

Since we are dealing with a 1974 file with 40% more records, spread rather similarly to the 1968 file, it is not surprising to note that penetration ratios have increased in virtually all business classifications.

In manufacturing, computers have now penetrated one of every twenty-five plants ... whereas in 1968 that penetration was one in forty. Modest penetration increases have been scored in Social Services, and Mining. Wholesaling has doubled in this period -- from one in two hundred to one in one hundred, as have Business Services (still excluding Computer Services and Service Bureaus). Even Retailing and Contracting show similar doubling of penetration. But as of this date only one Contractor in one thousand -- or roughly three hundred -- has a computer in house. And the same ratio of one per one thousand establishments holds for Retailing.

Penetration by Standard Industrial Classification Code

In 1968 penetration by two digit SIC Code (See Table II) ranged from 1 in 6 (for Ordnance) to 1 in 200 for Furniture and Lumber and Wood. By 1974 this penetration range had been decisively narrowed to 1 in 4 (for Ordnance) to 1 in 80 for Furniture and Lumber and Wood.

Again indicating that penetration is relatively stable -- and pervasive over all manufacturing, there is virtually no change in rank order between 1968 and 1974. (Petroleum Refining and Allied records actually dropped slightly on the file between 1968 and 1974 which may indicate that this classification is turning to larger and much more powerful installations rather than to more installations).

As in 1968 better than one in five computers in use is now to be found in one of the social services (0,000-9,400) -- which once again re-emphasizes the tremendous impact of computers.

Again as in 1968 the total number of computers in use in social services is greater than the total number found in finance -- but in the six-year interval the differential between these two classifications has increased.

COMPUTERS IN USE

<table>
<thead>
<tr>
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<th>1974</th>
<th>1968</th>
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<tbody>
<tr>
<td>Finance</td>
<td>3,192</td>
<td>2,967</td>
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<tr>
<td>Social Services</td>
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<td>4,206</td>
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</tbody>
</table>

Of the total for social services again as in 1968 almost half are found in governmental services (SIC 9100-9400) ... and the majority of these are locations in the federal government. (It should be noted that this study deals with locations of computers, and not numbers of computers per se. In the federal government the proliferation of computers per location -- about four to each location -- exceeds the ratio to be found in the private sector).

The high figure for education is skewed somewhat by the relatively thorough data available for College and University computer operations. The number of computers found in colleges and education in general is nearly equal to all computers in all levels of government, federal, state, and local combined. This condition was also true in 1968.

In 1968 the only other significant penetration within Social Services was in Hospitals and Associations, and to some extent Social Service organizations (primarily, it might be inferred, to control recency, frequency, and dollars of donations). The same is true in 1974. Church groups, labor, medical services other than hospitals still show little penetration, so far. The vogue of the mini, however, may and probably will alter this in the decade ahead.

I stated in 1969, "If some 300,000 trained minds are now working on, with, and for computers, some 65,000 are now likely to be working in some form of social service (non profit) applications. It is possible, in fact even likely, that this important minority will produce greater changes in the coming years than all the 240,000 or so computer specialists working in the profit sector of our economy." Not knowing just what the Armed Forces are doing with 650 much more powerful installations today than the 830 they had in use in 1968, one cannot be certain if there is or is not validity in that prediction of five years ago. Certainly outside the Armed Forces there is little to indicate it is as yet coming to pass.

Overall the penetration of computers for users has increased from 1/200 in 1968 to 1/150 in 1974 ... which is considerably slower than the growth predicted by most computer "experts" in 1969. It just may be that a ratio of some 1 in 100 -- or 50% better than present -- may be the leveling off point for main frame computer installations for users in the U.S. The slowing of the growth since 1969 plus large scale developments at either end of the computer spectrum -- time sharing on huge "computer utility" systems at one end and proliferation of mini-computers at the other, all seem to point in this direction.

Computer Services

A further factor which has obviously inhibited the growth of systems by users is the remarkable growth of Computer Services and Service Bureaus. In 1965 a compilation of all listings of such services
in every classified phone directory for every city of 10,000 population or above in the United States (sorted out by phone number to eliminate duplication) disclosed just over 1000 firms (offering computer based schooling, services, computer letters, tabulating, programming, analysis, systems, computer and peripheral equipment rental, sales and services). In 1968 firms in this cluster of classifications had risen to 7,000. Today it is over 12,000. And most have a computer "in house."

**The Financial Field**

Computer installations in Finance increased only slightly in the six years between the two studies -- so that the percentage of installations reduced from 17% in 1968 to 13% in 1974. Finance, in fact, is the one major SIC classification which shows virtually no difference in penetration of the market -- by number of installations -- from 1968 to date.

Penetration in finance in 1974, as in 1968, is somewhat deceptive. Insurance, overall, shows up in 1968 and in 1974 as 1/80. But Insurance Company Home Offices which do not total more than 1000 in the U.S. account for the lion's share of all computer installations in the insurance world which consists of 150,000 smaller fry including agencies, adjusters, branch offices, special agents, general agents, and brokers. Over half of all insurance companies are represented on this file giving a penetration ratio of one in two. This small group of home offices is the main reason Insurance accounts for 40% of all Computer installations in the entire field of Finance.

