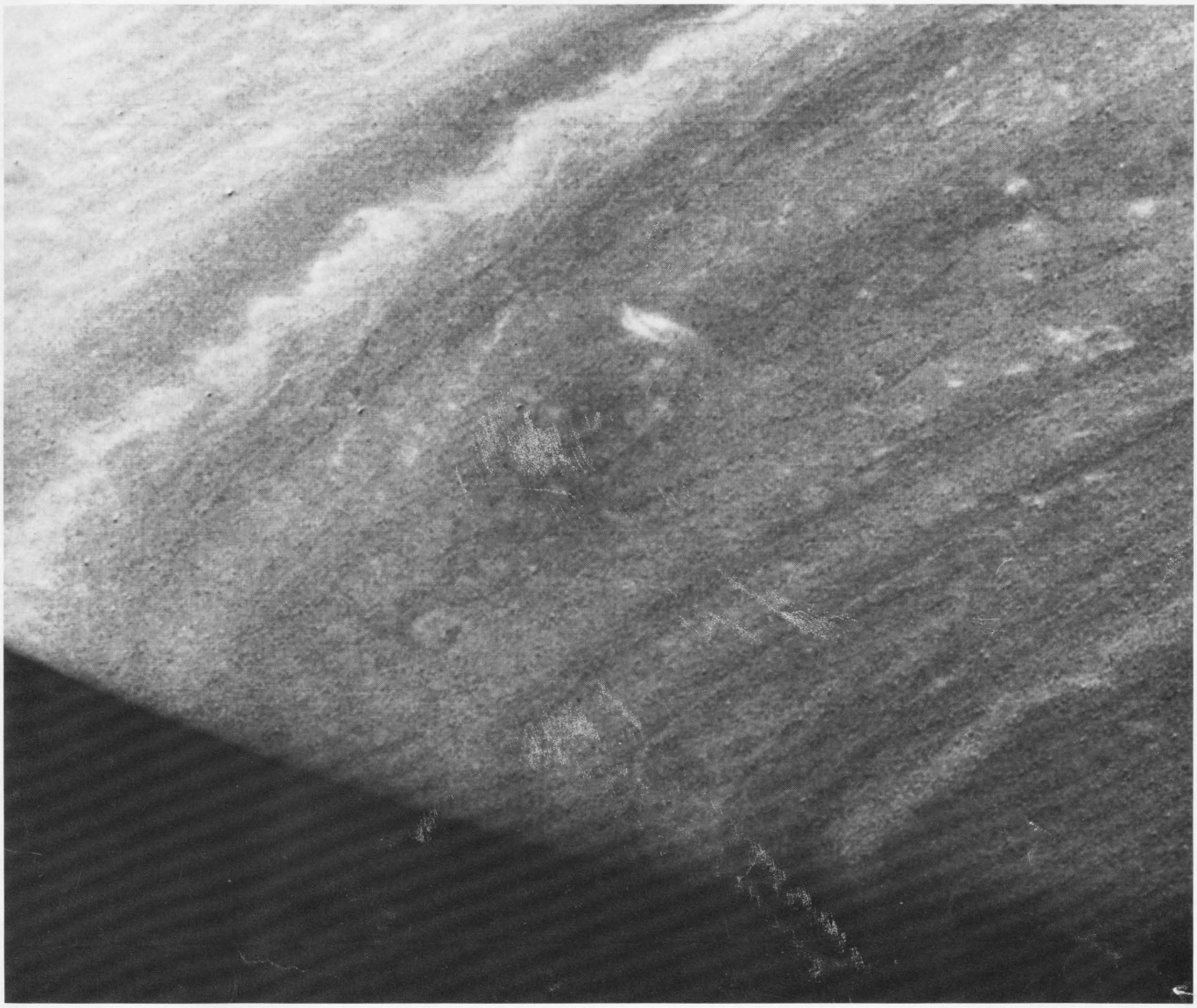
computers and people

March—April, 1981

Vol. 30, Nos. 3-4

formerly *Computers and Automation*



SATURN, SOUTH POLAR REGIONS – The Flyby of Saturn by Voyager 1 (Part 2)

The Computer Almanac and Computer Book of Lists — Instalment 18

Neil Macdonald
Assistant Editor

21 NOBEL LAUREATES CONVENING AT CARNEGIE-MELLON UNIVERSITY IN FEBRUARY 1981 (List 810301)

Hans A. Bethe / physics, 1967
Saul Bellow / literature, 1976
William N. Lipscomb / chemistry, 1976
Arthur Kornberg / physiology/medicine, 1959
Theodore W. Schultz / economics, 1979
Robert Hofstader / physics, 1961
Fritz Lipmann / physiology/medicine, 1953
Konrad Bloch / physiology/medicine, 1967
Sheldon Glashow / physics, 1979
Walter Brattain / physics, 1966
John Bardeen / physics, 1972 and 1956
Charles Huggins / physiology/medicine, 1966
Emilio Segre / physics, 1959
George Wald / physiology/medicine, 1967
Alfred Hershey / physiology/medicine, 1969
Samuel Ting / physics, 1976
Ivar Giaever / physics, 1973
Polykarp Kusch / physics, 1955
William Shockley / physics, 1956
Baruch Blumberg / physiology/medicine, 1976
Howard Temin / physiology/medicine, 1975
Willis Lamb / physics, 1955
Edwin McMillan / chemistry, 1951

(Source: Dept. of Public Relations, Carnegie-Mellon Univ., Schenley Park, Pittsburgh, PA, 15213, (412) 578 2900)

