computers and people

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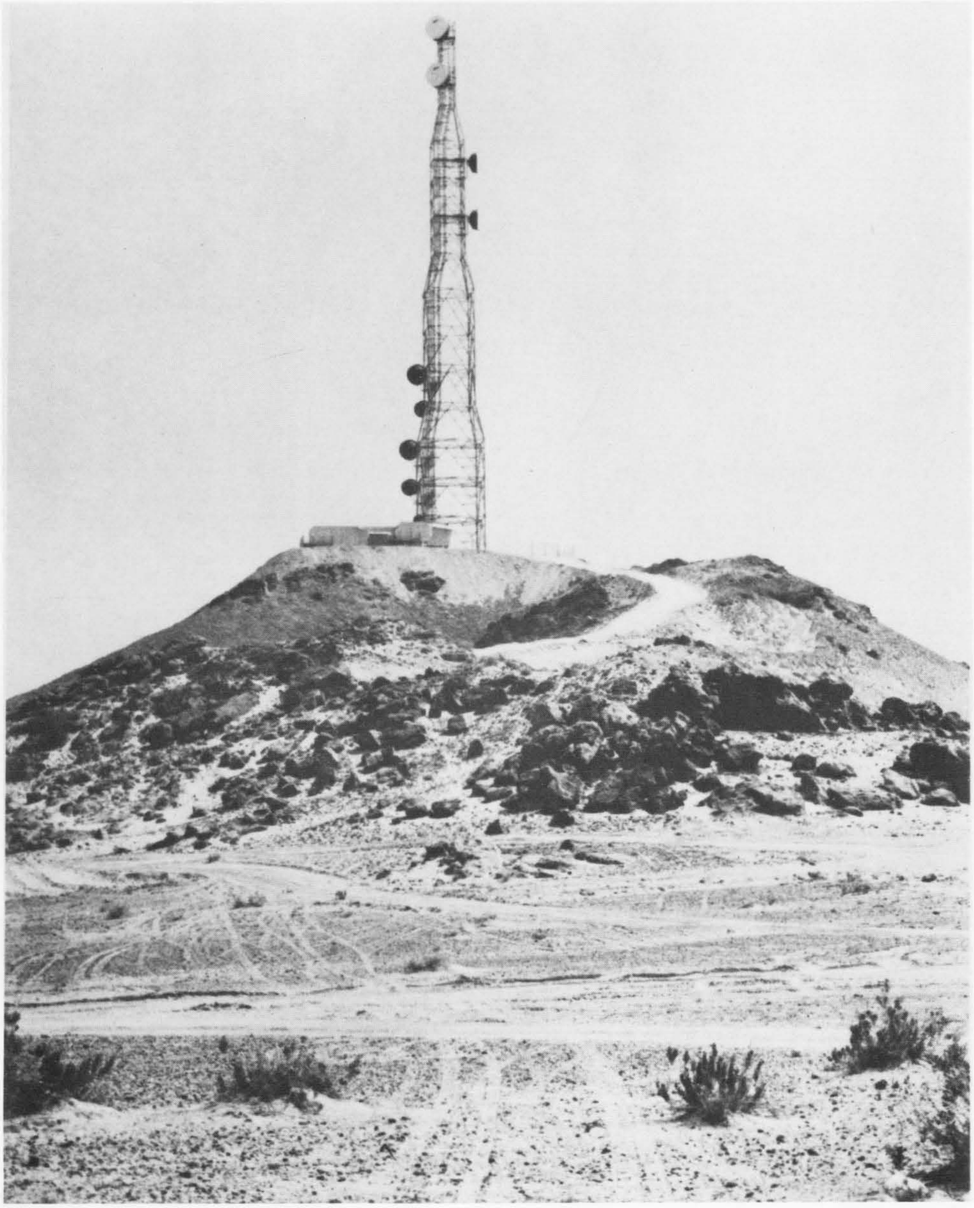

HIGH SPEED DATA TRANSMISSION IN SAUDI ARABIA

The Computer Almanac and Computer Book of Lists — Instalment 16

Neil Macdonald
Assistant Editor

28 TOPICS OF A COURSE "BASIC: A COMPUTER LANGUAGE FOR MANAGERS" (List 801101)

Introduction: Computing as a Management Tool
Executive Computing
- Problem solving
- Planning
- Forecasting
- Database systems

Programming Fundamentals
- The mindless computer
- Sequence, decision and iteration
- Computer languages
- BASIC

Simple Examples
- Profit and loss
- Compound interest
- Return on investment
- Discounted cash flow
- Group workshop problems

Problem Solving
- Trial and error
- Structured analysis and design

Simulation and Modeling
- Probability
- Random processes
- Monte Carlo simulation
- Group workshop problems

Conclusions on Problem Solving
- Role of the manager and the data processing manager
- Role of the manager and the programmer
- Role of the manager and the computer

(Source: announcement of a course "BASIC: A Computer Language for Managers" offered by the American Management Associations, 135 West 50th St., New York, NY 10020, (212) 246 0800)

104 TOPICS OF A COURSE "STRUCTURED METHODOLOGY FOR SOFTWARE DESIGN AND DEVELOPMENT (List 808802)

1. Real-Time Programming: An Industry Overview
   - Why is software difficult?
   - Why is real-time software especially difficult?
   - How is the industry doing today?
   - What should the industry improve?
   - How can the industry improve?
   - Better products through better components
2. Structured Management - Software Development Model
   - The need for a good model
   - Requirements of a good model: fidelity / actions / interfaces / responsibilities / quality
   - Model roles and responsibilities: customer / architect / system designer / test planner / subsystem designer / tester / coder / manager
3. Structured Methods Overview
   - Structured systems development
   - Structured analysis
   - Structured system specification
   - Structured walkthroughs
   - Structured programming
   - Structured coding
4. Real-Time Design Techniques
   - Structure of real-time systems: tasks / multiprocessors / networks / distributed data bases
   - Interrupt-driven control: interruptible programs / interrupt handling / hardware features / reentrant programs / scheduling priorities / multiprocessor strategy
   - Table-driven control: synchronous tasks / task scheduling / anonymous processors / graceful processors / deadline / priorities / throughput / memory contention
   - Synchronization of tasks: producer, consumer / mutual exclusion / deadly embrace
5. Structured Programming
   - Dijkstra on responsibility
   - Testing limitations
   - Program design languages
   - Data structure diagrams (Jackson)
   - Flowcharts
   - Data structure design language
   - Hierarchy
   - Module size
6. Structured Design
   - Importance of modifiability
   - Cost of modularity (Brooks)
   - Module strength categories (Myers)
   - Module coupling categories (Myers)
7. Structured Walkthroughs
   - Purpose of walkthroughs
   - Mechanics of walkthroughs
   - Games programmers play
8. Data Structures
   - Linked lists: design representation / internal representation / insert, delete, sequential process / doubly-linked lists / available space
   - Binary trees: representation of hierarchies / internal representation / traversal algorithms / application examples
9. Iterative Algorithms
   - Loop invariants
   - Termination
   - Program correctness
   - Organization
   - Computational complexity

10. Top-Down Implementation
    High level interfaces
    Timing assumptions
    Data base access methods
    Subsystem interfaces
    Module logic

(Source: announcement of the course "Structured Methodology for Software Design and Development" by Robert J. Rader, sponsored by the Education Foundation of the Data Processing Management Association, 5959 West Century Blvd., Los Angeles, CA 90009, (213) 670 2973)

8 CLASSES OF DAMAGE TO THE HUMAN BRAIN RESULTING FROM STROKE OR SENILITY (List 801103)

Emotional need (the "feeling" brain): damage to the desire to engage in communication
World knowledge (the orienting mechanism): damage to the awareness of who one is, where one is, clock time, identity of one's partner in conversation, one's probable present situation, one's relation to others
Input channels (input from eyes, ears, touch, taste, smell, ...): damage to some sensation
Output channels (flow of language messages to muscles): paralysis of one or more types of actions or muscles
Input analyzers (occupying separate areas of the brain for preliminary analysis of incoming messages): word blindness, word deafness, etc.
Output programs (muscle groups): disorganization of verbal expression via some route; trouble with writing words the patient can both say and spell aloud; etc.
Imitation mechanism (the "copycat" skill): such as damage to the capacity to repeat exactly the doctor's comments verbatim
Syntactic-semantic mechanism (the heart of the language mechanism): such as damage producing behavior like a parrot or an "echo box"; damage in which the patient cannot think of "le mot juste" or the right word, or cannot connect words in sentences, or produces fluent but unintelligible babble; etc.

(Source: from Chapter 6, in "Stroke: A Doctor's Personal Story of his Recovery" by Charles Clay Dahlberg, M.D., and Joseph Jaffe, M.D., published by W.W. Norton Co., Inc., New York, NY, 1977.)

50 ANSWERS TO QUESTIONS AND COMMENTS ON STATEMENTS (List 801104)

Affirmative
    Always
    Certainly
    Correct
    I agree
    No problem
    Of course
    OK
    Right
    Sure
    Surely
    That's so
    True
    Yes
    You bet

Negative
    False
    I disagree
    Never
    No
    No way
    Not at all
    Not so
    Over my dead body
    Wrong

Probability weighing
    Almost always
    Almost never
    It depends
    Maybe
    Maybe not
    Often
    Perhaps
    Perhaps not
    Probably
    Probably not
    Rarely
    Seldom
    Sometimes

Knowledge weighing
    Hunh?
    I don't know
    I don't see
    I don't understand
    I haven't decided
    I'll think about it
    I see
    I understand
    Oh!
    So that's it

Confidence weighing
    I have nothing to say
    I refuse to answer
    I stay mute
    No comment

(Source: Neil Macdonald's notes)

6 LAWS OF GENERAL SCIENCE (List 801105)

What the large print giveth, the small print taketh away.
    - Dan Green's Rule

Half of life's experiences are below average in satisfaction.
    - Ahlskog's Axiom

Less is more.
    - Browning's Theorem.

Most is least.
    - Berkeley's Corollary No. 1.

Life is one long process of getting tired.
    - Samuel Butler's Law.

Almost everything in life is easier to get into than to get out of.
    - Agnes's Law

(Source: "1001 Logical Laws ..." by John Peers published by Doubleday and Co., Inc., Garden City, New York, NY, 1979, 189 pp)

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computers and people

formerly *Computers and Automation*

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

Front Cover Picture

The front cover shows a microwave relay tower in a desert of Saudi Arabia. The network provides long distance telephone service, high-speed data transmission, and television signals. For more details see the story beginning on page 12.

Key

[A]	–	**Article**
[C]	–	**Monthly Column**
[E]	–	**Editorial**
[EN]	–	**Editorial Note**
[F]	–	**Forum**
[FC]	–	**Front Cover**
[N]	–	**Newsletter**
[R]	–	**Reference**

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.

Announcement

Statement of Ownership, Management and Circulation, see page 22.

Advertisement

"THE COMPUTER DIRECTORY AND BUYERS' GUIDE"

"The Computer Directory and Buyers' Guide" for 1978–79 contains: a Roster of Organizations of more than 1500 entries; a Buyers' Guide to Products and Services under 23 categories, including Computer Dealers; and a listing of Digital Computer Characteristics including over 800 computers made by more than 100 organizations.

Editorial

Computers and Conversations —and Lilith

Edmund C. Berkeley
Editor

If a computer program is to carry on a conversation with a human being and seek to be intelligent (or "artificially intelligent"), then it needs a number of capacities.