The overall penetration of the offices of stock brokerage firms is somewhat less than for all banks.

The overall penetration of the offices of stockbrokers is about equal to that shown for all banks. It is probable, if the some 1,100 broker members of the New York and American Exchanges were segregated out, the penetration would, as in major banks, approach 1 in 4 or 5.

For loan and credit offices, where branch operations outweigh home offices by some 4 or 5 to 1, the penetration shown (1/100) is obviously nearer 1 in 25 when home offices only are checked. And if most, which is likely, are in the 500 or so firms in this field with some 15,000 branches, then the penetration ratio approaches 1 in 2 or 3.

The proliferation of small entities in real estate is emphasized by the extremely low penetration by computers in this field. Interestingly enough, insurance agencies, which are often equated with real estate so far as size and market for business services are concerned, show far greater penetration.

**Retailing**

In retailing (4.5% of computers) only department stores show greater penetration than business as a whole. There are more department stores with computers than are found in any complete two digit retail classification (Lumber and Building Materials, Food Stores, Automotive, Apparel, Home Furnishings, Eating and Drinking, All Other).

While department stores are roughly 1% of all rated and/or listed retail, they account for 30% of those computers found in retailing. This might be considered surprisingly high until it is recalled that all chain operators in the country with 3 or more outlets do not total over 10,000 -- and it is likely a goodly proportion of that other 70% of computers in retailing will be found in chain operations.

**Wholesale Trade**

Computer Installations in wholesaling increased substantially in the period -- from 1232 to 2301 -- from 7% of installations to 9.57% of installations.

Wholesale Trade shows a penetration ratio approximately ten times as great as retail, and now about one fourth as great as manufacturing (up from 1/5th in 1968). The range of penetration, which might have been anticipated, is much smaller for various classes of Wholesaling than for other business segments -- and this range has been decreased in the six years between the two studies. In 1968 this range was from 1/80 to 1/400 -- and averaged out at 1/200. In 1974 this range is from 1/59 to 1/200 -- and averages out at 1/100. Manufacturing using two digit SIC groupings (Table VII) shows in 1974 a range not of 4 or 5 to 1 but of 20 to 1 (1/4 to 1/80 in 1974; 1/6 to 200 in 1968). Higher ranges, of course, can be found in retail, finances, and services. It is instructive to note that the pressure of the workload, not the kind of wholesaler is the key to penetration. The following prediction made in 1968 seems to have held up rather well:

As manufacturers and software producers bring to bear computerized thinking into the handling, picking, stocking, storing, shipping and recording of wholesale inventories, the infiltration of computers is likely to increase even more rapidly than in some of the other easier-to-penetrate business classifications.

**Penetration by Wholesale Class**

<table>
<thead>
<tr>
<th>SIC</th>
<th>Universe</th>
<th>No. of Computer Installations</th>
<th>Penetration Ratio</th>
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<td>501</td>
<td>28,000</td>
<td>154</td>
<td>1/200</td>
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<tr>
<td>502</td>
<td>8,000</td>
<td>170</td>
<td>1/50</td>
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<tr>
<td>504</td>
<td>45,000</td>
<td>400</td>
<td>1/100</td>
</tr>
<tr>
<td>505</td>
<td>7,000</td>
<td>53</td>
<td>1/150</td>
</tr>
<tr>
<td>506</td>
<td>18,000</td>
<td>177</td>
<td>1/100</td>
</tr>
<tr>
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<td>115</td>
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<tr>
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<td>1/100</td>
</tr>
<tr>
<td>509</td>
<td>94,000</td>
<td>824</td>
<td>1/100</td>
</tr>
</tbody>
</table>

The "Industrial Complex"

Some business analysts expand manufacturing into what they term an "industrial complex" ranging in SIC terms from Mining through Contracting, Manufacturing and Transportation, Communication and Utilities.

From the point of view of computer penetration, there is something to be said for this grouping.

Transportation, Communications, and Utilities (SIC 4000-4999) with 6% of computers, shows in 1968 a 1 in 80 penetration -- or about 1/2 of manufacturing. By 1974 the penetration has increased to 1/60.

Mining (1% of computers) is next in line with a ratio of 1 to 100 in 1968 and 1/80 in 1974.

The "Industrial Complex" theory breaks down, however, when one turns to Contracting (1/2 of 1% of Installations in 1968, 1% of Installations in 1974). Where the penetration ratio in 1974 is only 1 in 1000. There are virtually as many Research Labora-

*Notes:*

- For May, 1975
- The proliferation of small entities in real estate is emphasized by the extremely low penetration by computers in this field. Interestingly enough, insurance agencies, which are often equated with real estate so far as size and market for business services are concerned, show far greater penetration.
POLITICAL ASSASSINATIONS IN THE UNITED STATES

− Inventory of Articles Published in Computers and People (formerly Computers and Automation) 1970 to 1975

− 1970 −


A reexamination of some of the evidence relating to the assassination of John F. Kennedy — with emphasis on the possibilities and problems of computerized analysis of the photographic evidence. A 32 page article demonstrating that the "lone assassin" story cannot be considered true.