10 TITLES OF NEW AND FORTHCOMING BOOKS IN MATHEMATICS BEING PUBLISHED BY THE PRINCETON UNIVERSITY PRESS (List 810302)

Base Change for GL(2) / by R. Langlands
C*-Algebra Extensions and K-Homology / by Ronald G. Douglas
Conference on Several Complex Variables / edited by John Fornaess
K-Theory of Forms / by A. Bak
Riemann Surfaces and Related Topics / edited by I. Kra and B. Maskit
The Spectral Theory of Toeplitz Operators / by L. B. de Monvel and V. Guillemin
Pseudo-Differential Operators / by M. E. Taylor
Exact Sequences in the Algebraic Theory of Surgery / by M. E. Taylor
Algebraic Structures of Symmetric Domains / I. Satake
Recurrence in Ergodic Theory and Combinatorial Number Theory / by H. Furstenburg

(Source: announcement for the 75th anniversary of the Princeton Univ. Press, Box AAA, Princeton, NJ, 08540)

(Note by Neil Macdonald: Apparently, nothing in this announcement is a glossary where terms may be looked up, and a definition and illustration of the definition can be learned. This lack is characteristic of the mandarins of academia. Here is one of the reasons why the reorchestration of knowledge (see the Lias article in this issue) is on its way, and why university presses sell so few books.)

8 WARNINGS FROM XEROX SERVICE MAN RE PROPER OPERATION OF XEROX MACHINE AT 815 WASHINGTON ST., NEWTONVILLE, MASS. (List 810303)

This machine is subject to breakdowns during periods of critical need.

A special circuit in the machine called a "Crisis Detector" senses operator's emotional state, determining degree of desperateness to make copies.

The "Crisis Detector" then creates a malfunction proportional to the desperation of the operator.

Threatening the machine with violence increases the degree of desperateness and the degree of malfunction.

Attempts to use any other duplicating machine may cause it to malfunction also: they both belong to the same union.

It is desirable to keep cool.

It is desirable to say sweet things to the machine.

Nothing else seems to work, except carefully following the instructions in the manual, then telephoning Xerox service, then begging for help.

(Source: Xerox service man plus Neil Macdonald's notes.)

10 COMPLETE UTTERANCES OF ONE WORD (List 810304)

Ouch!
Wow!
Hurray!
Damn!
Please.

Hello!
Perhaps.
Hush.
Stop!
Goodbye.

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

10 COMPLETE UTTERANCES OF 2 WORDS (List 810305)

Time flies.
Shut up!
Never mind.
Help me.
I disagree.

No smoking
One way
Main Street
Bon voyage!
Dead end

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

10 COMPLETE UTTERANCES OF 3 WORDS (List 810306)

What is is.
Circumstances alter cases.
I love you.
Veni, vidi, vici.
Each for himself.

Sauve qui peut.
More in kitchen.
Family hold back.
Never give up.
How are you?

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

10 COMPLETE UTTERANCES OF 4 WORDS (List 810307)

The more, the merrier.
Eventually -- why not now?
Will you marry me?
The die is cast.
The rich become richer.

Tiger, tiger, burning bright.
All hell broke loose.
Life is a dream.
Queen of the sciences.
Keep off the grass.

(Source: from "Challenges to Investigators in Artificial Intelligence" by Neil Macdonald)

10 COMPLETE UTTERANCES OF 5 WORDS (List 810308)

Time flies like an arrow.
Fruit flies like a banana.
Notice flies like a dragonfly.
Judge the day at evening.
Experience is a harsh mistress.

Double, double, toil and trouble.
Twas the night before Christmas.
Old Macdonald had a farm.
Every flow has an ebb.
Long time no talk to.

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

10 COMPLETE UTTERANCES OF 6 WORDS (List 810309)

It is the will of Allah.
A stitch in time saves nine.
I came, I saw, I conquered.
Many and light fill the purse.
Who steals my purse steals trash.

Next station stop is Pennsylvania Station.
You can't push on a rope.
It is raining cats and dogs.
A rolling stone gathers no moss.
No stones fall from the sky.

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

26 SIGNS WITH NAMES AND OPTIONAL LETTERS FOR MAKING CRYPTOGRAMS MORE EYE-APPEALING (List 810310)

A	ARROW	
B	BALLS	
C	CATERPILLAR	
D	DEL	
E	EYES	
F	FLOWERBUD	
G	GOALPOSTS	
H	HEART	
I	INSECT	
J	JEWEL	
K	KEY	
L	LIPS	
M	MOON	
N	NET	
O	OCTAHEDRON	
P	POLE	
Q	SQUARE	
R	RECTANGLE	
S	SUN	
T	TULIP	
U	ANTLERS	
V	HOUSE	
W	WHEEL	
X	EX	
Y	PITCHFORK	
Z	ZIGZAG	

(Source: from "101 Maximdijes" by Edmund C. Berkeley, published by Berkeley Enterprises Inc., 815 Washington St., Newtonville, MA, 02160, in 1976, 32 pp; and Neil Macdonald's notes)

(please turn to page 31)

Vol. 30, Nos. 3-4
March-April, 1981

Editorial Offices
Berkeley Enterprises, Inc.
815 Washington St.
Newtonville, MA 02160
(617) 332-5453

Advertising Contact
The Publisher
Berkeley Enterprises, Inc.
815 Washington St.
Newtonville, MA 02160
(617) 332-5453

"Computers and People" (ISSN 0361-1442), formerly "Computers and Automation," is published every two months at 815 Washington St., Newtonville, MA 02160, by Berkeley Enterprises, Inc. Printed in U.S.A. Second Class Postage paid at Boston, MA and additional mailing points.

Subscription rates: United States, $14.50 for one year, $28.00 for two years. Elsewhere, add $6.00 per year.

NOTE: The above rates do not include our publication, "The Computer Directory and Buyers' Guide." To receive this, please add $15.00 per year to your subscription rate in the U.S., and $18.00 elsewhere.