Some of these capacities are those which the human brain has, and which are listed in "8 Classes of Damage to the Human Brain Resulting from Stroke or Senility" (List 801103, on page 3 of this issue), such as the orienting mechanism and the copycat mechanism.

Another of these capacities is that it should have a considerably wider range of responses than simply:

- YES
- NO
- silence minute after minute
- flashing lights
- such messages as "BDOS ERROR 80", which of course is a nuisance to the human being who can't find the list in which these errors are described, or understand the words there appearing

For example, the "Boston Globe" of Sept. 30, 1980, contained the following vivid report:

CONCORD, NH. - Inclusion of New Hampshire areas in a study of possible sites for storing nuclear waste has brought strong opposition from Gov. Hugh Gallen and Sen. John Durkin:

> "Over my dead body," said Durkin.
> "No way," said a spokesman for Gallen.

One of the most successful computer programs in carrying on conversations with human beings has been Eliza, a creation of Prof. Joe Weizenbaum of Mass. Inst. of Technology. Eliza imitates a psychiatrist of the school who states nothing of importance but asks questions of and sympathizes with the patient. But after a while, Eliza produces the impression of being deaf and stupid. I understand there are now more than 500 Eliza programs here and there over the world.

Let us imagine a computer program, which we might call Lilith, and consider the variety of short responses which Lilith might be able to give to a human being. These responses are to be restricted, for the present, to 50 "answers to questions and comments on statements" that are very often used in today's world (for a suggested inventory of these responses, see List 801104 starting on page 3 in this issue). Lilith (LL) is assumed to be "conversing" with a human being, Sam Smith (SS). Sam is eager to trip her into showing she is not a person but a program.

SS: Do 2 and 2 make 4?
LL: Yes.
SS: Do 2 and 2 make 22?
LL: Oh! Yes.
SS: Does a line have weight?
LL: It depends.
SS: Is a thought weighty?
LL: Sometimes.
SS: Do you still beat your husband?
LL: No.
SS: Then you admit you used to beat your husband?
LL: No.
SS: Do you forget eleven times eleven?
LL: Never.
SS: Will the sun shine in the year 2000?
LL: Yes.
SS: Are you a person?
LL: Perhaps. Perhaps not.

Is such a dialog too fanciful? No. Will Lilith come into existence? Probably. Would it it be fun to produce Lilith as a computer program? Certainly. □

Forum

FREE REPRINTS OF ARTICLES IN "COMPUTERS AND PEOPLE"

1. From L. F. Alwitt
1136 Jeffrey Court
Northbrook, IL 60062

With regard to the invoice you sent, 11310, I never received any copies of back issues of your magazine nor do I wish to receive any back issues of your magazine/journal. Hence I owe you no money.

For your information, the cards I sent you were standard reprint request cards for free reprints of articles published in technical journals. If it is not your policy to provide such free reprints, you should say so.

2. From the Editor

"Computers and People" is not a technical journal. We are not able to publish or supply free reprints of articles. Our response to requests for reprints is to send an invoice for the back copy in which the article is published. If the person really wants the article (and does not have access to a library which will xerox a copy for his personal use), we consider that he might pay for the back copy in the regular capitalist-society way.

MORE DETAILED INFORMATION ON DJINNI

1. From Ben F. Beasley
Supervisor, Management and Engineering Data Systems
Tennessee Valley Authority
Chattanooga, TN 37401

We are interested in more detailed information on the "Djinni" family of devices and what computers these may be teamed with.

- Is it your normal practice to write software to interface this device with a computer?
- What is a tentative schedule for marketing the 400 plus word version mentioned in the article in "Computers and People" for Nov.-Dec. 1979?

We have not defined a specific application for this device; however we are building reference files in this area.

2. From Olaf Thorsen
Berkeley Enterprises, Inc.
815 Washington St.
Newtonville, Mass. 02160

At present the various versions of Djinni have been expressed as programs in computers, i.e., software. The languages in which Djinni has been implemented are: PDP 9 assembly language; IBM 360 assembly language; PL/1; CBASIC. Ordinary English instructions go automatically into programs that run on a computer; the programs produced are in: Dartmouth BASIC, BUSINESS BASIC, FORTRAN, COBOL, FOCAL, APL, and PDP 9 assembly language. All of these are preliminary versions. We have issued six licenses, so far, of the Djinni system to licensees, and these licensees are in process of developing and marketing forms or versions of Djinni.

Competition, particularly in the field of software for microcomputers, is developing. From grapevine information reaching us, it seems likely that a very large computer firm may already have plain ordinary natural language programming, and is very likely to enter the field and take over the whole market at a time they consider appropriate.

Djinni is not so much a device as it is a way of dealing with words and concepts both syntactically and semantically; and the result is to produce meaning, to "understand" what is being said. Versions up to 500 or 600 word vocabularies should become available in 1981 or 1982. It seems that a large percent of human programming effort will be replaced by the Djinni system and similar developments, by means of which plain ordinary natural language becomes equivalent to a technical programming language. □

A Black Box Called Djinni — 1980 Status

We have developed a "black box" which takes in many thousands of ways of describing a business procedure in ordinary English, automatically runs the procedure in ordinary English, and stores the procedure in ordinary English.

We can demonstrate this black box in Boston, Providence, and Menlo Park (CA), on a microcomputer with CP/M operating system and 64K of memory.

At the present time, a vocabulary of about 150 words like "the, of, by" can be freely used; about 60 concepts like "add, copy, print" can be freely used; and the preliminary ground rules in English cover some 6 pages. Later versions will include over 400 words and over 80 concepts and will be considerably more powerful. As a result of the black box, and the "artificial intelligence" principles it uses:

- learning a technical programming language (like BASIC or COBOL) is unnecessary;
- documentation becomes automatic;
- conversion of a program in one language into another becomes automatic;
- analyzing or summarizing of text based on meaning becomes automatic; and
- the use of any computer by an ordinary high school graduate becomes almost as easy as the use of a motor car.

We invite inquiries from any organization that might help test, expand, and market the device.

Berkeley Enterprises Inc.
Attention: Olaf Thorsen
815 Washington St.
Newtonville, Mass. 02160

The United States and Japan: Some Management Contrasts

Dr. Norihiko Nakayama, President
Fujitsu America, Inc.
Member, Board of Directors of
Amdahl Corp. and TRW-Fujitsu Co.
Santa Clara, Calif.

"In 1979 Fujitsu had revenues of $2.2 billion compared with $1 billion in 1974. We had 34,000 employees in 1979 against 33,000 in 1974."

Note: Based on a talk before the Commonwealth Club, San Francisco, June 1980.

An Exchange of Views

There is a proverb which is widely quoted in both Japan and China. It is:

> When the battle is over, the mountain remains.

When the storms relating to trade between the United States and Japan subside, our two great peoples will be there, in their two countries, living useful and, I devoutly hope, happy lives.

In the meantime perhaps we can have an exchange of views which will help us weather these storms and will lead to better understanding between Americans and Japanese. As long as there is dialogue, there is the possibility that differences can be adjusted and that harmony will in time prevail.

An Obstacle to Harmony

One of the obstacles to that harmony is the widely held belief in your country that Japanese industry has been economically successful because it appropriates American ideas, dumps products here at far below cost, and enjoys unfair government subsidies and other support which U.S. industry does not receive. You have been told that Japan engages in "dirty tricks." It will hardly surprise you to hear that I do not accept this view.

To respond to these and other misstatements about Japan puts me in an awkward position. My remarks about my country may sound boastful, and you may consider me an ill-mannered guest in your country, one who accepts your hospitality and then turns around and heaps criticism upon you.

Wiping Away Myths about Japan

However, I am, frankly, on the spot. I want to do what I can to improve understanding between the United States and Japan. That calls for correcting misapprehensions that exist in the United States. In this process I may seem like a promoter from the Chamber of Commerce. Even worse, I may sound like all those anti-Americans that unfortunately you find all over the world.

I am neither. Believe me, I love America and I love Japan. I want to see both our countries work smoothly together and to prosper. Wiping away myths about Japan may help.

The Highest Rate of Productivity in the World

One of the real reasons Japan has, on the whole, done rather well economically in the Fifties, Sixties, and Seventies is its high rate of productivity, the highest in the world. Let me give you an example of just how high from my own company.

In 1979 Fujitsu had revenues of $2.2 billion compared with $1 billion in 1974. We had 34,000 employees in 1979, against 33,000 five years before. Thus, in that half-decade, our sales more than doubled. But our work force went up a mere 3 per cent.

To put it another way, the productivity of each employee doubled. This compares with declines in its rate of growth, throughout much of the world. Why?

Lifetime Employment

One of the reasons is our policy of lifetime employment, which so many people in the United States mistakenly consider a serious impediment to Japan's progress. That is because they do not understand its benefits.

Most American managers feel that it is their prerogative to terminate employees whenever they think it is necessary. The Japanese manager seeks a way to find new duties for employees who are no longer needed in their present posts. He is loyal to them and they are loyal to him.

Benefit: Great Knowledge of the Company

The average term of employment at Fujitsu is 13 years. The average job tenure in the United States, according to the Bureau of Labor Statistics, is 3.6 years. The lifetime employment policy in Japan means not only great loyalty, but great knowledge of the company and its many operations. Our executives spend two years in our facility in Kawasaki, for example, and then perhaps three years in Tokyo headquarters. They really get to know how the company functions.

Example: How it Works

Let me use my own experience to explain to you how the Japanese system works. In 1953, I joined Fujitsu as part of a team which was developing a cathode ray tube. Ten years later I was appointed a senior engineer and I supervised a group of 10 to 15 engineers who were working on display devices. After four years I was appointed manager of the electron devices laboratory.

To my great surprise, in 1975, I was sent to New York to head my company's liaison office there. In 1978 I moved to Santa Clara to be head of Fujitsu America Inc. The following year I was elected to the board of directors of Amdahl Corp. After that I was heavily involved in setting up my company's new semiconductor plant in San Diego, which will be operating at the end of the year. Just recently I joined the board of the new joint venture with TRW, Inc. And now my company has given me yet another responsibility: to make speeches in the U.S. like this one. That is the toughest assignment of them all!

These experiences have endowed me with a broad understanding of the activities and policies of my company. Hundreds of other top and middle management executives are similarly situated. The people who run Japanese companies really know a great deal about those companies.

Benefit: Knowing Each Other

They also know each other. Because they know each other so well, they are able to work together smoothly and effectively.

Let us see how all this applies to high technology fields of computer and semiconductors, areas in which I am involved. Every product in these fields has its own design concept. But when the engineer who originates the design concept moves off to greener pastures, his successor must spend a considerable period studying his predecessor's approach. And when this happens repeatedly during the many years it takes for a product to progress from a glimmer in someone's mind to mass production, you can see how productivity is affected.

We have our problems in Japan, of course, but that is not one of them.

Benefit: Design Engineers Think about Design

Our design engineers are usually thinking about designing a better product, or meeting customer requirements more effectively, or cutting manufacturing costs. Yours may be thinking about finding a better job that pays more money. Ours don't have to concern themselves about such things because they know that the company will take care of them. They also know that everyone at the same level is paid more or less the same and pay increases, though small by American standards, will come regularly. Again one can see the possible influence of the two systems on productivity.

Now let us turn to the salesman. Ours understand the history of the product, the need that gave rise to it, the capacity of the company to stand behind the product, the improvements in the product which lie ahead. Our knowledgeable sales force and production control personnel make it possible for our customers to keep inventories low. They know that by so doing, they do not run the risk of being caught short.