More about Jim Hicks / Confirmation of FBI Knowledge 12 Days Before of a Plot to Kill President Kennedy / The Second Conspiracy about the Assassination of President Kennedy

The Assassination of Senator Robert F. Kennedy / August 1970

Preface, by Edmund C. Berkeley / Two Men With Guns Drawn at Senator Kennedy's Assassination: Statement to the Press, by Theodore Charach / Map of the Scene of the Assassination of Senator Robert Kennedy / The Pantry Where Senator Robert Kennedy was Assassinated / Bullet Hole in the Frame of a Door / Two Bullet Holes in the Center Divider of the Pantry Door

Patterns of Political Assassination: How Many Coincidences Make a Plot? / by Edmund C. Berkeley, Editor / September 1970

How the science of probability and statistics can be used as an instrument of decision to determine if a rare event is: (1) within a reasonable range; (2) unusual or strange or suspicious; or (3) the result of correlation or cause or conspiracy.


The Conspiracy to Assassinate Senator Robert F. Kennedy and the Second Conspiracy to Cover It Up / by Richard E. Sprague / October 1970

A summary of what researchers are uncovering in their investigation of what appears to be not one but two conspiracies relating to the assassination of Senator Robert F. Kennedy.

Index to "Special Unit Senator: The Investigation of the Assassination of Senator Robert F. Kennedy" / October 1970

An index is supplied for the Random House book written by Robert A. Houghton, of the Los Angeles Police Department, about the investigation of the assassination of Senator Robert F. Kennedy.

Confidential and Secret Documents of the Warren Commission Deposited in the U.S. Archives / by Neil MacNold, Assistant Editor / November 1970

A list of the subjects of over 200 documents of the Warren Commission which were classified confidential, secret, and top secret.

The Assassination of Reverend Martin Luther King, Jr., The Role of James Earl Ray, and the Question of Conspiracy / by Richard E. Sprague / December 1970

James Earl Ray says he was coerced into entering a plea of guilty to killing Martin Luther King . . . and contrary evidence (plus other evidence) have led to filing of legal petitions for relief.

− 1971 −

The Death of Walter Reuther: Accidental or Planned? / by Edmund C. Berkeley and Leonard Walden / January 1971

Some significant questions about the plane crash in May 1970 in which Walter Reuther was killed.

The Report of the National Committee to Investigate Assassinations / by Bernard Fensterwald, James Lese, and Robert Smith / February 1971

What the National Committee in Washington, D.C. is doing about computerizing files of evidence, initiating lawsuits to obtain information, etc. and comments on two new books by District Attorney Jim Garrison and Robert Blair Kaiser.

"The Assassination of President Kennedy: The Application of Computers to the Photographic Evidence" — Comment / by Benjamin L. Schwartz, Ph.D. and Edmund C. Berkeley, Editor / March 1971


II. Responses, by Edmund C. Berkeley, Editor

District Attorney Jim Garrison on the Assassination of President Kennedy: A Review of Heritage Stone / by Neil MacNold, Assistant Editor / March 1971

The Right of Equal Access to Government Information / by the National Committee to Investigate Assassinations, Washington, D.C. / April 1971

The Assassination of President Kennedy: The Spatial Chart of Events in Dealey Plaza / by Robert B. Cutler, Architect / May 1971

The chart, first published in May 1970, is revised and brought up to date.

The Case of Secret Service Agent Abraham W. Bolden / by Bernard Fensterwald, Attorney, Executive Director, National Committee to Investigate Assassinations / June 1971

Bolden wanted to tell the Warren Commission about a Chicago plot to kill President Kennedy, and was jailed six years on a framed-up charge for trying to do so.


The issue of systematic suppression of questions about the assassination of President John F. Kennedy, and a hypothesis.

Jim Garrison, District Attorney, Orleans Parish, vs. the Federal Government / by Bernard Fensterwald, Attorney, Executive Director, National Committee to Investigate Assassinations / August 1971

How District Attorney Jim Garrison of New Orleans became interested in the New Orleans phase of the assassination of President Kennedy; and how the Federal government frustrated and blocked his investigation in more than a dozen ways.

The Federal Bureau of Investigation and the Assassination of President Kennedy / by Bernard Fensterwald, Attorney / September 1971

How J. Edgar Hoover and the FBI withheld much pertinent information from the Warren Commission, flooded them with irrelevant information, and altered some important evidence, thus concealing Oswald's connections with the FBI.

The Assassination of President Kennedy — Declassification of Relevant Documents from the National Archives / by Richard E. Sprague / October 1971

The titles of the documents and other evidence indicate convincingly that Lee Harvey Oswald was trained in spy work by the CIA before his visit to Russia; etc. Like the Pentagon Papers, these documents should be declassified.