NOTE: No organization in Switzerland or Morocco is authorized or permitted by us to solicit subscriptions for, or receive payment for, "Computers and People" or "The Computer Directory and Buyers' Guide." Such subscriptions and payments should be sent directly to us.

Please address mail to: Berkeley Enterprises, Inc., 815 Washington St., Newtonville, MA 02160.

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

Change of address: If your address changes, please send us both your new address and your old address (as it appears on the magazine address imprint), and allow three weeks for the change to be made.

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 numerous small cloud features, waves, and eddies, in the south polar region and mid southern latitudes of Saturn. This image was taken by Voyager 1 from a distance of 265,000 miles on Nov. 12, 1980. See more of the story on page 33.

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.

Notice to Our *D Subscribers

The 1979-80 *Computer Directory and Buyers' Guide* is expected to be printed by mid-1981. In the meantime, the 1978-79 *Directory* may be consulted. Copies are available.

The Electronick-ization of Knowledge

Edmund C. Berkeley
Editor

An article in this issue of "Computers and People" describes and illustrates one more vast rolling ocean wave of the computer revolution. This article is "The World's Knowledge: Who Will Re-Orchestrate It?" by Edward Lias. This new wave is derived from machines that have four important parts:

- electronic communication over unlimited distances: nerves
- electronic storage of vast resources of information: memory
- electronic capacities for inputting and outputting information: listening, talking, querying, replying
- electronic computation: reasoning, logic, analyzing, synthesizing, ...

This is a new version of the giant electronic brain, for which new buzzwords are distributed processing, data base management, etc.

This is one of the ways in which artificial organisms (robots) living in symbiosis with human beings will come into existence, will become real. The French word "telematique" is appropriate: from "tele" for "distance" and "matique" from "automatic". Of course, robots will naturally not have human form because that is too limited: too slow, too clumsy, too distance-restricted. The human style of animal is literally an archaic style, produced by evolution of chemical compounds without purpose, and not yet proved in nature's testing laboratory to be able to survive for eons, like cockroaches for example.

Books, paper, pen and ink, letters, magazines, ... this was the information culture of the years 1500 to 1950. Now there is developing a new information culture: electronic information, electronic knowledge, pouring into and out of the organism, the machine, the robot.

Previously universities and schools taught how to read the symbols for spoken sounds of language and how to interpret and understand all the knowledge expressed in those symbols. Now there will be a new information culture based on spoken sounds into the machine and speech issuing from the machine. Among other consequences: would you want to listen to a lecture by Professor J. Jones of Siwash College on the history of World War II, at 7:30 pm on Thursday night, 11 miles away, with the weather snowing and windy? or would you prefer to listen to a lecture by Sir Winston Churchill on this subject, spoken out of your terminal connected to the machine, at any time of day or night you would like to listen to it? complete with pictures and maps?

Governments (both democracies and dictatorships) will receive an enormous asset: they will be able to know what a person chooses to look at or listen to. They will be able to deny access to "sensitive information" or matter "classified for national security", whether or not that classification is to protect the country or to protect a tyranny. "Power tends to corrupt, and absolute power corrupts absolutely". (Lord Acton, 1834-1902).

Perhaps even more insidious will be the power of the reorchestrators, the power of those who select the knowledge to be put into data bases, the material which persons consulting the vast memory of the machine will find first as they look up information.

Really all that is needed now is for the terminal to be able to see the room in which it is and the person to whom it belongs. Then we shall have in reality the appalling Big Brother dictatorship of George Orwell's "1984".

Unless we take care of preventing it ahead of time.

□

Computer Games: the Computation of Judgment

Hans J. Berliner
Computer Science Department
Carnegie Mellon University
Pittsburgh, PA 15213

"Most people would agree that playing interesting games is difficult; that is, it requires intelligence."

The Exercise of Judgement

How is a computer to exercise judgement?

We have done some research as follows: (1) A computer program was built that played backgammon, a game requiring large amounts of judgment. (2) A new method for computing judgements was discovered. (3) This method produced a program that was good enough to be invited to play the World backgammon champion. (4) To most people's surprise, the computer program won.

Playing Interesting Games

Most people would agree that playing interesting games is difficult. That is, it requires intelligence. We tend to look up to people who are chess champions. Games are also much better defined than is ordinary life. The rules of a game don't change. Thus it is possible to study it in its confined, but still rather large and difficult context. Further, instructional literature, test problems, and competitions exist for most interesting games. All of this makes it possible to create computer programs that deal with an interesting domain, one that requires intelligence to do well, and one for which standards already exist for what is considered acceptable, good, and excellent.

Computer Methods and Human Methods of Playing Games

These are the attributes that have made computer games attractive as objects of study to many researchers. A computer program that can play a game must have access in its program to the exact rules of play. These are used to determine whether a move from an opponent is legal. When it is the program's turn to play, it uses the rules of play to guide its own activities (Figure 1). A technique known as tree searching can be invoked to examine successive moves that follow a potential course of the game to some well defined termination (Figure 2). This termination usually is not the end of the game, because in most interesting games the termination may be 40 or more moves away. It is impossible for even the fastest of computers to examine all moves very deeply because of what is known as the exponential explosion. If there are (say) 35 moves possible at each turn for each opponent, then to examine one move for each side involves looking at 35 * 35 = 1225 terminal situations. To look at two moves for each side leads to 1.5 million endings, and to examine 10 moves for each side produces a number with 30 decimal places. Thus to play a sophisticated game properly requires some control of the search, and some knowledge to guide the search and evaluate alternatives.