Quality Control, Value Analysis, New Ideas, and Motivation

High productivity runs hand-in-hand with effective programs of quality control and value analysis engineering. Both of these concepts originated in your country. We were taught them by our American friends. We then took these principles and modified them to meet our own cultural and economic needs.

Fujitsu has had a value analysis engineering campaign for 15 years. Its purpose is cost reduction. Management welcomes all ideas from its employees. Maybe it is some small modification in the work flow proposed by a low ranking employee which will shave a fraction of a cent off the cost of a product. Maybe it is a plan for a wonderful new product which over the years will result in millions in cost savings for the company. All ideas are warmly welcomed and closely examined.

This program saves Fujitsu many millions of dollars a year. It thereby contributes to our profits by that amount. And it gives our employees at every level a sense of participation, of being part of the team, however lowly their position may be. It is a great way to motivate people.

Example of Quality Control Working

Let me give you an example of how our quality control operations work. Just a few miles down the highway from here -- in Santa Clara -- we used to manufacture a certain subassembly for Amdahl Corp. We also made the same item in Japan. Two years ago -- to our surprise and horror -- we discovered that the subassemblies made in Santa Clara had ten times the number of defects as those made in Japan.

Direction, Correction, Inspiration

Some observers might conclude that American workers are not as good as Japanese workers. Others might blame the American labor unions. I don't buy that.

American workers and Japanese workers and German workers and Indian workers have one thing in common: They all need supervision, leadership, direction. Management must direct them, correct them, and when necessary, inspire them.

Accordingly, I summoned the managers involved in that subassembly to a weekly meeting in our Board Room. Some of them had never been in the Board Room before. We discussed the problem at length. We found mistakes. We developed ways of improving our procedures.

But Not Criticism or Attack

We made progress in these and other ways as soon as the managers discovered that they were not there to be criticized or attacked, but to develop methods of doing a better job. Specifically, we found:

- Carelessness.
- Rough handling of delicate parts.
- Inappropriate placement of parts which were undergoing testing.
- Inaccurate testing equipment.
- And, most important, failure of the managers to correct these problems.

Having reached that point, it was a simple matter to eliminate all those defects. The American products became as good as -- if not better than-- the Japanese products.

Non-Isolation

This brings us to another point: the first-rate Japanese manager does not isolate himself in the executive suite while attractive young women bring cup after cup of tea. He goes down on the production floor, sees what is going on, talks to the employees, asks for their ideas. The president of our $2 billion company, Mr. Kobayashi, visits about 20 of our facilities all over the world on a regular schedule. He sees for himself what is going on.

Our workers know him when they see him. They expect to see him from time to time. He is able to address a surprising number of them by name. Our employees thus come to the conclusion that the top boss is interested in them and that their contribution to the total operation, however humble, is valued.

High Technology, But Waiting Longer for Profits

As everybody knows, this is an era of high technology, which means that new and better equipment is constantly becoming available. The purpose of such equipment and its integration into the system is essential to the maintenance of high productivity, high quality, and long-range profits. (Yes, Americans sometimes lose sight of the fact that we Japanese believe in the profit system. We don't -- as some may think -- work for the Emperor. Our companies strive to be profitable, though we are willing to wait longer than you to achieve those profits.)

Embracing the newest technology means utilizing LSI -- large scale integrated circuits -- for use in memory and logic in computers and related equipment. Ten or fifteen years ago we were using discrete transistors, which had to be mounted on boards, wired, and soldered. The opportunity for errors was considerable.

Today, we use LSI, which simplifies assembly, reduces the size of our products, increases their speed, makes for much greater reliability, and cuts costs. Just down the road is the VLSI -- the very large scale integrated circuit. It will bring still greater improvements in productivity, quality, and cost reduction . We like to think that Fujitsu is in the forefront of those companies which are developing and capitalizing on this amazing new technology.

So the progressive company invests in new and improved equipment. That's what we're doing. In 1980 Fujitsu is investing many millions of dollars in such equipment, and additional millions on engineering costs for hardware and software.

This heavy investment in the most modern equipment has a beneficial fallout. It results in:

First, improved productivity.
Second, better quality.
Third, because most of the new equipment is automatic, we have small need to hire and train large numbers of new people. That is one of the major reasons why our productivity per employee doubled during the last five years.

Able, Imaginative, Daring Management

The key to all this is able, imaginative, even daring management. Companies must have effective management which organizes well, motivates the employees so that they give their best, and deals skillfully with scores of problems. If the employee gives an indifferent performance, that is not necessarily a labor problem · It may be a management problem. If quality is poor, that is not necessarily a labor problem. It may be a management problem. For management to blame every failure on the workers is what you Americans call a cop-out.

Let me give the final evidence of how our system works so well. Japanese companies which open manufacturing operations in the United States have, on the whole, better productivity and better quality than their American competitors. I know that this may be difficult for American industrialists to accept, but I don't think we will be able to deal with the differences between our two nations meaningfully without facing reality.

What Do Americans Think about Working for Japanese Bosses?

When our company was thinking about building a semiconductor plant in San Diego, we thought long and hard about how American workers might feel about working for Japanese bosses. So one of my associates, an American, telephoned American employees of a half-dozen Japanese companies in all sections of the United States to see what they had to say. Here is what we learned:

The vice-president of a zipper manufacturer in Georgia said: "There is a strong interest in people here. The administration seeks suggestions from all employees and tries to give everyone a feeling of importance. There is a sense of job security. An employee will have his job as long as he wants it. The company believes in promoting from within. Productivity is high.

This evaluation was confirmed by a local editor and a Chamber of Commerce official.

In the farm belt of Wisconsin, where a Japanese food company put down roots, a technician said:

"I like my job. It is interesting and gives me a chance to advance. I take satisfaction in contributing to a good product. The Japanese are patient decision makers. They listen to many opinions before making up their minds. When a decision is made, you know that it has been well thought out."

An American executive at the same company said, "There is more emphasis on group success

(please turn to page 22)

Computing Your Needs Before Buying the System

Richard F. Denning
Vice President, Anistics Inc.
Alexander and Alexander, Inc.
130 E. Randolph
Chicago, Ill. 60601

"Modern systems can deliver nearly instant status reports on the information they hold. But should they? The issue is cost versus benefit."

The Evolution of Information Systems in a Business

Information systems are currently a major component and will be a dominant component of modern risk management. But many computer systems evolve through a cycle of initial enthusiasm and early success only to be followed by incipient doubt, schedule slippage, cost overruns, revised specifications, finger-pointing and inevitably scrapping the project.

The result is an information system that limps along doing very little for very few. While successes are widely touted, the failures do not advertise themselves.

The Limited Success Cases

I believe that the seeds of such limited success may be sown at the start of the project. Yet the flaws, if appreciated, could be eliminated, resulting in a productive and inexpensive system or service. Identifying these self-destructive flaws is the purpose of my article. Let's focus on what is and what is not within the scope of modern computer technology.

Never overestimate the capabilities of a computer. The high technology jargon (software, hardware, modems, bytes, bits, feedback loops, intelligent terminals, address times, etc.) is a smoke screen. The lauded sophistication is merely the ability to do simple tasks at incredible speed. In Robert Townsend's book "Up the Organization," he says computers are "big, expensive, fast, dumb, adding machine-typewriters." Therefore, success in computer applications requires simple and well-defined procedures that are repeated many times.

The Scientific Origin

The origin of computer usage lies within the sciences, where computers developed a significant role 30 years ago. Why? Simple! The scientists knew exactly what they wanted. Their mathematical models were basic in concept, but required millions of calculations. Non-machine methods were unrealistic because of time and human-engineering constraints. You should recognize that current computer designers use memory access times of one instruction every 2.5 microseconds (that is 400,000 times per second! -- that speed intimidates even hard-working secretaries).

Evaluating computer power in terms of the number of instructions per second is, however, irrelevant to the risk manager's needs. Applications in our field are rarely limited by computational power.

Unrealistic Expectations in Business

Most systems should be axed because the expectations are unrealistic. In such cases the reports, when generated, are of minimal value, or worse, distract from management's prime activity. Remember that corporate success depends on decision and action -- not on extensive records. Window dressing, rather than results, characterizes most systems because they are inadequately planned and designed.

How does one identify such exaggerated expectations? To answer this question, I have listed the functions reasonably provided in an information system project. They are ranked in descending order so that the higher your application is on this list, the more wary you should become.

Deciding Among Alternative Courses of Action

The ability to decide among alternative courses of action or utilization of resources. If you believe your new model SMX-714 or whatever is going to start running your risk management department, you have a lot to learn about computers! Eliminate such "decision-making" applications and realistically evaluate the benefit of the additional information to your decision-making. The idea that a computer can choose a loss retention level for a corporation is ludicrous. At the very best computers can produce background information, but making the decision is far too complex for anything available in today's technology.

Planning and Forecasting

Essentially the task of forecasting the future usually done by employing mathematical models of historical trends. Computerized forecasting is a viable product, but you must recognize that there are serious limitations. Historically derived models can never forecast the future with predefined confidence levels (statements that a result is "a 95% upper bound ," etc.,

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only apply if the fitted underlying historical environment continues in the future). Also, the precision of the resulting forecast is a strong function of expected loss frequency.

Never confuse causation with mere correlation. Variables not controlled by the decision-maker and not anticipated by the model or system designer often exert more influence than any past experience. At best, computer forecasting models are good for a one-to-two-year lead time; longer planning periods cannot exclusively depend on extrapolating past patterns.

Developing Feedback to Detect Significant Deviations – Possible?

A means of continuously gathering data from specific processes and developing feedback loops to detect significant deviations. This is a pioneering effort for risk management, especially in claims administration and loss control activity.

However, recognize the key requirement: accurate information that is promptly processed. The organization's location coding system must be consistent and accurate to permit valid comparisons between one time period and another. Corporations that are constantly reorganizing must be realistic as to whether or not such coding is feasible. If it is not, an exception reporting system will merely be a source of false alarms and misdirected fire drills.

Instant Status Reports – Why?

Modern systems can deliver nearly instant status reports on the data they hold. But should they? The issue is cost versus benefit. To make a realistic evaluation, the risk management department should maintain a detailed log of all internal and external information requests. These requests should be analyzed, comparing current time requirements for answering versus the proposed system.

On-line information is critical when dealing with individual claims, but in my experience and opinion, summary level information is rarely required instantly, but rather several hours or overnight is more than sufficient speed. Meticulous design is especially important with on-line systems to deal with the problems of simultaneous record access and inconsistent editing.

Retrieving Past Records – Why?

Ability to retrieve past records, etc. This is an obvious and valuable risk management need, but consider the commitment to consistent corporation coding. In my experience, most accounting (i.e., premium allocation) systems usually code claims on the organizational basis existent when the claim occurred; but for loss control monitoring or forecasting, it is necessary to develop the experience in accordance with current organization. The designer must recognize these problems.

Note that information, like most commodities, is perishable with a well-defined shelf life. Given the changing nature of claims and corporation risks, is 10 or even five years of history relevant? Given five years of data that show or even suggest a step change in the most recent two years, how often is the early data merely dismissed?

Accounting and Statistical Calculations

Ability to perform calculations of an accounting statistical type. The key here is to maintain a hard-nosed practical bent. Yes, the computer can do the job, but is the application necessary and cost effective? Too often the desire to automate reflects other deficiencies in the activity. Unless your present procedure is well documented and effective, the computer will only speed up the mess.