The Assassination of President Kennedy: The Pattern of Coup d'Etat and Public Deception / by Edmund C. Berkeley, Editor / November 1971

Five significant, eye-opening events from May 1970 to October 1971, showing patterns of coup d'etat, assassination, and concealment; and some predictions.


A study of the reasons why a great deal of the Federal government's own evidence in the assassination of President John F. Kennedy declared "conspiracy" — and a hypothesis, supported by considerable evidence, about why the President was assassinated and how the implications of that action were to be signaled to those who could read the signals.

The Strategy of Truth-Telling / by Edmund C. Berkeley, Editor / December 1971

− 1972 −

Spotlight on McGeorge Bundy and the White House Situation Room / by Robert B. Cutler, Manchester, Mass. / January 1972

An argument that the "lone assassin — no conspiracy" announcement from the White House Situation Room could have resulted from information available in Dallas and Washington prior to the announcement — and thus does not actually demonstrate that someone there had a guilty foreknowledge of the shooting.

Who Shot President Kennedy? — Or Fact and Fable in History / by Gareth Jenkins, Wotton, Mass. / February 1972

How the physical evidence actually published by the Warren Commission relating to the assassination of President John F. Kennedy shows conclusively that more than one man was responsible for the shooting — contrary to the Commission's own report.

Dallas: Who, How, Why? (in four parts) / by Mikhail Sagatelyan, Moscow, USSR / March, April, May, June 1972

A long report published in Leningrad, USSR, by an ace Soviet reporter about the circumstances of the assassination of President John F. Kennedy, and their significance from a Soviet point of view.

COMPUTERS and PEOPLE for May, 1975 29
The Shooting of Presidential Candidate George C. Wallace: A Systems-Analysis Discussion / by Thomas Stamm, Bronx, N.Y., and Edmund C. Berkeley, Editor / July 1972

An analysis of the shooting of Governor Wallace of Alabama; and a discussion of systematic methods for protecting American leaders from violent attacks.

The Shooting of Governor George C. Wallace, Candidate for President / by Edmund C. Berkeley, Editor / July 1972


A review and summary of the evidence showing conclusively the fact of conspiracy and the presence of two guns firing, at the time of the assassination of Senator Robert F. Kennedy.

The Central Intelligence Agency: A Short History to Mid-1963 — Part 1 / by James Hepburn, author of Farewell America / November 1972

The unverified, but probably largely true, secret history of the Central Intelligence Agency of the U.S. — at a preliminary to its involvement in the assassination of President John F. Kennedy.


Le Francois Qui Devait Tuer Kennedy (The Frenchman Who Was to Kill Kennedy) / by Philippe Bernert and Camille Gilles, Paris, France / December 1972 — 1973 —

The Frenchman Who Was to Kill Kennedy / by Philippe Bernert and Camille Gilles, L'Aurore, Paris, France; translated by Ann K. Bradley / January 1973

English translation of the French newspaper report on José Luis Romero, which was reprinted in French in the December issue.

Why I Distort the Romero Story / by Robert P. Smith, Director of Research, Committee to Investigate Assassinations, Washington, D. C. / January 1973

The Romero report reprinted from L'Aurore has many earmarks indicating that it is very difficult to believe.

Analysis of the Autopsy on President John F. Kennedy, and the Impossibility of the Warren Commission's "Lone Assassin" Conclusion / by Cyril H. Wecht, M.D., Institute of Forensic Sciences, Pittsburgh, Pa. / February 1973

The coroner of Allegheny County, Pa., reports on his examination of the evidence that still remains (some of it is missing) locked up in the National Archives of the United States, not accessible to ordinary investigators.

The New Orleans Portion of the Conspiracy to Assassinate President John F. Kennedy — Four Articles: (1) by Edmund C. Berkeley (April); (2) by Jim Garrison (April); (3) by F. Irving Dymond (May); (4) by Jim Garrison (May)

On November 20, 1972, the Supreme Court of the United States refused to permit Jim Garrison, District Attorney, New Orleans, to prosecute Clay Shaw for perjury. On November 21, Jim Garrison issued a statement commenting on this refusal, which is Article 4 of this set; Article 1 is an introduction; Articles 2 and 3 are opening statements to the trial jury, by Jim Garrison, Prosecutor; and F. Irving Dymond, attorney for the defendant, in the February 1969 trial of Clay Shaw in New Orleans; Clay Shaw was charged by the grand jury with "having conspired with David W. Ferrie and Lee Harvey Oswald to murder President John F. Kennedy" — in regard to which the trial jury found Clay Shaw "not guilty".

Burying Facts and Rewriting History / by Edmund C. Berkeley, Editor / May 1973

Taken together, the information published May 1970 to May 1973 in Computers and Automation effectively destroys a large segment of the belief, the rewritten history, that the establishment in the United States has arranged for the people in the United States to believe.


An examination of what happened in many important American news organizations, to cover up and hide the facts about how President John F. Kennedy was actually assassinated in Dallas.