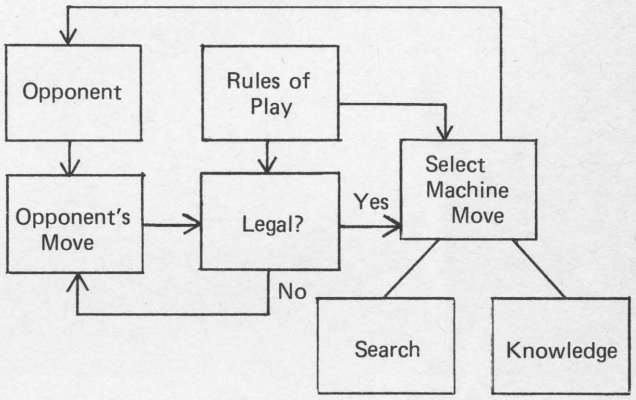


Figure 1: *Basic game playing program*

Search Intensive and Knowledge Intensive

A great deal has been accomplished along these lines to make a search as efficient as possible. It has been shown experimentally that a certain amount of search can be substituted for a certain amount of knowledge. Humans tend to be very knowledge intensive, and to resolve problems by referring to their vast store of experience which will usually produce an answer based on the ability to note similarity of problems. If this fails, then a small amount of searching will be engaged in to make the nature of the problem clearer. After such additional examinations, humans usually find they can produce an answer.

Knowledge Oriented Programs

One reason why game playing programs rely so heavily on searching is that this technique has been made to work, whereas the techniques involving use of knowledge and judgement have thus far been found to be exceedingly difficult to apply in a large, complex domain. The general public firmly believes that it is impossible for a computer to make judgements; i.e. to examine a large number of alternatives and choose the "best" one. Even humans have disagreements on what is best, as witness the judging in any beauty contest. How-

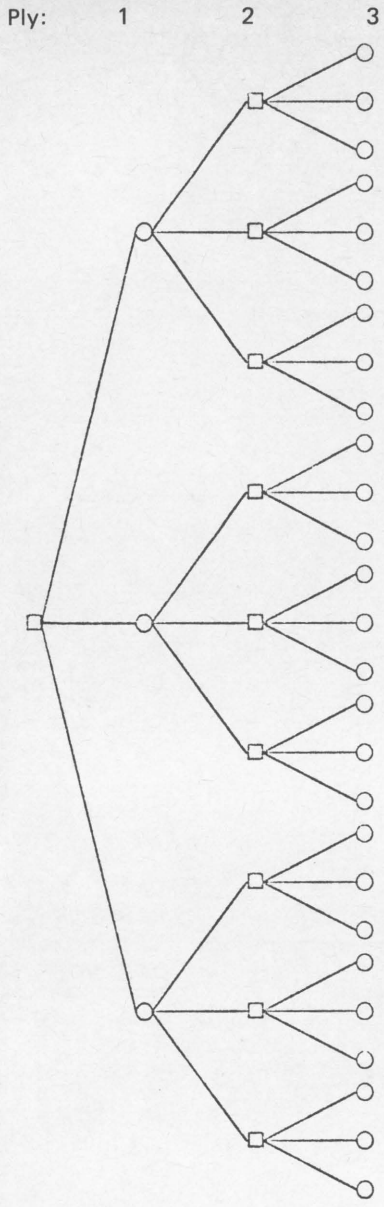


Figure 2: *Tree search*

ever, most people tend to think that machines will never be able to do such things. This is partly because no such machines have existed, and because it is generally thought that machines operate in an all-or-none mode where they can deal with black and white, but have trouble with shades of gray. However, this is a faulty view, as present research demonstrates.

Representing Real World Knowledge

The world tends to be a continuous place in many of its aspects. However, continuity can be approximated to any desired degree of fidelity with a quasi-continuity that places 10, 50, or even hundreds of data points along a continuum. However, if we wish to portray our data in such a way, there are certain cautions that must be observed.

Representing Knowledge by a Set of Rules

The usual way that knowledge is represented in a so-called "expert system" in the field of "Artificial Intelligence" in which this work was done is by a set of rules. A rule is of the form A→B: "If A is true, then do (or deduce) B". From rules such as this it is possible to go from a set of antecedent conditions to produce very complicated conditions or actions.

Representing Knowledge by a Function

Another method of representing knowledge is in the form of mathematical functions. The function A = 2B says that, everywhere, A has twice the value B has. A = C/B (where C is a constant) says that A varies inversely as B. Many other basic types of functions are possible, and for certain kinds of knowledge these serve better to represent the basic domain, than knowledge in the form of rules. For instance, the rule "The warmer the weather, the lighter the clothing you should wear" is much better represented in the form of a function than by a set of rules dealing with various possible temperatures and various items of clothing.

The Finer Points of Function Knowledge

The function A = 2B is called a linear polynomial. This is a very convenient way to encode knowledge, but it has some severe limitations that account for its lack of success in earlier attempts to use this form of knowledge representation. If above, A represents the price of oranges and B the price of apples, then the equation states that "Oranges are twice as valuable as apples". However, as valid as this relationship may appear to be, there are times when it is utterly wrong. One such time could be during an orange glut. A true expert knows that the above rule is just a first approximation, and that there may be some other effects that may control the situation. In the case of a glut, the price ratio is somehow affected by the relative number of apples and oranges.

In general, if a grocer wanted to compute the value of the goods in his stock room, the linear polynomial:

$$\text{Value} = C1\ F1 + C2\ F2 + C3\ F3 + \ldots + Cn\ Fn$$

would do the job. Here the C's are the constants that represent the price of an item, and the F's are the number of items in each category. In the same manner a game position (or any other situation) can be evaluated by summing up the value of its parts. A well known cliche states that the whole is not equal to the sum of its parts. However, there is nothing in the above that says that each term must represent a part. In fact, we could sum the apples, the oranges, and also the fruits. As we have seen above, failure to take into account the relative number of apples and oranges available, also can yield an incorrect picture. And this would require some corrective measure. Difficulties such as this lead humans to believe that they can make good judgements and that machines never will be able to do this.