Never automate a function unless you are committed to maintaining a dual operation for three to six months. Few companies have been injured by too slow a conversion to automated systems. However, the losses caused by accelerated and ill-conceived automation are legion!

Is the Report Necessary?

The processes of entering, verifying, classifying, sorting and summarizing data. How can one challenge a computer application in this area, the sine qua non of computer technology? Easy! Is the report necessary? Is it really the basis of any action or decision? What would you do if you did not have the information?

Being ruthlessly hard-nosed about bottom line values up front will save you a lot of dollars and embarrassment later. To avoid the difficult process of weeding out poor systems later on, do your own housekeeping at the inception.

The raw material of risk management is volumes of data. Computer systems, being the most effective today for translating data into information, will enjoy explosive growth in our industry. The danger is that computers are a business mystique. Your protection will be based on the simple rule: Use management information systems less for fashion and more for need. □

HIGH SPEED DATA TRANSMISSION IN SAUDI ARABIA

George Jones
Western Electric
222 Broadway
New York, NY 10038

A microwave system for telecommunications transmission has been built in Saudi Arabia by Western Electric International engineers and technicians. The system crisscrosses 830,000 square miles of countryside with 273 microwave towers. Initially the capacity is 45,000 long distance circuits, which can carry also high speed data transmission and television signals.

The towers were constructed in rugged mountains and scorching deserts, with temperatures sometimes rising to 150 degrees Fahrenheit. Some of the features of this project were:

- 6 million pounds of equipment flown from Atlanta to Saudi Arabia in 747's
- 700 specially designed and built communication shelters

(please turn to page 21)

The Era of Intelligent Machines?—Part 2

Thomas Logsdon
c/o Computer Science Press, Inc.
9125 Fall River Lane
Potomac, MD 20854

"After an extended session the two students were brought into the room with the robot they had been playing. They could hardly believe that they hadn't been playing against a real person."

Note: This article is excerpted from Chapter 9, "The Era of Intelligent Machines?", in "Computers and Social Controversy" by Thomas Logsdon, The book is available from the publisher. Price, $17.95.

Game Playing Machines

Tic-tac-toe

Tic-tac-toe is probably the most common competetive game programmed on a digital computer.

How is the computer programmed to play the game of tic-tac-toe? There are several easy methods. One of the most straightforward ways of visualizing a workable approach is to regard the various possible moves as being diagrammed in "tree" fashion. In this particular instance, the machine moves first and it uses the X symbol. The computer has three fundamentally different choices for its first move: it can put the first X in a corner, in the center, or along one of the edges. Depending on the choice the machine makes, its opponent has either five viable responses or two. Some of the branches end in victories, some in defeats, and some in draws. At every opportunity the computer chooses a move that could, depending on the opponent's response, lead the game along one of the victorious branches.

For a simple game like tic-tac-toe the entire game tree (or its equivalent) can be stored inside the computer. Thus, the machine can be programmed to play a perfect game. This means that if its opponent makes a mistake at any point, the machine will win, if not, the game will end in a draw.

Checkers and Chess

If the construction of the game tree for tic-tac-toe allows us to program a perfect winning strategy on a digital computer, why don't we do the same thing for checkers and chess? It sounds like a good idea and if we could do it, it would definitely work. Unfortunately, checkers and chess are much more complicated than tic-tac-toe. If we attempted to draw their complete trees, we would need a very large sheet of paper! Arthur Samuel, who developed a highly successful checkers program in 1967, has estimated that a complete checkers tree would involve approximately 10^{40} branches. Even if we could program a computer to examine a move every one-thousandth of a second, it would take it $3\text{x}10^{23}$ years to consider all of the possibilities. Chess is even more complicated. According to Samuel's careful estimates, a complete chess tree would involve approximately 10^{120} branches.

In view of their complexity how is it possible to program a computer to play checkers or chess? The trick is to "prune" some of the branches from the tree by using "heuristic" rather than "algorithmic" programming techniques. The distinction between these two different programming methods is relatively easy to make. Most of the programs we hear about use algorithms. An algorithm is a fixed step-bystep procedure which will inevitably lead to the solution of a particular problem - assuming that the computer keeps at it long enough. By contrast, a heuristic program is one which uses clever rules of thumb to help the computer move toward a solution. The solution is not guaranteed but it is likely provided the heuristic rules are properly chosen. Thus, for example, a heuristic checkers program might be programmed in accordance with the following rules of thumb:

1. Always play to cause your opponent to have fewer pieces than yourself.
2. In counting the pieces on each side equate two kings with three men.

In accordance with these rules, the computer will set up a trade with its opponent if in so doing it will gain an advantage. Note that when heurestic programming procedures are used, the computer, like its human counterpart, cannot foresee the ultimate outcome of the game.

Checkers, which is vastly simpler than chess, has yielded well to computer analysis. It turns out that there are practical ways to determine the probable value of a particular move on the basis of such quantifiable parameters as control of the center position, advancement, etc. This, plus the fact that there are relatively few possible moves at any given point (because some pieces block one another and captures are forced), makes it possible to explore all plausible possibilities to a depth of as many as 20 moves which proves sufficient for excellent play. Although there was great optimism for chess playing programs in the 1950's they still play, at best, only a mediocre game. By 1970 several programs had reached the level of grade C tournament play but have not progressed much beyond that level in the intervening years. Moreover, any gains in proficiency that have been attained are due mainly to faster computers and greater programming effort rather than to any conceptual breakthroughs in the art of chess programming.

But why haven't our experts been able to develop grandmaster-level chess programs as has been done with tic-tac-toe and checkers? The fundamental problem is that the tree structure of chess is enormously complicated. By using heuristic programming techniques we can "prune" the tree to some extent but, if we prune it too much, the computer will miss promising lines of play that would be spotted by a human expert.

It might seem that we could increase the skill of the computer by having it analyze more branches on the tree. However, careful studies of the way human grandmasters approach the game have shown that they do not analyze more lines of play than players of lesser ability, nor do they look ahead any further--typically only 6 or 7 moves. Instead, the grandmasters owe their expertise to the fact that they can "zero in" on the most promising areas of the board--in short, they have a highly-developed sense of what is important in the game.

Can we program our computers to approach chess in the same way? It's conceivable, but nobody seems to know how to do it. However, there is another possible approach: in theory we could program the computer to "learn" from its past experiences in much the same way a human being learns to master the game. A few years ago this concept created a wave of excitement when Arthur Samuel incorporated learning capabilities in his checkers program. In playing a series of games against Samuel a few dozen times, it was able to clobber him in every subsequent game. Given further training, it also beat the champion of Connecticut in one well-publicized game although the world's champion checkers player beat it four games out of four. At first there were high hopes for improving chess programs by using the same "learning" approach. To date, however, none of the attempts have been notably successful.

The learning routine in Arthur Samuel's checkers program has been widely praised by those in the field of artificial intelligence. Does it seem to learn in any meaningful sense? It definitely improves its performance on the basis of past experiences, but most people who get a chance to watch it operate are somewhat disappointed by its rather primitive learning capabilities. Generally speaking, the learning routines now being programmed on computers are not much more impressive. As Marvin Minsky has observed: "(Some) programs use...processes that might be called learning; they remember and use the methods that solved other problems; they adjust some of their internal characteristics for the best performance, they 'associate' symbols that have been correlated in the past. No program today, however, can work any genuinely important change in its own basic structure."

On the other hand, we are often impressed with what machines do until we learn that they are machines. Peter J. Sandiford, director of operations research for Trans-Canadian Air Lines, demonstrated this point rather clearly when he exposed two young students to a robot in blind trials -- without telling them they were playing against a machine. As we shall see, they were much impressed with the results. Sandiford arranged the game so that the two students, a boy and a girl from a local mathematics club, would think they were playing against one another. "Each contestant was alone in a room, and indicated his moves to a referee," explained Sandiford in a letter to Martin Gardner. Unknown to the players, the referees reported to a third room which contained two learning-box robots, their actual opponents. "With much confusion and muffled hilarity, we in the middle tried to operate the computers, keep the games in phase, and keep score." During the session the two students were encouraged to make running comments on their own moves and those of their opponents. Here are some sample remarks:

"It's the safest thing to do without being captured. It's almost sure to win."

"He took me, but I took him too. If he does what I expect, he'll take my pawn, but in the next move I'll block him."

"Am I stupid?"

"Good move! I think I'm beat."

"I don't think he's really thinking. By now he shouldn't make any more careless mistakes."

"Good game. She's getting wise to my actions now."

"Very surprising move...couldn't he see I'd win if he moved forward?"

"My opponent played well. I guess I just got the knack of it first."

After an extended session the two students were brought into the room with the robot they had been playing. They were astonished. They could hardly believe they hadn't been playing against a real person!

Was this then an impressive demonstration of the ability of an inanimate machine to mimic the learning capabilities of intelligent human beings? Perhaps. But those of us who understand how the robot actually works are left with the nagging feeling that it really doesn't do much of anything after all. If we want someone to learn to swim or ride a bicycle we often give them only the skimpiest of instructions. However, at present, we can develop a learning program only if we can explicitly define (usually in numerical terms) what it means to execute a successful strategy.

Contrary to some current science fiction accounts, it should be relatively easy for us to control the learning capabilities of our digital computers. For one thing it has been found that they eventually reach a stage beyond which they exhibit no measureable improvement.

Language Translations

Of all the activities in the field of artificial intelligence, the computer translation of natural languages has probably attracted the heaviest funding. In addition, there have been large expenditures for developing mechanical and electronic devices to understand the content of spoken or written messages without translating them into another language.

Syntax and Semantics

Until the 1950's most linguists believed that natural languages could be analyzed in two separate phases: first syntax, then semantics.

Syntax deals with the formal structure of a language whereas semantics deals with the meanings of the individual words. In keeping with this strategy, many early researchers were convinced that if all the proper word meanings were stored inside a computer, accompanied by the proper rules of grammar, the machine would be able to develop effective translations from one of the lnguages to another. It seemed like a good idea at the time. So good that various government agencies, mostly the military, ended up spending more than $20 million on language translation procedures of various types. Unfortunately, as Bertram Raphael pointed out in his book "The Thinking Computer", "these experiments failed miserably, producing translations whose meanings differed from the original in all kinds of strange, unexpected ways."

After much careful analysis it was learned that the boundary between syntax and semantics is much fuzzier than anyone had previously suspected and that we constantly use subtle real-world clues in extracting meaning from sentences. For example, a syntactic analysis of such utterances as

"I ain't never been here."
"Me Tarzan, you Jane."
"Them's them."

produces only empty and profound confusion. Yet most people have little difficulty interpreting these awkward strings of words--and many others like them--in entirely meaningful ways. On the other hand, an expression like "Colorless green ideas dream furiously" is semantically correct (as well as we can tell) but it conveys no clear useful meaning.

Ambiguity and Context

The context of an utterance also has an important impact on its proper interpretation. As Hubert L. Dreyfus the author of "What Computers Can't Do" has pointed out, a simple phrase like "stay near me" can mean anything from "press up against me" to "stand one mile away" depending upon whether it is addressed to a child in a crowd or a fellow astronaut exploring the moon.

Similar ambiguities based on context crop up with discouraging regularity in machine translations. Foe example, if we attempt to translate the seemingly simple English phrase "It is beautiful" into French, the proper translation should turn out to be "C'est beau" if we are referring to a concrete object such as the Statue of Liberty, but "Il fait beau" (literally "It does beautiful") if we are referring to an abstract concept such as the weather or a theatrical performance.