Establishments and Truth / by Edmund C. Berkeley, Editor / September 1973

The nature of an establishment as a system

A Parallel of 1963 / by Marguerite C. Oswald, Ft. Worth, Texas / September 1973

The ignoring of evidence of conspiracy regarding Lee Harvey Oswald — a parallel to the Watergate cover-up.

The Framing of Lee Harvey Oswald / by Richard E. Sprague, Hartsdale, N.Y. / October 1973

When Lee Harvey Oswald was arrested, Nov. 22, 1963, for the assassination of President John F. Kennedy, he said to his captors in the Dallas jail cell, "I'm a patsy". A review of the evidence (including 18 photographs) proves that Oswald was a patsy, and that he was "framed" for the murder of President Kennedy — although "establishmentese" American history denies it.

Burying Facts and Rewriting History — II / by Edmund C. Berkeley, Editor, Computers and Automation / November 1973


How Jim Garrison, District Attorney of New Orleans, was tried on false charges brought by the U.S. Department of Justice that he received bribes; how the trial proceeded — making use of a bought judge, fabricated evidence, and spliced tapes; how the jury found Garrison innocent on the first ballot, and how the United States press almost entirely suppressed the true story — establishing evidence of a continuing conspiracy by a portion of the establishment in the United States.

The Attempted Framing of Jim Garrison — Part 3 / by Ivan Dryer, Los Angeles, Calif. / January 1974

How one of the investigators, Pershing Gerva\is, formerly hired by New Orleans District Attorney Jim Garrison, was forced and paid by the U.S. Department of Justice to establish a false life in Canada, and how Gerva\is told the whole story on television in May, 1972.

The Assassination of the Reverend Martin Luther King, Jr., and Possible Links with the Kennedy Murders — Parts 1 to 11 / by Wayne Chastain, Jr., Reporter, Memphis, Tenn. / February to December 1974

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.

Conspiracy to Kill Leaders of Blacks, and FBI Involvement in It / by United Press International / May 1974


Governor George Wallace of Alabama, presidential candidate, was shot and nearly killed May 15, 1972, in Maryland; at least a dozen pieces of solid evidence demonstrate conspiracy and cover-up, and the trail connects with Watergate.


1975


Presenting "a reasonable hypothesis" for Gerald Ford's pardon of Richard Nixon, and other extraordinary events correlated with that.


People in the Watergate United States of 1972-75 have finally begun to realize where the important issues lie: The important issues related to computers are largely political, criminal, or moral. What therefore is implied by a true social concern?

Conference in Boston on U.S. Political Assassinations Attended by Over 1600 Persons / by Assassination Information Bureau, Cambridge, Mass. / March 1975

Highlights on the largest conference so far on this subject, and some news of developments in Congress and elsewhere.

American Oil Interests, the Central Intelligence Agency, and the Reversal of President John F. Kennedy's Plans to Get Out of Viet Nam / by Grace P. Vale, St. Louis, Mo. / March 1975

Reporting on some careful tracking of people and events related to the assassination of President Kennedy in Dallas, Texas, Nov. 22, 1963.

Political Assassinations in the United States, and Computers and People / by Edmund C. Berkeley, Editor / March 1976

The policy of this magazine is to publish both "safe" and "unsafe" articles, both "pro-establishment" and "anti-establishment" articles.

The Assassination of President Kennedy — Some Comments / by Jack White, James P. Murphy, and J. L. Maynard / March 1975

The Politics of Conspiracy, the Conspiracy of Politics / by Sid Blumenthal and R. D. Rosen, Boston, Mass. / April 1975

A careful and thoughtful report on the information brought out at the conference attended by over 1500 persons at Boston University, Boston, Mass., Jan. 31 - Feb. 2, organized by the Assassination Information Bureau.

House Resolution 204 — For a Congressional Committee to Investigate Political Assassinations in the United States / by Representative Henry B. Gonzalez, Member of Congress, Washington, D.C. / April 1975

"People and the Pursuit of Truth" / April 1975

Announcement of a new, separate, monthly magazine starting May 1975, which will take over and expand the reporting (up to this time provided by "Computers and People") of the cover-ups of political assassinations in the United States and other important suppressed truth.
COMPUTER PENETRATION OF THE "INDUSTRIAL COMPLEX"

Penetration Percentage

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<th>Computer</th>
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(To be continued in next issue)

Tomeski — Continued from page 15

Responsibilities of Computer Manufacturers vs. Responsibilities of Computer Users

What about the respective social responsibilities of the computer manufacturers and computer users? It is difficult in some areas to draw a line where vendors' responsibilities end and users' begin.

Nevertheless, the computer vendors should be concerned about the public image of computers as it relates to both the computer industry and the use of computers. The automotive companies are apparently increasingly concerned about certain social responsibilities (even if they cannot directly control them in all instances): fatalities from automobile accidents, accidents causing injuries, air pollution due to fumes from car exhausts, recall of vehicles due to faults in manufacturing or quality control, etc. Similarly, other business organizations — including computer vendors — are likely to face a broad spectrum of social responsibility issues.