A New Approach

This was the situation facing me when I began my research on backgammon. Backgammon was chosen because it requires mainly a great deal of judgement to play well, whereas games such as chess require a great deal of calculation of possibilities in addition to a great deal of judgement.

The result of my research showed convincingly that to make good judgements it is necessary to use non-linear functions to represent the knowledge. The simplest form of such a function is:

Value = C1 A1 F1 + C2 A2 F2 + ... + Cn An Fn

and this appears to work just fine as long as some cautions are observed. Basically, the functions must be:

- Smooth
- Non-linear
- Non-volatile: since there are two variables in each term, one must vary slowly. We call such variables Application Coefficients

Functions that are Smooth, Nonlinear, and have Application Coefficients = SNAC Functions

From the above, Smooth, Non-linear, using Application Coefficients, we get an abbreviation "SNAC". SNAC functions produce good judgement. If we wanted to judge the usefulness of an overcoat, we would not only want to know its price (the C) which tells us what we could purchase alternatively for the same amount, we would also want to know how far from the equator we were going to use the overcoat. This is the Application Coefficient which changes slowly as we move North or South, but gives a very clear indication of the usefulness of the overcoat.

The effect generated by expertly constructed SNAC functions can be spectacular. In Figure 3 is shown a move that my backgammon program made in its match with the World champion. For backgammon afficianados, it was Black to play a 5,1. Here the program made the highly unusual but correct move of 13-8, 3-2. It recognized that it did not mind being exposed to having additional men sent home, because it already had a fine defensive position and was committed to defense for some time to come. Therefore, it played with reckless abandon, judging that this gave it two chances to win: If the wild attack succeeded, or if the defense (which will be improved if the attack fails) succeeds. Two chances are better than one. Besides this highly imaginative move, the program also played steadily in more usual situations, showing that the application coefficients controlled when to risk and when not to.

Experimental Results

The results of several experiments with our backgammon program before and after discovering the SNAC method of organizing the knowledge is shown in Figure 4. Both versions of the program had essentially the same knowledge in them; however, the organization of the functions that produced the evaluation was radically different. It can be seen that with SNAC, the program did much better on a set of test problems, against other computer programs, in tournament matches against human players, and against the old program. The culmination of this testing was when the computer program BKG 9.8 beat the human World backgammon champion in a specially arranged exhibition match by the score of 7-1, the first time that a World champion of an intellectual activity (such as backgammon) had ever been beaten by a machine.

Test Results

	Without SNAC	With SNAC
Problem set from book	45%	66%
Versus best other programs	56%	78%
Matches against humans	0 - 2	3 - 1
Against each other	38%	62%

Figure 3

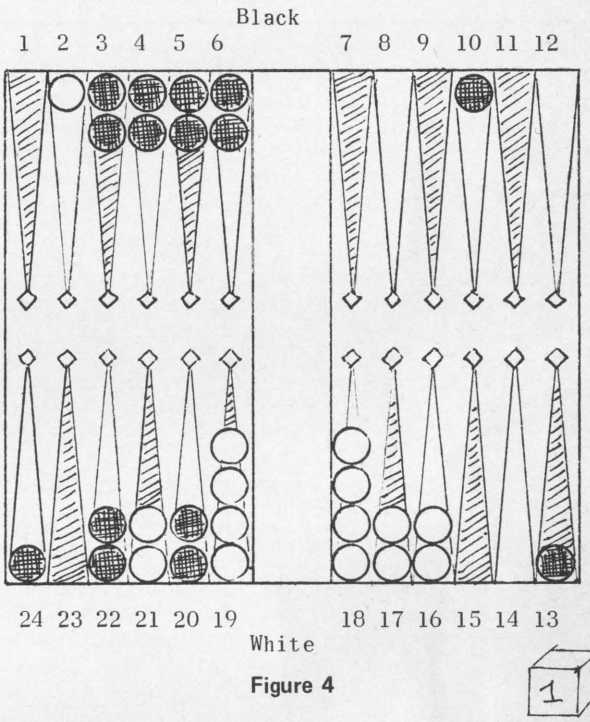


Figure 4

The Implications for the Future

The most important result to come out of this work is not the fact the "first" time of having a machine beat a World champion at his own game. Instead it is the fact of the demonstration of a method for capturing the essence of judgement. This proof is something that can be used now in many domains to allow machines to deal with relatively ill-defined, fuzzy situations.

In general, the F's in the above equations may be looked at as the number of items of a certain type that exist in the problem environment. F's can be the number of oranges or overcoats, or the

(please turn to page 31)

The World's Knowledge: Who Will Re-Orchestrate It?

Dr. Edward J. Lias
Systems and Computer Technology Corp.
4 Country View Road
Malvern, PA 19355

"Opportunists are providing extremely popular, easy-to-use, electronic services which directly compete with the mission of the university ... to portion out man's heritage of information."

Hungry for Information

Once upon a time, a person who was hungry for information knew just what to do. First check the encyclopedia, then go to the community library, then, if really serious, sign up for a course at the nearest school or college.

Today, no single institution has a monopoly on the information marketplace. The information-hungry public has surrounded itself with a maze of electronic media which attempt to supply details to our minds at the speed of light. Television, radio, movies, microfilm, newspapers, and telephones compete with schools for the chance to deliver to us our facts or skills.