Because of these, and a host of similar difficulties, computer translations have begun to lose favor in recent years. The early vision of workers in the field was that high-quality translations could be produced by machines supplied with sufficiently detailed syntactic rules, a large dictionary, and sufficient speed to examine the context of ambiguous words for a few words in each direction. Unfortunately, after nearly 20 years of developmental efforts, computers are still not producing high-quality translations. Of course it can be argued that with larger expenditure and more years of hard work, acceptable translations might be forthcoming. Would this happen? According to Joseph Weizenbaum "Every serious worker now agrees that the answer to this question is simply 'No'". Today we have machine-aided translations but it would appear that some sort of conceptual breakthrough will be required if we are ever to have complete and meaningful translations made solely by computer.

Language Comprehension Programs

Even though language translation by machine has encountered seemingly intractable difficulties, the use of machines to understand and duplicate human speech patterns is still receiving widespread attention. In these efforts the computer does not attempt to translate languages; instead, it attacks the simpler task of attempting to extract meaning from a single language. If computer programs of this type could be perfected, it could open up the use of computers to ordinary citizens who would not have to learn a special programming language in order to communicate with machines in many useful ways. Unfortunately, even this simpler task is plagued with serious difficulties. Consider the following passage which has been devised by a group of researchers at the Xerox Corporation to test the reading capabilities of various computer programs:

"Tommy had just been given a new set of blocks. He was opening the box when he saw Jimmy coming in."

In order to pass the Xerox test, a language comprehension program must be able to answer three questions:

1. Who was opening the box?
2. What was in the box?
3. Who came in?

Although a typical attentive first grader would have little difficulty answering these apparently simple questions, language comprehension programs find them surprisingly hard to handle. What causes the difficulty? One thing is clear, the questions can't be answered simply by repeating words directly from the passage. This strategy would lead the computer to reply to the first question: "Who was opening the box?" with the nonsense answer: "He was opening the box." Unfortunately, our language is structured in such a way that pronouns like "he" make sense only if they refer to a particular person.

The second question, "What was in the box?" calls for specialized knowledge of the real world. Nothing in the passage tells us what the box contains: however, we effortlessly use our background knowledge of how the world works to decide what the correct answer must be. We know from experience that new items often come in boxes--and we conclude that the blocks must be in the box.

To answer the third qestion: "Who came in?" we must understand the full implications of the phrase:"...he saw Jimmy coming in." Again we use our real world experiences, in making the proper interpretation--we realize that Tommy is probably not opening a box and walking through a door at the same time.

Thus we see that in order to extract meaning from everyday language, we need to know numerous subtle things about the world in which we live. The difference between "Join me in the pool" and "Join me in a cup of coffee" has nothing to do with syntax and everything to do with the difference between a cup and a pool. As Dr. Terry Winograd, assistant professor of Electrical Engineering at MIT has explained: "A sentence does not 'convey' meaning the way a truck conveys cargo, complete and packaged. It is more like a blueprint that allows the hearer to reconstruct the meaning from his own knowledge." Language comprehension programs encounter many different difficulties, the most serious of which stems from the fact that a computer has no sense of what it is to be alive and participating in the many experiences that give us a common heritage with those whose communication we seek to comprehend.

Turing's Test for Machine Intelligence

In 1936 a full decade before the first electronic digital computer was placed in operation, a gifted English logician named Alan Turing proposed a clever technique for determining whether or not a particular computing device is actually a thinking machine. In Turing's scheme, a human interrogator would be seated in front of two teleprinter terminals--one linked to an intelligent human subject and the other linked to a digital computer. The interrogator would type a series of questions on any desired subjects. After a suitable delay, man and machine would answer the questions via the teleprinters. In Turing's view if the interrogator couldn't distinguish the man from the machine--on the basis of the typed replies--then the machine would have to be regarded as being capable of intelligent thought processes. Turing himself anticipated that by the year 2000 machines would be built that could pass his ingeniously contrived test.

It seems clear that a computer can pass the Turing test only if it has genuine knowledge of the real world. A typical exchange might go something like this:

Q. HOW MANY CASUALTIES DID THE U.S. FORCES SUFFER IN WORLD WAR II?
A. Most historians place the figure at 450,000.
Q. WHO WOULD HAVE A PERSONALIZED LICENSE PLATE THAT READ 10S NE1?
A. Jimmy Connors.
Q. WHAT WAS THE LEAD STORY IN TODAY'S NEW YORK TIMES?
A. I'm not sure I remember, but I think it dealt with the settling of the coal miner's strike in Pennsylvania.

It certainly looks impressive but is it actually possible to store enough real-world information in a computer to allow it to answer such a broad range of questions? After all, our brains contain an incredible amount of data.

In order to give you at least a vague feel for the storage capacity of a digital computer, we should point out the fact that a typical large-scale digital computer can store approximately a million bits--or only about 1/10,000,000 the information content of the human brain. However, the computer's auxiliary storage devices are considerably more spacious. The Unicorn memory system used by the Illiac 4 is among the largest in existence. It stores a trillion bits of data (1/10 the capacity of the human brain) by using a laser beam to burn tiny holes in a thin mylar sheet. Thus, as technology develops over the next few years, it does not seem entirely unreasonable that we might develop a storage system that could handle as much data as is contained in the human brain.

The problem is that the brain doesn't just store data in a passive way. It is equipped to set up remarkably complicated links between the various data entries being held in storage. It is not clear how we could ever institute all the necessary crosslinks--a job of stupendous proportions! Thus we see that the fundamental problem we encounter in attempting to equip a computer with human judgment is not that we find it hard to tell it what is true. Instead, our difficulties center around telling it what is important.

Problem Solving and Pattern Recognition

The ability to recognize subtle patterns is closely related to native intelligence. In fact many popular intelligence tests consist mainly of pattern recognition procedures of various sorts.

Consider an item from a highly popular type of pattern recognition test. It is in the form of a ratio and proportion, i.e., "A is to B as C is to...?" Can a computer be taught to select the proper answers on a test of this type? You bet it can! Dr. Marvin Minsky at the Massachusetts Institute of Technology has programmed a computer to make exactly the kind of choices indicated. The geometrical analogues he used were obtained from a popular college entrance exam. In general, his program matches the performance of a tenth-grade student--not good enough to get into Harvard or Yale but still surprisingly good.

Another computer routine. which was developed by Terry Winograd at MIT, can "understand" (to a limited extent) both verbal language and geometrical manipulations. Among other things, it is programmed to carry on protracted conversations, recognize and use colloquial sentence fragments, correctly interpret pronouns, and assume the most meaningful interpretations of almost all ambiguous constructions. The geometrical figures it handles are drawn on a CRT screen and, when it does its manipulations, the pictures move.

It is an impressive program in many respects, but it suffers from several nagging limitations. As Winograd himself points out, the program cannot understand commands that involve compound nouns such as: "Build a three-block stack." Nor can it handle sentence fragments or implied meanings which make up most of our daily conversation. Moreover, it is baffled by commands like "Build a stack without touching any pyramids." The difficulty stems from the fact that it has no way of working on one goal (building a stack) while keeping track of another (avoiding contact with pyramids).

To Winograd these shortcomings, and others like them, indicate that his program--which is one of the most advanced in existence--has a long way to go before it will understand language the way hu-

(please turn to page 22)

The Impact of Automation on People — Part 1

by a Panel of Eight Individuals under the auspices of the National Bureau of Standards, Washington, DC, consisting of

1. *Wil Lepkowski, Science and Technology Editor, Washington News Bureau, McGraw Hill World News*
2. *Ben Bova, Editor, Analog Magazine*
3. *Dr. John McCarthy, Director, Artificial Intelligence Lab., Stanford Univ.*
4. *James Albus, Project Manager, Office of Developmental Automation and Control Technology*
5. *Daniel V. DeSimone, Deputy Director, Office of Technology Assessment*
6. *L. K. O'Leary, Asst. Vice Pres., Amer. Tel. and Tel.*
7. *Dr. Michael MacCoby, Psychologist*
8. *Gus Tyler, Asst. Pres., International Ladies Garment Workers Union*

"For progress there is no cure. Any attempt to find automatically safe channels for the present explosive variety of progress must lead to frustration. The only safety possible is relative, and it lies in an intelligent exercise of day-to-day judgment."

Based on a Symposium at the National Bureau of Standards in 1974.

1. Automation Technology and Its Public Impact

by Wil Lepkowski Science and Technology Editor, Washington News Bureau, McGraw Hill World News

The most important thing to realize in matters of public policy is that there is no such thing as the "public." There are such things as persons, however, and persons are really the ultimate receptors of any policies and technologies impacting on the public. The public is a concept; persons are real. This panel's focus will be on persons.

Automation means many things to many people: machines that cough up Cokes to thirsty youngsters at turnpike gasoline stations; computer-run systems that navigate supertankers around shoals and icebergs; programmed assembly lines that spill fully assembled cars off the conveyor at the rate of one a minute; and, of course, data banks.

Automation technology speeds processes. It raises productivity. It accelerates the flow of information. It makes everything in the economic stream move faster. And it has a way of nourishing itself toward fuller capacities, toward tighter control.

In this process it has created worry. Technologists may like their new technology, but social thinkers and the artists and the humanists don't. Workers don't. Young people especially don't. Automation used for promoting economic growth has a bad name. Maybe a case of mistaken reputation, but a bad name nevertheless.

The critics say it has produced boredom and frustration on the job, when it hasn't utterly taken jobs away. They say it has forced humans to trot along at a pace dictated more by the speed of the machine than by the naturalness of their own inner rhythms. And they fear the decline of personal freedom as the automation technologies, which operate through control, are applied to the greater and greater control of human beings.

How can automation technology achieve a good name in a period of rising economic and social insecurity?

Obviously, by helping make life and work better, and people happier.

These goals, of course, include personal value judgments. As such they can hardly be approached by programming the questions and asking them of a computer. In fact, if people could program the questions, they would already have the answers. You can measure parameters that help define life quality. But you can't manipulate a social system, I think, to achieve an inspiring life style. Such a style is all too intimately related to persons.

The purpose of this panel is to lay out the human challenge to automation technology, but neither to probe the design of new technologies nor to begin an ambitious expedition into the human condition. We may make an approach toward both, but the point will be the personal focus -- to help persons live their lives as free of unneeded control as possible, as unhurried by the pace of the machine as practical. A person is to have the option to turn it off if he thinks he needs to, and then to turn on another machine more appropriate to his needs.

2. The Science Fiction View of This Automation Conference

by Ben Bova, Editor, Analog Magazine

The thing about science fiction is that it teaches you to look at things in the very long term. We think in terms of millenia and megaparsecs rather than next week's headline. We tend to take the panoramic view of things, including the panoramic view of human history. And very often, when you want to try to determine where the human race is going in the future, it's instructive to look at where we've been, what our past has to teach us.

Now, this entire automation problem is a particular part of the technology that human beings have created for themselves. Though an anthropologist might say that technology has created human beings, yet technology's roots go far beyond our own physical appearance on this planet. Before there was man, before there was Homo Sapiens, there was technology. Very early ancestors of ours a million years ago and more were using pebble tools and animal bones; and basically, technology is a matter of making and using tools. The tools can get very sophisticated, but it's tool making. Instead of adapting physiologically to our environment, instead of growing claws or wings or fur, we have built a technology that in turn forces us to adapt socially, culturally, and psychologically. Now, without technology, long ago, long before Homo Sapiens appeared on this planet, the human race would have been at a deadend. Man without technology is a dead, naked ape.