An increasing awareness about such social responsibility areas, as discussed in this article, would probably aid the computer profession in setting broad goals which would strengthen its service to society and its public image. It would appear that both computer vendors and computer users can substantially improve their awareness of and contribution towards their social responsibilities.

References


Spangle — Continued from page 25

Economic Pressures

The long term trends and inflation in wages and material will provide the economic impetus for users to implement these types of systems. Certainly the forces of inflation and economic shortages are giving users the economic incentive to apply computers to an ever broadening spectrum of activity.

Just as the manufacturing half of the industry has made progress, and will continue to make more, so will it be with the user side. Users have learned how to use the tools available. They have learned something about the costs in resources and time in implementing operational systems. They have learned to balance these costs with the benefits to be achieved.

All of us have a job to do in bringing this about in the next 10 years. Computer companies must support the growth of such systems and provide the techniques, but users must shoulder the responsibility for executing them, and participate in their failures and costs, as well as their successes and profits. Middle and top management must provide the environment and sense of managing change that will bring them about.

The Base for Management Information Systems That Work

Looking a step beyond, if these operational systems and accounting and control systems are implemented with common data bases, then we have established the base for a management information system. Such a system will come incrementally. It will come as a new generation of management — a generation which has grown up with the computer — comes to command responsibilities and top management responsibilities. They will have grown up through a middle management experience familiar with data processing techniques and in many ways unfamiliar with seat-of-the-pants management.

They will know what files exist. They will know what information is useful in real time and what is just as useful in a monthly report. They will know about simulation, modeling, and statistical techniques.

They will start to extend the use of the operational data banks to help top management decision-making. They will develop a true management information system because they will know what information is available and what information is needed to do a more effective job of management.

New monthly magazine

PEOPLE AND THE PURSUIT OF TRUTH
starting May 1975

See the announcement on the back cover of this issue.
COMPUTER "BREEDS" CATTLE HERDS ON CAMPUS

Dr. Charles Gaskins
College of Agricultural Sciences
Texas Tech University
P.O. Box 4249
Lubbock, Texas 79409

Thousands of the finest beef-producing cattle ever bred are "roaming the grounds" at Texas Tech University. The mammoth herd is "corralled" in a computer on campus.

At the start of each semester, students studying Animal Genetics are assigned "herds" of cattle in the form of computer selections listing different genetic characteristics for as many as 50 imaginary animals. Each student's objective is to make genetic improvements by interbreeding the animals. The computer compresses 15 years on a genetic time scale into 12 weeks. A computer program simulates the most important genetic characteristics of livestock. Each student's initial computer-generated "herd" contains a list of characteristics for each animal including weight, fat thickness, sex, etc. Their breeding choices are entered into the university's computer, which combines the characteristics of each animal with random environmental factors to produce a second generation of cattle. Based on the sires and dams selected, the computer program determines if the mating was fertile, if the calf died at birth, or if a healthy animal resulted.

The computer then produces a second generation "herd", again listing genetic characteristics students use to select their breeding animals. Mathematical models describe traits of cattle and the factors that influence these traits. Without the computer, the genetic computations would take months. As the students continue to simulate breeding of their animals, they learn the importance of an animal's rate of weight gain, the amount of feed it takes an animal to gain one pound, and other factors important in breeding.

At the end of the course, the computer produces an analysis of all the generations produced by each student. The final analysis enables students to see where they made mistakes. It shows them that selecting proper breeding animals is not a simple process. The fattest sire and fattest dam would be logical mates. However, the computer program shows that when progress is made in meatiness, reproductive performance declines.

The computer enables students to take classroom theory and test it, as if each student had an actual herd and a great number of years to experiment with it.

VIBRATION TESTS OF A LARGE SPACE TELESCOPE PROVE ITS FEASIBILITY AND CUT THE DEVELOPMENT RISKS

Newsbureau
Lockheed Missiles & Space Company, Inc.
(A Subsidiary of Lockheed Aircraft Corp.)
Sunnyvale, Calif.

Experiments conducted in Sunnyvale, Calif., by Lockheed Missiles & Space Co. have identified and confirmed some of the complex engineering techniques needed to assure the extremely precise pointing accuracies that will be required for NASA's Large Space Telescope (LST).

The LST, one of the first payloads planned for the Space Shuttle in the early 1980's, will make astronomical observations from an orbit 300 miles above the Earth's surface. Lockheed presently is under contract to NASA's Marshall Space Flight Center for preliminary LST design and definition studies.

Free of the Earth's atmospheric interference, the LST will be able to observe objects 50 times fainter and 7 times farther away than is possible with the best ground-based telescopes. It will also offer a 10-fold improvement in resolution.

To do this, however, the LST must maintain pointing accuracy of .005 arc seconds while an object is under observation - sometimes for as long as 30 to 40 hours.

The Lockheed experiments centered on one potential source of image distortion: The possibility that extremely small microvibrations (30 micro-g's) from the high-speed rotation of LST control moment gyroscopes (CMG's) could be transmitted to the telescope's optical surfaces. The gyro's are used for spacecraft attitude control.