The School and the University

It is not yet true that all printed information is instantly available in the wristwatch or wallet - not yet. Serious information seekers eventually take courses such as "Research 901", which give them special skills in extracting details from the books and journals which libraries hide away. The sheer physical size and bulk of most library holdings work against any hope of making their contents openly available and easy to get.

Thus, our personal quest for facts and skills is handicapped, and schools thrive on this deficiency. Almost all of our ideas, our discoveries, our traditions, are uniquely preserved in the writings and pictures which are housed in the world's libraries. Universities have traditionally managed, catalogued and, through their courses, have dispersed this knowledge. Teachers assist students in browsing through these resources.

Serious Competition

But new technologies are competing seriously for the chance to dispense the bulk of the world's knowledge. Giant corporations funded by advertisers, and giant governments funded by tax dollars, are finding ways to deliver the world's knowledge on instant ad hoc demand directly to our homes, offices, and community centers.

Schools never made it easy to obtain knowledge, considering the testing, grading, tuition costs, grade-point averaging, and rigid scheduling. Some students wait for years to sign up for a course which is always full, or which is infrequently offered.

New, Simple, Colorful, Swift ... Methods of Access

Thus, nearly everyone who chances to use the new systems which navigate the seeker through an easy path to the desired data, in 30 seconds or less, is probably pleased with it, as we shall see.

Opportunists are providing extremely popular, easy-to-use services which directly compete with the mission of the university; that mission being to vouchsafe and portion out man's heritage of of information. The competitors use three things in their systems which most universities already have: mainframe computers, terminals, and the telephone network.

Their methods of access are so simple and colorful that they point toward a gradual re-orchestration of the world's knowledge -- rearranging it into computer-based forms which can be dispensed in dozens of ways, depending on the whim or mood of the user.

Three distinct forms of this re-orchestration can be identified which currently operate: (1) General Public Information Systems; (2) Specialty Data Banks; and (3) Curricular Learning Systems.

General Public Information Systems: France: Telematique Programme

France was the first country to bet 30 billion dollars on our hunger for information. Part of their plan for modernizing the telephone system is to discard the common phone from every home in France. In its place, a screen and small keyboard will be installed free of charge in every home. The normal voice handset on the side is incidental to its use.

250,000 devices are now installed, each device costing about $100. The funding for this project is advanced from the savings in not printing the white or yellow pages. All of that information will be available on the screen -- on demand. The terminal will do the walking through of the electronic pages.

Savings in Trees Not Cut, Trucks Not Driven

The simple savings in trees not cut for paper, and in not trucking heavy books to every office and home, probably pays for the device in a few years.

Meanwhile, the French telephone company is re-orchestrating portions of the world's knowledge. The teletext system offers many other services beyond telephone numbers. Armchair shopping, reservations, electronic mail, travel information, entertainment listings, and other social or community directories are all available in simple, easy-to-request form. Behind the scenes, computers jockey more than 100,000 almanac-like pages of disk-data down the phone lines to the users on demand.

England: Prestel and Viewdata

In England, the Post Office controls the communication channels. Their electronic joybox is installed in 20,000 homes.

This system uses the standard (English) color TV set with a calculator-like button box which allows the information-seeker to pedal up and down through a menu of simple options. For instance, the first screen might give the options:

(a) weather (d) library
(b) sports (e) airlines
(c) wine sales (f) store

The viewer can press a button on the box, and the screen might then fill with - "which airlines?"

(a) British (d) Pan Am
(b) Scandanavian (e) American
(c) TWA (f) Canadian

By pressing buttons, viewers can step down through seven levels of choices. Some choices add a few shillings charge to the phone bill.

70,000 Pages Stored Electronically

At the Viewdata headquarters near Ipswich, 70,000 "pages" of information are stored on five GE 4080 computers.

Who organizes and enters the information? At the BBC TV center, newscasters feed their stories into keyboards, while graphics specialists create the pictures which accompany the text.

GTE is franchized to demonstrate and sell this service to U.S. firms, and they give demonstrations of it at various GTE centers throughout this country.

United States: Electronic Newspapers

The Columbus Ohio Dispatch was the first U.S. organization to stake a claim in the online public information arena. Unfunded by governments or grants, and undaunted by the lack of standards, they have successfully installed 3,000 home terminals which display any article or section of the newspaper - each day.

Since their newspaper is typeset out of word processing files (most are), the text is already on disk. With small revisions, it is re-orchestrated (daily) for delivery to the screens and printers in 3,000 homes.

Coral Gables, Florida

The Knight-Ridder Project in Coral Gables, Florida, has a 1.5 million dollar underwriting for similar services to 200 homes. Eastern Airlines, Merrill Lynch, ... provide the funds.

With this system, viewers can receive 15,000 different screens on demand, including department store shopping, wine sales, boating tips, reference materials, and language lessons. Also, the API transmissions of 100,000 words per day are available live at all times.

Because of the funding from corporations and advertisers, the users pay no fee. The newspaper corporation will collect statistics on how many people are interested in tennis, food, science, birds, stamps, etc.

Los Angeles, Calif.

The Teletex system in Los Angeles adopts the French style of popular information delivery. Users learn to think of it as a giant magazine (500 pages) with instant access to any page - except that it never gets old or out of date. It has 1 million dollars funding as a feasibility study.

But Universities Are Not Innovating

Computers were born and bred in Universities, but universities are not in the list of electronic teletext suppliers. Universities hold nearly all the wealth of the world's knowledge - both in their libraries and in the faculty whose wisdom they hire and vend.

Everything about the university prepares it to enter the electronic information business, but it has not yet pursued it.

The desire for information is probably higher than ever. But other agencies are communicating information to our homes - agencies like newspapers, post offices, and telephone exchanges.