But with technology, we have organized ourselves to a point where we are threatening our own existence in any of several ways. The price we have paid for depending so heavily on technology, I think, is obvious to everyone concerned with automation. One part of that price is a loss of human individuality. We are mammals; we live in groups; we live in very, very concentrated groups in our Western, technologically dependent society. The more we depend on technology to air-condition our rooms, to provide the fabrics that we wear, to carry us from various parts of the globe to this conference, the more we have to give up some part of our individuality to accomplish these things. So the basic question, I think, for this panel and this conference is quite clear: Does automation technology lead to an increase in human freedom or a decrease? Essentially, are we serving the machines, or are the machines serving us?

This question has not yet been answered, but there are some trends that are easily discernible.

Let us look at technology, or even at automation technology in particular, as a force in society, and compare it to the other forces that shape society. Almost every major force in any society and in any human society, is conservative in nature. It seeks to preserve the status quo. It attempts to maintain the situation today exactly as it existed yesterday. You can look at law, politics, religion, tradition -- they are all attempts to keep things the way they were.

Now technology by its nature is anti-conservative. It's dynamic; it changes things. Every invention, every improvement on a device, every new idea upsets the status quo to some extent. Yet it would seem to me in the long run that automation technology is, or can be, an enormous force for human freedom and for liberating the human spirit. It seems to me, that without technology a million years ago the human race would have died. We would have never survived the ice age. Without the invention of steam machinery, we would still have slavery. Despite all the other social forces moving against slavery, the actual force that destroyed slavery was the steam engine. It became cheaper to use steam than people. I think without the developments of the early twentieth century, without say the internal combustion machine, we would all be on the farm right now, working from dawn to dusk and probably longer to try to produce enough food to feed ourselves. And without the kind of technology we have today, if we suddenly stopped our technology -- if that were possible -- I think most of the people on this planet would die.

Now the question is what is the impact of automation technology? To me -- the question is how can we shape it to suit ourselves best? We are going through essentially an industrial revolution. It might be called the second industrial revolution, and like the first industrial revolution, it's a time of great upheaval and no one can see the end of the tunnel. The first industrial revolution was that of steam power, essentially, and it freed many human beings from tasks that required their muscular strength. We began to use machines instead of slaves or serfs.

In the second industrial revolution as we are going through it right now, we are beginning to use automated machinery to free people from the drudgery of repetitive tasks. In a recent newspaper there is a story about young workers in industry who find their jobs utterly boring. They have no enthusiasm for it; they just don't care about the work they are doing. But this is the kind of job that should be done right now by automated machinery. If a task can be done the same way twice, why risk -- why use -- a creative human being? Use a machine.

Eventually, of course, the machines will become creative, too, and that will bring up another problem. For example, some people at MIT are working toward what they call a "self-aware" computer; in fact, the "self-aware" computer is a computer that is "intelligent", and that is a staple of many science fiction stories. But, in a strange way, the psychologist, Carl Jung hit on it also. I don't think he would recognize the computer as the answer to his conception; but he did say once that psychologists will never be able to understand how the human mind really works, until they have another kind of intelligence against which to compare our own way of thinking.

3. Home Terminals

by Dr. John McCarthy, Director, Artificial Intelligence Laboratory, Stanford University

As for computer sciences, we have the proposition: There is, at most, one computer science so far.

My view of the role of automation today contrasts with the views of the two previous speakers.

I don't think we are living in a world which is being revolutionized by technology. I think that the direct effect of changing technology on the life of the average person today (the rate of change of technology) is less than it was in the thirty years 1890 to 1920. During that period, much more fundamental changes took place: for example, automobiles, refrigeration, aircraft, radio, the mass introduction of telephones and so forth. True, there have been substantial changes in recent years, But they have been smaller than the changes 1890 to 1920. However, they are currently perceived to be larger. So there exists a certain distortion of perception of the present which leads to a misevaluation of the future.

It is difficult to advocate new technology to people whose perception of what they see is distorted. And I would say the distortion is mainly an intellectual fashion. The price we paid for technology is a loss of human individuality -- and I regard this as a kind of distortion.

How can we shape automation technology to suit ourselves best?

Home terminals are an important example of a significant factor in the answer to this question. Home terminals and things that may be based on them, affect the current monopolies of information. Nowadays, we don't have total monopoly, but many local monopolies. A newspaper or a T.V. station or a radio station is a substantial commercial undertaking. If you want to get material before the public, then you don't merely have to produce it, you actually have to get somebody in control of a substantial resource to publish it, to disseminate it, for you.

Consider now a national information system which can be constructed of many interconnected sub-information systems. Everything that is published or has been published could now be stored in an immediately accessible form. In this form, everyone would have immediate access, for example, to the Library of Congress, and many, many more libraries.

To publish something would be simply to put it in the system and declare it to be publicly available. So anybody can publish anything. However, of course, people will still have to decide what to read. They will presumably read it using some trail of ideas related to what they normally read. What will be the result? There will be an enormous break in the information monopoly. A popular author doesn't need a publisher; he just puts it in the system, and his fans find it and they decide it's worth what he charges for it to read it; and so forth.

In such a system would there still be publications? I don't know. I rather imagine that there would. You might like Ben Bova's taste as a science fiction editor, and so you would very much like the things that he has put his stamp of approval on through persuading the authors to write it better than they otherwise would.

Now, I'd like to mention a few experiments that we have made in that direction. One experiment that we made was to put the Associated Press Wire into our computer. We have a program that reads it continuously and categorizes the stories according to the presence of key words. So if you want to know something about today's news, then let us say you are interested in energy research, you can type into this program "energy research". It will type back to you for a certain day, two stories, perhaps. Regrettably the number is usually zero.

In any case, you can have the first lines of all stories appear before you and decide which ones you would like to read.

This program has proved quite popular. We are planning to put more news services in, etc. I think this kind of thing is one direction in which automation can go to eventually break the information monopolies.

4. Income and Ownership in the Robotized Society

by Dr. James Albus, Project Manager, Office of Developmental Automation and Control Technology, National Bureau of Standards

From the general knowledge I have of the technical field in robot control, I would assert that the technology is essentially here to do almost anything that we want.

In other words, we have the technical ability, we know what is really necessary, to build robots which would revolutionize: (1) the manufacturing industry in this country; (2) resource development; and (3) many other of our very crucial, wealth-producing industries.

In still other words, if enough political and social and economic resources were devoted to only the development (merely the development of existing technology), we can build robots that would revolutionize production.

The blocks, the impediments, are economic, social, and political. Two basic questions hinder this technology. These are:

- If the robots do the work, then how do people get the income?
- If the robots can operate industries by themselves (producing an enormous concentration of economic power), who owns the power, and who controls it?

The two questions of income and ownership in our economic system and in our society, are the central questions which are impeding progress in robot control.

It is curious to me that in our society which has a capitalist ideology, this discussion is hung up on the issue of ownership, of private ownership, of property. Yet something as powerful as robots can completely control industry and can completely do anything that we really wanted to do technically, and so we have to discuss ownership. Who is to own these machines and who is to control them?

5. Technology Assessment

By Daniel V. DeSimone, Deputy Director
Office of Technology Assessment
Congress of the United States

Up until a generation or so ago, technological advance was generally regarded as almost entirely beneficial to mankind. We marveled at the increasing flow of new products and machines that seemed to be making life easier and more pleasurable for millions of people. Technology was a bountiful deity that poured out a seemingly endless stream of wonders:

- computers that did incredible things,
- wonder drugs,
- synthetic materials for clothing,
- vehicles that moved people faster and more comfortably than ever,
- devices for home entertainment,
- instant worldwide communication,
- a wondrous array of household applicances and automated equipment, and
- computers the size of one's hand,
- the promise of unlimited nuclear power, which would further swell the river of technological novelties.

Ours was becoming a steadily more affluent society and, seemingly, a happier one. The view was simplistic, but it was seldom questioned, except by a handful of people, some with uncommon vision, others, just cranks.

Then the pendulum began to swing. Some people who were definitely not cranks warned us to stop and think whether all progress was an undiluted blessing. Among them were a few leading philosophers of science and technology.

Dr. John von Neumann, for example, was one of the first to issue a general warning. He said, "For progress, there is no cure. Any attempt to find automatically safe channels for the present explosive variety of progress must lead to frustration. The only safety possible is relative, and it lies in an intelligent exercise of day-to-day judgment."

Joseph Wood Krutch, the humanist, gave us another perspective: "Technology made large populations possible...large populations now make technology indispensable."

We have plenty of people, like Krutch, who do not believe the clock could, or should, be turned back. The benefits of technology cannot be ignored -- e.g., the green revolution, more medical advances, a greater variety of leisure-producing devices. We are more or less successfully feeding and clothing a steadily increasing number of people, and our opportunities for education have expanded enormously.

At the same time, technology has produced a reaction. Is the present rate of progress so rapid as to threaten our mental and emotional balance? In any case, most people agree that we need to control technology and channel it to useful purposes. With this realization was born the technology assessment movement.

What is technology assessment? There are many ponderous technical definitions, but let us begin with a parable. The story is told that at the medieval University of Paris professors were disputing about the number of teeth in a horse's mouth. They agreed that the number could not be a multiple of three, for that would be an offense to the Trinity; nor could it be a multiple of seven, for God created the world in six days and rested on the seventh. Neither the records of Aristotle nor the arguments of St. Thomas enabled them to solve the problem. Then a shocking thing happened. A student who had been listening to the discussion went out, opened a horse's mouth and counted the teeth.

Looking into the horse's mouth symbolizes the kind of objective inquiry which is essential to technology assessment. But technology assessment is many other things, too. It is a social movement, like consumerism. It is a technical art, like forecasting. It is a method of managing change, like systems analysis. It is an integrated way of scrutinizing technology and evaluating its possible effects before opportunities are lost or before irreversible troubles arise.

The role of technology assessment has been both understated and oversold in different instances. Those who have studied the process thoroughly are confident that in some cases a good technology assessment may turn out to be the only way to bring 535 members of Congress together on a common ground, in order to discuss the complexities of a new technical subject and arrive at a considered decision. But technology assessment is by no means a magical tool for resolving all problems -- not even those that primarily concern engineering and the sciences. Technology assessment is no button that, when pushed, will deliver an unequivocal "right" answer. More likely, it will provide a number of choices, each with its own sets of consequences, good and bad. That brings us to the Office of Technology Assessment.

The first thing that happens to a new agency is that it loses its name and becomes an acronym: OTA. This office opened for business in 1974. After almost ten years of widespread public discussion, formal hearings, debate, legislation, and detailed planning and organization, OTA is finally a reality.

OTA is charged with assessing not only the current state and rate of progress of technologies, but also their consequences from many viewpoints: physical, biological, economic, social, and political.

OTA thus gives Congress a new window with a fresh outlook on technological issues that are increasingly important in national decision making. A majority of the first technology assessments will deal with some of the most urgent and troublesome problems of our times, including those concerned with preservation of our environment, ecology, wide use of natural resources, human health and safety, assurance of ample food, and long-term social and economic effects on large groups of people, such as the urban poor and small farmers.

Most people view technology assessment as dealing with the negative aspects of technological change, taming the rampaging bull, so to speak. The other side of the picture is the neglected opportunities. This is less obvious to nontechnical people, but just as amenable to technology assessment. We will be assessing technological opportunities as well as technological problems.