A full-scale engineering model of the 2.4-meter-diameter telescope was used during the experiments. Standing approximately 9 meters tall, the test model contained representative LST structures, including primary and secondary optical surface simulators and operating CMG's.

A special support system used air suspension to isolate the model from building vibrations that could have produced erroneous response data.

To determine the effect of the gyro's, the Lockheed experiments had five specific objectives:

- To develop and evaluate microvibration measurement techniques;
To verify the validity of analytical pointing accuracy prediction techniques by comparing theoretical and experimental structural response data.

To evaluate the influence of CMG speed and spin vector orientation on pointing accuracy.

To evaluate the effectiveness of CMG vibration isolators in improving pointing accuracy.

To examine the interaction effects between adjacent CMG's.

The experiments were conducted using Lockheed's MODALAB (Mobile Dynamic Analysis Laboratory) system.

This automated test system allows real-time reduction, display, and evaluation of test results, highlighting those modes which are major contributors to total pointing accuracy distortions.

The portable MODALAB system includes an analog-to-digital converter, a 256-channel multiplexer, and a Digital Equipment Corp. PDP-11/45 processor with dual removable discs, each having a capacity of 1.2-million 16-bit words.

The system also used 15 shakers and 240 accelerometers to generate and monitor microvibrations at levels suited to the LST project.

According to Max W. Hunter II, Lockheed's LST program manager, the project successfully met all test objectives. It demonstrated the feasibility of the microvibration measurement systems, verified the validity of Lockheed analytical pointing accuracy prediction techniques, and provided substantial insight into the principal factors contributing to pointing accuracy control.

"As a result," Hunter said, "engineering development risks — both cost and technical — have been greatly reduced."

A NEW NETWORK TO SPEED PARTS CHANGES, INSTALLED FOR AMERICAN MOTORS CORPORATION

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A new computerized Engineering Documentation System using video terminals is saving American Motors, Detroit, Mich., about 90 percent of the time it usually takes to implement parts changes. A parts change that used to take from six to nine weeks is now completed in three days. The network, with a total purchase value of over $300,000 is composed of 40 video terminals and other equipment at a dozen locations. The system is fully operational and can be expanded as requirements increase.

"A simple lug bolt that required as many as 300 to 400 separate entries can now be completed with a single entry," according to John Sanders, Assistant Manager of Engineering Documentation. He maintains a data base of around millions of auto parts, their relationships to one another, and where they are used.

"When you consider that even a holdover Matador model requires 20 percent parts changes, a new Pacer, available in three models and 15 colors, has about 60 percent parts changes, and that the same part may appear many times throughout the entire line, the cost of parts changes in any model year commands attention.

"It was impossible to do anything about it using the old keypunch method; but, with terminals giving AMC operators immediate, direct, and continuous access to the data base, a change can be made, documented, and authorized in minutes.

"As a result, redesign costs are lower and paper floods in accounting, purchasing, production planning, and engineering are reduced. Last-minute innovations that might improve the salability of AMC cars can be encouraged." In calendar year 1974, while industry sales declined almost 23 percent, AMC held to within 15 percent of its 1973 volume.

So far, the payback on the system is substantially ahead of schedule. The repeated purchase of keypunch cards and use of operational printouts have been eliminated for the most part, replaced by terminals with alphanumeric keyboards. Instead of typing on punch cards, the operator types his or her instruc-
tions in clear text on the screen. Data forms are lined on the screen so that parts changes become a process of "fill in the empty spaces".

"The use of one, clear, legible record on the screen takes the place of much paperwork. It has eliminated the mistakes that go with paper records."

"The integrity of our data base is improved with the elimination of the intermediate keypunch step, and so has our security."

The new Engineering Documentation System is segmented into 35 formats under seven classifications. Each format represents an area of responsibility, such as purchasing or engineering. Putting data into the data base is confined to a few skilled persons in each area who are given special numbers and passwords to which the computer will respond. An engineer's number will not access an accountant's format, and vice versa.

Because entries are limited to a few persons, the chances for pilferage and mischief are small. Because operators are chosen for their skill, mistakes are fewer and the quality of the inputs has become professional.

Each entry is recorded with the time, date, and who made it. The output is given to the department of origin every day so that misfortunes that do get through can be corrected.

The terminals are also used to monitor the basic methods and procedures Engineering Documentation has set up, in search for ways to improve them.

In this system, GTE/IS 7801 video terminals with alphanumeric keyboards (provided by GTE Information Systems, Stamford, Conn.) access an IBM 370/145 768K computer with tape drives and disc storage. Terminals are tied into a 1270 controller. Modulation and demodulation are accomplished with 24 baud modems through dedicated phone lines. The video terminals have 1920-character screens.