Without subject matter experts, without libraries, without classrooms, without land grants, without testing and grading, without much discipline, information is being distributed by non-scholastic agencies to a world which can't wait to get it. Why?

College-Like Courses

Several observations about this class of information service can be made. These systems rely on 3 things: large central machines, cable or telephone switching systems, and sources of information to send out to our homes. Alliances between universities and cable TV companies would thus be natural. Even the normal dial-up phone lines work well. They await the university vision.

These systems don't depend on micro-computers in the the home. Whether you have a micro or not is unimportant. The services might appear (today)

to be outside the university arena. Scholars aren't important to the distribution of almanacs, bus schedules, and news stories. But, public services will blossom outward, I predict, to include college-like courses of all types on these public networks, especially after the statistics start to show the interests of the public users. Videotext systems appear to be distributing trivia, but it is just for practice.

Specialty Data Bank Systems

For the past ten years, researchers have been able to dial various phone numbers to attach their ($1,000) terminals to distant banks of data. The pediatrics data bank in New York State, the lawsuit data bank in New York City, the stock exchanges, and dozens of other specialty data banks are in use each day.

The owners of these data banks know that not everyone will want to use them. They are not marketing them to the general public, but rather to the serious researcher and specialist. Even so, there is money to be made in this marketplace because the specialist is willing to pay. For many specialists, timely information is power.

The computer meets this need ideally. The data banks which these people access are usually large, too large to manage in the home or office. Many people buying into the central system help to make it possible to keep it up-to-date.

Ten to fifty data entry staff may be required to continuously enter the data in the re-orchestrated formats necessary for such electronic delivery systems.

College Selection Guidance

One suggestive example will illustrate the worth of this class of service. TimeShare's Guidance Information System (Hanover, New Hampshire) provides (for a fee) six major files to any central computer. High schools and colleges in that area can then dial into the nearest computer.

If you wish to search for a college to attend in the Southwest United States, but not in New Mexico, with Protestant religious affiliations, and with an archery club, the GIS system will inform you immediately that 30 colleges qualify (for example). Using very simple commands, counsellors can narrow the search further and then print the entire description list of the selected schools.

Six large files are all accessible through the same system of commands. At the top of the run, the user states to the system which of the six files are desired. Professional counsellors use the occupational file to great advantage with students of all ages. Surprising financial aids are available from unexpected sources in the sixth file.

No single university or college would want to invest in the collection and re-orchestrating of this information. A large full-time staff collects and enters the dynamic data. It is a bargain at an $8,000 annual fee to a central computer, which may in turn sell the service to 10 or 50 other institutions for $1000 per year.

Inst. for Social Research at the Univ. of Michigan

A few universities have seen the wisdom of collecting data banks in areas where they are experts. The Institute for Social Research at the University of Michigan (Box 1248, Ann Arbor, MI 48106) publishes their "Guide to Resources and Services 1979-80". The book lists and indexes 300 large data files which have been collected by the 220 member universities and colleges.

For a fee, selected files can be mailed to local colleges for use on their central computers. Or, by dialing into Telenet, researchers and students can navigate through the data. The files cover a broad range of information - census data, economic, sociological, historical, psychological, political, organizational, electoral, urban studies, foreign policy, judicial, racial, and national data.

The university stockpile of information seems heavy and unyielding. But this is only because we have not yet re-orchestrated enough of it to be delivered through the electronic systems. The data banks above represent a first step in the re-orchestration, which allows us to get it out and use it. Universities collect information - why not also distribute it electronically?

The White House Conference on Library and Information Systems

The White House Conference on Library and Information Services met in March, 1980. They proposed that a comprehensive national library and sinformation services program should be initiated. Its purpose would be to incorporate technology -- the computers and satellites -- into the distribution of our national printed resources.

The stated goals are:

-- To reshape information services to serve the people in more useful ways.

-- To prevent monopolization of information services by an elite group of hardware or information vendors.

-- To socialize information so that individuals can be guaranteed the right to access information and to decide how it will be used.

President Carter invited all libraries and all telecommunication services to provide services to homes, businessess, agencies, and colleges. Re-orchestration will soon begin. Who will do it?

Systems for Learning the Contents of Courses

A profound and costly re-orchestration of the world's knowledge is required when we attempt to prepare tutorial materials. The world's knowledge could be presented in question-and-answer form, etc., but someone has to prepare it for enjoyable, interactive delivery to the learner. Seventy hours of work may be required to obtain 30 minutes of computer-aided instruction.

Here are three instances of significant investment in electronic curricular delivery:

1. The science simulation programs at Emory University and at Irvine, California.

2. The PLATO systems from the University of Illinois.

3. The CAI typewriting and Nursing Math courses at Ocean County College in New Jersey.

In 1980, two large bids were awarded for computer hardware. The California State University system ordered $50 million of hardware to support 2747 terminals throughout their 19 campuses. Note the persistence of mainframes.

Also, the Houston Area schools purchased 600 microcomputer terminals for grade-school children to use.

The video disk, with its ability to hold 54,000 color slides or movie frames on one side of a disk, should complete the technology required to fully hold and distribute in inter-active ways the subject matter which has yellowed in professors' notebooks long enough.

The Classroom Environment for Learning vs. The Electronic Environment

The classroom is not a perfect learning environment. A comparison of electronic versus human instruction is presented in Table 1. From this table it can be seen that the differences are significant, and can be costly to a school if it relies only on traditional lecturers.

Table 1

Contrast Between Two Learning Environments

1. Human Instructor

-- Instruction is directed to the average student in the group.

-- Teachers will give lower grades to slower learners.

-- Teachers get their primary feedback at examination time.

-- Teachers schedule class times at rigid hours.

-- Teachers are not at their best every time they perform.

-- Teachers may not keep their lectures up to date.