OTA intends to be a truly public agency, which links Congress with concerned people throughout the nation. It can relieve Congress of much uncertainty on highly technical matters. It can point out areas in which the impact of te technology on society, and the impact of society on technology, are far from obvious. And it can weigh risks, benefits, costs, and alternatives before the pressure of time requires legislative action. But Congress will continue to make the value judgments and ultimate decisions that lead to legislation.

Even at this early stage of its existence, it is clear from all of the requests we have received from Congress that OTA will not suffer from a lack of interest or a dearth of ideas.

We will be performing a unique function for the Congress, but I do not want to suggest our assessments will be magical tools that will vanquish all of the enemies of enlightenment.

It would be irresponsible or naive to assert that technology assessments will always deliver answers, in simple form, that can be translated directly into Congressional action. Yet we will be clearing away clouds. For every ray of understanding that shines through, we can be grateful.

6. The Management of Automation in Regard to People

by Mr. L. K. O'Leary, Assistant Vice President, American Telephone and Telegraph

I shall base my remarks on the experience of my own business, the telephone business, and to talk about the management of technological change in automation.

In the minds of some people, the telephone industry is the ultimate automated industry. My business has some claim anyway, for good or ill, to be called highly automated. The heart of that claim is what has been identified, often to the point of boredom, as the world's largest computer -- the nationwide telephone network. An irreverent colleague of mine points out that it's also the world's slowest computer, but he's a purist who ordinarily thinks in nanoseconds.

Anyway, we operate with due and deliberate speed an incredible data processing machine. It works on demand for many of 110 million input output terminals, any one of which can at any moment select one of the 7 million billion possible connections to reach any other. It has trillions of parts and must work with all of the others with absolutely no down time, even while we are continually reconfiguring it to meet new and changing demand.

We have one million people working at thousands of different jobs so that this big telephone system computer works for all of us every time we want it to. That's one million people working on a support system for a computer that serves over 200 million human beings.

Now needless to say, the ubiquitous phone service of today is absolutely dependent on this big computer. We started building it in real earnest back in 1920, when we began to convert our manual central offices to dial operation. Back in 1920, it took 142,000 operators to say "Number, Please," and those 142,000 young ladies served some 8,800,000 phones. Today we have 150,000 young ladies and gentlemen as operators serving some 109 million phones. Of course, you are dialing or key pulsing most of your own calls. If you didn't, and we were still on manual service, you'd be paying probably something like hundreds of dollars every month for local phone service, and we would be employing the total U.S. work force. Actually, the whole damn thing would be impossible, so I don't have to calculate the operator ratios to amuse you.

One final number towards an eventual point. Back in 1920 before these big dial conversions, we had many more operators per thousand phones than we have now. In fact, they were over half of the telephone company work force. We had 229,000 employees back then; now we have far fewer operators per thousand phones, but we have one million employees, as I mentioned earlier.

Now, automation may be working quietly and insidiously away to put us all into the full-time leisure market, but at this stage of evolution in my own business, there are very few signs of it. Automation has made the technology much more available and much more valuable to many more people, providing many more jobs, and a much more inexpensive service.

Back in 1953, I was a young, liberal type. If someone had identified the establishment for me, I would have been against it. But I didn't know we had one; so I was against the "power elite," if you go back that far. I was still sorry, back in 1953, that Henry Wallace had not become President. Yet, I found myself wondering if all the fuss and furor about 23 nice little old ladies, formerly telephone operators, was really worth it, which I submit is kind of a hell of a position for an angry young humanist. After a long meeting with my boss one day, I asked him in effect if we couldn't do the decent thing for these little ladies, short of the time we were spending on it. My boss gave me something of a help talk. I don't recall many of his words; but the gist of it was if the Bell system hadn't managed the 30 years of dial conversion, properly, we would have had a militant and highly virulent labor union by about 1925; we would have had restricting Federal legislation by about 1928; and probably Federal ownership of the phone company by 1932. And then he said something that I do remember: he said that neither one of us would like the outfit now, either, because it would have become something that would have been hurting people, and neither you nor I would like it. I wish he had said something really memorable like "Machines count better than people, son, but only people really count," or some other such words to live by; but he was a kind of engineer/management type. However, he did know pragmatically that technical change had to be managed with people in mind.

This was a lesson that the system had somehow learned over those decades of dial cutovers, although I really do think that some of it was instinctual, built-in, based on the sense of service to humanity of the outfit, going back to its beginning. And that, finally, is my central point.

Automation must be managed. Technology must be introduced ready-cut to human measure. We also have learned along the way, beware of the romantics, who would either wreck or worship the machine -- and we have them in my business on both sides of the fence. And a final thing -- don't ever, ever talk or think about a human employee as a subsystem of a computer design.

This is a string of cliches, I know that, but I think the experience of my company generally proves that you can make automation work if you live by these cliches, and operate from their meaning. Parenthetically, I want to add very quickly that one of my jobs in my outfit is to design and produce better jobs for people after their old jobs are taken apart by technology. And other forms of progress. And we're still learning how to do this well. But we have been just successful enough to give me heart. The beast can be managed, which will leave us with the oldest and biggest problem of all -- who is man and what should he become? And the answer to that, if there is one, will never be punched in any machine.

(to be continued)

Jones – *Continued from page 12*

- 265 roadside emergency telephones, placed at about 20 kilometer intervals
- an extensive two-year technical training program for instruction of Saudi Arabian telecommunication personnel
- a $512-million project completed on schedule □

QUIZ NO.2 FOR READERS OF "COMPUTERS AND PEOPLE"

Who said each of the following quotations? when?

1. Who steals my purse steals trash.
2. An investment in knowledge pays the best interest.
3. There are more things in heaven and earth than are dreamt of in your philosophy.
4. We know accurately only when we know little; with knowledge doubt increases.
5. How far that little candle throws his beams! So shines a good deed in a naughty world.
6. How vain is learning unless intelligence go with it!
7. You should keep learning as long as there is something you do not know.

Nakayama – *Continued from page 10*

than individual supremacy. There is easy mixing, lots of respect, and a relaxed atmosphere here."

A Chamber of Commerce official in the area concurred. He declared that the company "is an excellent corporate neighbor." The editor of the local weekly called the company "a positive force in the community."

A personnel clerk at a Nebraska motorcycle company felt that employees seemed happier. "This may result from the accessibility of the management," she concluded.

Another woman at the same company said that more than 100 applications are received weekly because it is well known in the community that this is a good place to work. However, she continued, "Job turnover is minimal."

Finally, the purchasing manager of a Japanese electronics company in San Diego told us: "It is as different working for Japanese and Americans as the difference between night and day. I have been here a year, after ten years with an American company. The Japanese are interested in their employees. They want you to stay. Your principal concern is not only how you can do your job but how you can do it better. I never want to leave this company."

I have many more such comments if any of you are interested. And if anyone thinks I am making it all up, I shall be glad to give you the names and phone numbers of the people who were interviewed. The point is that here we have, out of the mouths of Americans, the real reasons why Japanese industry is so successful.

What about the future? If we look at the friction between our two countries revolving around the semiconductor, computer, automobile, and steel industries, we may learn something.

Continuous Development of New Technology

An essential feature of the semiconductor and computer industries is their continuous development of new technology, of remarkable new products which satisfy social demands. Another feature is that their markets are so huge that they will probably not be saturated for the next two decades. Therefore innovative technology which will assure the future interests of society is imperative.

Such is not the case with the automobile and steel industries. Their markets are growing at a far slower rate and the future demands upon them are much less dramatic.

To meet their destiny, manufacturers of semiconductors and computers will have to invest vast sums of money in research, development, and superior equipment to make sure that the quality and quantity of their products do not fall below demand. For the past ten years, Japanese manufacturers have been doing exactly that.

It would be unreasonable to expect American stockholders to exercise the same patience.

Potential for Inflicting Damage

But it is not unreasonable to point out that the situation has the potential for inflicting serious damage upon the relationship between our two countries, and that this could be harmful to the community of nations bordering upon the Pacific Ocean.

For five exciting years I have lived in your country. It has been a wonderful experience. Not only am I the manager of several Fujitsu operations in this country, but -- as I told you -- I am a member of the Board of Directors of Amdahl and the TRW-Fujitsu Company. Because of this background, I like to think that I am reasonably well informed about business and industry in the United States.

One thing I know is that you have your culture and tradition and we have ours. Ideas that work well in Japan cannot necessarily be transplanted to this country.

Promotion of Better Understanding

Be that as it may, the purpose of my talk here today is not to convince you that you should "go Japanese." It is to help you understand how we operate, to dispel some of the ugly stories that circulate here about Japan, to promote better understanding between our two countries. I hope that in some small way I have succeeded. □

Logsdon – *Continued from page 16*

man beings do. As he wryly comments: "At present, it takes a huge computer and sophisticated programming to do a small part of what a young child does naturally..." □

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PS Form Aug. 1978 3526 *(Page 1)* (See instructions on reverse)

Computing and Data Processing Newsletter

COMPUTER REACHES BACK 500 YEARS: WERE JUSTICES OF THE PEACE IN ENGLAND BIASED OR NOT?

Robert Reid
IBM Corp.
3424 Wilshire Blvd.
Los Angeles, CA 90005
(213) 736-4722

Were 15th century justices of the peace in England true spokesmen of the people? or were they a group of people swayed by the monarchy? And after almost 500 years, can one arrive at the truth today?

Dr. Robert L. Woods, Jr., history professor at Pomona College, expects to find out with the help of a computer. After almost seven years of research, much of it among England's archives of five centuries, Dr. Woods has gathered some 100,000 records on 2800 justices of the peace who served between 1485 and 1537. The names of these individuals have appeared over 34,000 times in the records. These figures may double as the final stages of the study draw near.

Dr. Woods describes his study as an attempt to reveal the past in England's early Renaissance period, where not enough work has been done. Justices of the peace represented a central instituion of law and politics, and there is some evidence that although they have been held as natural leaders of the people and early spokesmen for democracy, yet they may have been bought off by the Tudor monarchy.

The computer helps focus on individual justices, and shifts in the justice's income or property. Here are some of the questions being analyzed: Who received royal commissions to be justices of the peace? During what dates? With what powers? Was their selection based on landed wealth or other wealth? How did the government of Henry VIII recognize a qualified justice? Did their power stem from their social influence or from the king's authority?

The computer can automatically correct calendar dates, correct for misspellings of names by using other data to confirm the identity of a justice, and do detailed clerical work hundreds or thousands of times faster than a human being.

NEW MARTIAN CLOUD TYPES DISCOVERED BY VIKING ORBITER 1 SPACECRAFT

Nicholas Panagakos
NASA Hqrs.
Washington, DC 20546, and

Frank Bristow
NASA Jet Propulsion Laboratory
Pasadena, CA

Types of weather activity rarely or never before observed on Mars have been discovered in pictures taken by the spacecraft called Viking Orbiter 1 of the National Aeronautics and Space Administration.

These unusual phenomena (see Figure 1) were found in images taken on a very clear Martian day on Feb. 22. Several prominent features are visible in a mosaic of 102 frames taken that day. The photomosaic is probably the best wide-area view of Mars yet obtained.

The most remarkable weather activity in the picture appears as a sharp dark line which curves north and east from the huge volcano Arsia Mons in the Tharsis Ridge. It is believed that this line is either a weather front or an atmospheric shock wave. Nothing like this has ever been seen up till now on Mars.