DIGITIZED SPEECH FOR IMPROVED TRANSMISSION

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0001110001110011101011001111000110000011000010100
1110000110000111101010001101100110100011000001100
01111000110011100011111111111111111111111110100
00000111100001111001101010100011000000110000101
110000011000011100111111111111111111111111110100
0000111110000111110011010101001101010111111111111110100
111100001100000111111111111111111111111111110001
1111000011000001111111111111111111111111111111111
000011111111111111111111111111111111111111111111111111111

That's not a test pattern, and no, the typesetter did not go berserk. Look again and you'll see a visual depiction of speech digitized for telephone transmission.

Each line of binary numbers represents a part of a telephone conversation. Using only slightly more complex equipment and without sacrificing quality, all eight conversations are taken place simultaneously on the same standard telephone line that now carries a single call.

The economic advantage of increasing capacity without a major investment in new equipment, plus the convenience and efficiency of digital transmission, appeals to the phone company. The U.S. Defense Communications Agency, too, is interested in digital transmission, for building a worldwide strategic communications network with the capability to use existing telephone facilities.

The technology for reducing the bit rate, or digits per second, low enough to use a standard telephone circuit while keeping both cost and complexity of hardware low was developed at the University of Notre Dame's College of Engineering.

Dr. James L. Melsa, chairman of the Department of Electrical Engineering, and Dr. David L. Cohn, assistant professor of electrical engineering, used tape recorded speech and computer simulation to test sophisticated mathematical operations (algorithms) which could reduce the bit rate to 9,600 bits per second.

"There are other, more sophisticated speech processing techniques that will produce intelligible speech," Cohn said, "but it sounds like a machine buzzing at you, not like a person talking. We're interested in high-fidelity reproduction which allows you to identify the speaker's voice and emotional state."

In digital transmission, the voice signal is converted to binary numbers which represent exactly the voltage values of the wavelength at the points of measurement. The wave signal is reconstructed at the receiving end. According to Cohn, it's a simple operation and the phone company already uses some digital transmission — at 64,000 bits per second. Engineers have been able to halve the total number of bits needed simply by using the differences between consecutive absolute values.

What Melsa and Cohn have developed is a more sophisticated differencing operation to get the same quality voice representation in the range of 9,600 bits per second. Their system is designed to predict, based on the prior speech sample, what the next sample is going to be.

For any digital transmission system to be practical, it must be able to tolerate errors. When the system is based on simple differencing, one error will change the values down the line.

"If a single error makes the system blow up, then it's not useful, because errors are going to happen sometimes," Melsa said. "We made the algorithm more complicated, designing it to forget a single error. But while errors eventually disappear, there always is a little bit of information about the absolute value which accumulates."

It is very difficult to mathematically measure how well the processed speech compares in quality to the original. Using tape recorded sentences like "Cats and dogs each hate the other," the two engineers test their algorithms by simulating them on a computer. "If it sounds good, we know we've done a good job," Melsa said. "If it doesn't sound good, we know we've made mistakes. It's a very real cross check of theoretical problems."

Melsa and Cohn have developed a system which is more than a pretty concept. It is practical to build. The Defense Communications Agency has awarded a contract to an industrial group to design and build the small computer which will implement the system.
It is fun to use one’s mind, and it is fun to use the artificial mind of a computer. We publish here a variety of puzzles and problems, related in one way or another to computer game playing and computer puzzle solving, or to the programming of a computer to understand and use free and unconstrained natural language.

We hope these puzzles will entertain and challenge the readers of Computers and People.

**NAYMANDIJ**

In this kind of puzzle 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 Nature's 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 be expressible in not more than four English words. (But Man can use more words to express it and still win.)

**NAYMANDIJ 755**

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

**MAXIMDIJ**

In this kind of puzzle, a maxim (common saying, proverb, some good advice, etc.) using 14 or fewer different letters is enciphered (using a simple substitution cipher) into the 10 decimal digits or equivalent signs for them. To compress any extra letters into the 10 digits, the encipherer may use puns, minor misspellings, equivalents like CS or KS for X or vice versa, etc. But the spaces between words are kept.

**MAXIMDIJ 755**

\[
\begin{align*}
\text{T} & \text{E} \\
+ \text{W} & \text{O} \text{O} \\
\text{D} & \text{R} \\
\text{H} & \text{A} \text{S} \\
\text{D} & \text{S} \text{W} \text{L} \\
\end{align*}
\]

Note: In the April issue an incorrect version of this Numble was printed. In this issue (May) a corrected version of this Numble — containing a second plus sign and a second equals sign — is printed.

We invite our readers to send us solutions. Usually the (or “a”) solution is published in the next issue.

**SOLUTIONS**

**NAYMANDIJ 754**: (In the April issue, incorrectly labeled 754): Row 8: under 4.

**MAXIMDIJ 754**: (In the April issue, incorrectly labeled 754): There is no rest for the weary.

**NUMBLE 754**: In the April issue, published incompletely; correctly published in the May issue as NUMBLE 755. We regret these errors.

Our thanks to the following individuals for sending us their solutions to — **NUMBLE 753**: T. P. Finn, Indianapolis, Indiana.
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- The Watergate crimes and punishments have changed the atmosphere in the United States.

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