The second unusual weather activity consists of four small clouds that hover just north of the crater called Lowell. Two of the clouds are so close together that they are almost inseparable even in high enlargement; but all four clearly separate cloud shadows are cast on the surface of Mars. The largest cloud is about 32 kilometers (20 miles) in length. Judging from the distance between the clouds and the shadows, the clouds float at an altitude of nearly 28 km (15 mi). The shadows, which are cast to the south of the clouds, indicate that the photographs were taken close to noon, local Martian time. Distinct cloud shadows appear only rarely on the surface of Mars.

Viking Orbiter 1 was launched on Aug. 20 1975, and entered on Mars orbit June 19, 1976. When these pictures were taken, it was close to the end of four years of planned operation, taking an average of 30 pictures a day.

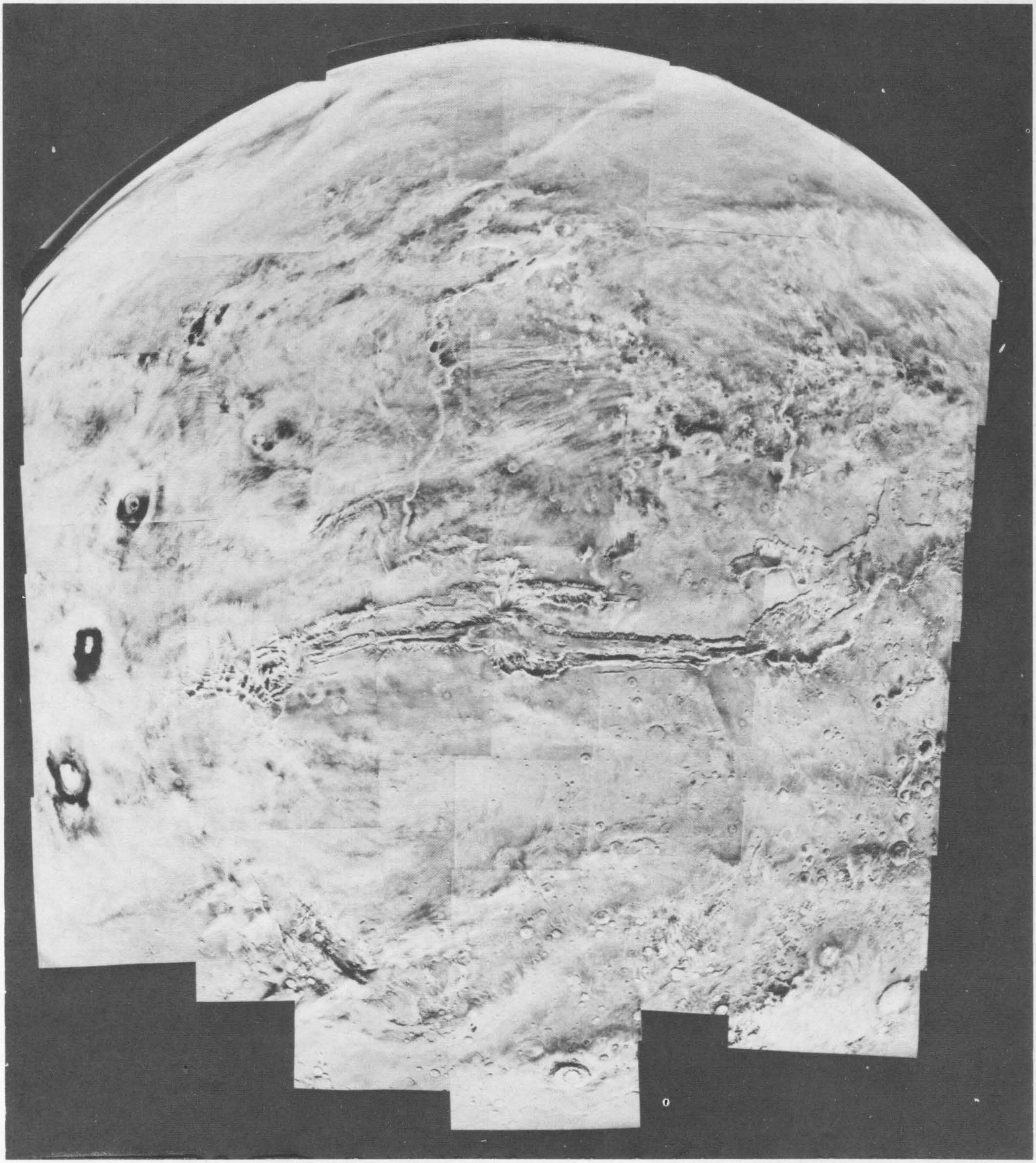


Figure 1 – *A photomosaic of the surface of Mars.*

ELECTRONIC TELEPHONE DIRECTORY IN ST. MALO, FRANCE BECOMES A REALITY

Jean Young
News Telematique
John Adams Associates
1825 K St., N.W.
Washington, DC 20006

Some residents of the popular coastal area of St. Malo in France now have an electronic telephone directory that promptly displays the number they need on a screen in their home or office. Dozens of residents in St. Malo starting July have become pioneers in the first large-scale test of France's plan to completely eliminate conventional telephone directories and telephone information services. PPT, the phone company, says the electronic directory is easier to use, faster, and cheaper.

Every customer of the telephone company is to be provided with an electronic terminal over the next 10 years. More than 30 million terminals are to be distributed free. This is predicted to be more efficient, cheaper, and of course always up to date.

The electronic directory terminal is a nine inch black and white screen connected to the telephone and linked with the data base through the regular telephone line. Customers will type on the keyboard the requested name, and the number will appear within seconds on the display screen.

The Havas Sociological Research Center is monitoring the trial, and reports that the terminal was at once accepted by St. Malo participants, and they had no trouble operating it. A little training was all that was necessary. People quickly grasped that the terminal was no more trouble than a pocket electronic calculator.

By 1981 some 250,000 terminals will be installed in the Ille et Vilaine region around Saint-Malo. There will be 30,000 entries in the test data base; and a high-level man-machine dialog is needed. The effectiveness of the system will be thoroughly tested in this trial.

A national program known as Telematique is developing several new telecommunications projects. These include two-way facsimile service for home and office, a free form telewriting system, and teleconference facilities. They will be mass-marketed at a relatively low cost because of new developments in microprocessors and digital technology.

FIRST TRADE SHOW IN CHINA LIMITED TO U.S. EXHIBITORS, DRAWS OVER 40,000 VISITORS IN CANTON

Banner and Greif, Ltd.
110 East 42nd St.
New York, NY 10017

More than 40,000 executives from every province in China except Tibet, attended ELECTRONICS/CHINA 80, the first exhibition restricted to U. S. companies as exhibitors ever staged in that country. The show took place Aug. 14-24 at the Canton Trade Fair site. Tens of thousands from all over China who are concerned with electronics attended the show. Sponsors of the show were the United States-China Trade Consultants, Inc., Washington, D.C., and the China Council for the Promotion of International Trade (CCPIT).

Following were some features of the show:

- Every exhibitor who had equipment to sell on the show floor, had sold it to Chinese buyers by the close of the show.
- There were long lines of persons at the booth of the CCPIT asking for literature and producing credentials showing their position in the electronics industry.
- 32 seminars by exhibitors ran from Aug. 15 to Aug. 24, and an average of 560 persons attended each day.
- Attendance was under the control of Chinese officials and was open to the trade only.

IS BOSSY'S DIET NUTRITIOUS? COMPUTER SEEKS THE ANSWERS

Edward A. Fiez
University of Idaho
College of Agriculture
Caldwell, Idaho

To help cows stay contented and productive, dairy farmers are using a computer to determine if they are eating enough and their diet is nutritious. We consult a computerized ration analysis program to determine the level of nutrition of a herd.

A farmer can be shown in minutes if his herd's ration is within the guidelines of the Federal research organization, the National Research Council, that publishes nutritional data for both animals and humans.

Feed samples are given by a farmer to a laboratory to identify the type and quantity of roughage, alfalfa, grain, and other diet elements being fed to the herd. The data is transmitted by a terminal to the university's computer in Moscow, several hundred miles to the north. Within seconds a report is sent to Caldwell, where it is printed out. Contained in the printout are:

- a summary of herd specifications, such as average weight, production, and milk fat
- percentages of nutritional concentrates, such as calcium, phosphorus, potassium
- average pounds of nutritional elements consumed by a cow
- listing of adequacy or not
- the maximum milk production possible using the herd's ration
- a specification of any inadequacies in the herd's ration

□

Games and Puzzles for Nimble Minds – and Computers

Neil Macdonald
Assistant Editor

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 programming 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"). 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 must display some kind of evident, systematic, rational order and completely remove some kind of randomness; the operation must be expressible in not more than four English words. (But Man can use more words to express the solution and still win.)

NAYMANDIJ 8011

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

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, plus a few more signs. To compress any extra letters into the set of signs, the encipherer may use puns, minor misspellings, equivalents (like CS or KS for X), etc. But the spaces between words are kept.

MAXIMDIJ 8011

NUMBLES

A "numble" is an arithmetical problem in which: digits have been replaced by capital letters; and there are two messages, one which can be read right away, and a second one in the digit cipher. The problem is to solve for the digits. Each capital letter in the arithmetical problem stands for just one digit 0 to 9. A digit may be represented by more than one letter. The second message, exexpressed in numerical digits, is to be translated (using the same key) into letters so that it may be read; but the spelling may use puns, or deliberate (but evident) misspellings, or may be otherwise irregular, to discourage cryptanalytic methods of deciphering.

NUMBLE 8011

```
           O N E
      *    D O G
      ---------
         A T I F        O=C
       G H A O
     N I I H
   -------------
=    C A F D E F
```

51406 8270

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

SOLUTIONS

NAYMANDIJ 8009: Make six X's.
MAXIMDIJ 8009: A man takes his world with him.
NUMBLE 8009: Praise the day at evening.

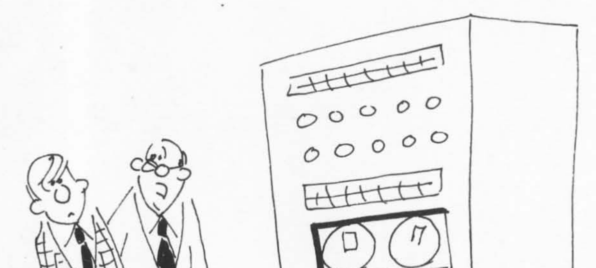
Our thanks to the following people for sending us solutions: Roland Anderson, Stockholm, Sweden – Naymandij 8007, Maximdij 8007, numble 8007; T, P. Finn, Indianapolis, IN – Maximdij 8009, Numble 8009; Fred Pitts, Washington, DC – Maximdij 8007.

The Frustrating World of Computers

by Harry Nelson
1135 Jonesport Ct.
San Jose, CA 95131

THE AVERAGE WATER BILL IS $8.63, THE COMPUTER MADE OUT A BILL FOR $1726.01, AND YOU DIDN'T THINK THAT WAS A BIT STRANGE —— ?

OLD RELIABLE IS CRYING WOLF, AGAIN ——



IF YOU THINK THIS IS BAD, YOU SHOULD SEE WHAT WAS PROGRAMMED IN—

I DIDN'T THINK IT WAS NECESSARY TO RE-CHECK THE STRESS ANALYSIS FIGURES; WHY —— ?