2. Interactive Electronic Instruction

-- Learning rates for each individual are sensed by the computer and remedial or advanced themes are provided.

-- Computers will give endless hours of extra drill or dialogue to slower learners.

-- Computers get feedback at every interactive point, minute by minute.

-- Learners call in for appointments with a computer terminal at any time. Terminals in the home can provide all subjects at all hours.

-- Computer based materials are tested and modified to obtain excellence in every module.

-- Computer based materials can be updated every hour or week if required.

Students at Ocean County College who received a Computer Literacy Course entirely from the terminal expressed degrees of their pleasure with it in the anonymous responses which they gave to the computer questionnaire (see Table 2).

Table 2

Student Responses to Computer-Assisted Instruction Course in Computers

1. How do you evaluate CAI in general as a method of instruction?

A. More satisfactory than a classroom situation ... 70.5 %

B. About the same satisfaction as being in a classroom ... 24.8 %

C. Less satisfactory than a classroom ... 4.5 %

2. In other classes there is much social interchange; so you:

A. Didn't want social interchange: Happy without it ... 41.8 %

B. Found interchange with the terminal simulated A friendship ... 47.8 %

C. Wished for more social interaction and missed it ... 10.2 %

The Proposed Satellite for Microwave Packets of Information

Bell Labs is proposing a microwave satellite which would sweep across the entire continent in 1/100th of a second - much like the scanning lightbeam in a TV set. Along the way, it would suck up packets of data from New York, then Chicago, then Seattle, etc., also dropping simultaneously the packets intended for any city. The packets of data from New York may be designated for San Francisco, Houston, and Tampa. Within 1/100th of a second, plus the satellite distance delay, they will have the information they requested - from anywhere.

Information Needs and Desires of John Q. Public

What shall we do? Haines Gaffner (President of LINK Corp.) stated:

"We are advising those who own information to experiment and get involved. Many owners of information are conservative and their attitude is to wait and let pioneers like Knight-Ridder do the experimenting."

Those who begin in 1980 to re-orchestrate their information holdings to computer-accessible form

(please turn to page 34)

Tying and Other Monopolistic Practices: AT&T, the Data Processing Industry, and H.R. 6121

Jerome L. Dwyer
President, ADAPSO
1925 North Lynn St., No. 1100
Arlington, VA 22209
(703) 522-5055

"Tying ... occurs when a firm uses the strength it possesses in one market to increase its sales or market position in another market by coupling the sale or lease of two or more goods and services in the separate markets."

Based on a statement of the Association of Data Processing Service Organizations, regarding H.R. 6121, before the Subcommittee on Monopolies and Commercial Law of the Committee on the Judiciary, Sept., 1980.

The Association of Data Processing Service Organizations, Inc. ("ADAPSO") has serious concerns with respect to H.R. 6121, the Telecommunications Act of 1980. Chief among these concerns are those provisions of H.R. 6121 which would enable American Telephone and Telegraph Company ("AT&T") to enter the computer services industry without adequate competitive safeguards.

In order to appreciate ADAPSO's concerns with respect to the impact which AT&T's entry would have on the computer services industry, it is necessary to understand -- on a very pragmatic level -- the competitive abuses in which common carriers such as AT&T can engage. There are a number of well-known anticompetitive carrier abuses with which any potential communications legislation should be concerned.

Cross-Subsidization

The most widely publicized abuse is that of cross-subsidization -- the practice by which a carrier's competitive service offerings are supported, directly or indirectly, with the revenues generated by noncompetitive communications services.

There are, however, other anticompetitive abuses in which carriers such as AT&T can engage. Chief among these are tying and its structural manifestation, tying effects, and a host of practices that fall within the rubric of unfair competition. Generally speaking, an arrangement involves tying whenever a firm uses the strength it possesses in one aspect of its operation or market to enhance its general market position or to increase sales or profits in another part of its operation or market by coupling the sale or lease of two or more goods or services. /1/ In other words, economic power over one product (the tying product) is udes to induce customers to purchase another product (the tied product) for reasons unrelated to the price or quality of the tied product. Ties may involve coercion or they may be voluntary:

> Tie-ins occur where a customer is forced or induced to accept other products and services along with that product which he seeks. Such tie-ins may result from actual coercion by a seller or from a customer's realization that he stands a better chance of securing a scarce and important commodity (such as credit) by "volunteering" to accept other products or services rather than seeking them in the competitive market place. In either case, competition is adversely affected, as customers no longer purchase a product or service on its own economic merit. /2/

The effects of tying -- both voluntary and involuntary -- are the same /3/: "the suppression of competition," /4/ the transfer of economic power from one market to another /5/, and the erection of entry barriers in the market of the tied product /6/ .

Carriers that Own or Control Transmission Facilities

If carriers that own or control transmission facilities, such as AT&T, were permitted to offer data processing services without effective competitive safeguards, the opportunities for such carriers to engage in tying would be great. This is so because these carriers, by virtue of their ownership or control of scarce transmission facilities, would have the ability both to coerce and to induce users to subscribe to their data processing services. In order to appreciate the endless opportunities which an underlying facility-owning carrier has in order to engage in tying and related anticompetitive activities, one must never lose sight of the fact that unaffiliated resale carriers, independent data processors, and other users cannot conduct their businesses without the underlying carrier.

In today's market, in which AT&T does not compete with data processors, the relationship between AT&T and the data processor has been, at least from the data processor's view, cooperative. There is no incentive for it to be otherwise. AT&T wants the data processor's business, as opposed to the data processor's customers, and the data processor wants quality, hassle-free service. If AT&T could offer data processing services without meaningful competitive safeguards, as envisioned by H.R. 6121, it would have a disincentive to cooperate. Simply stated, it would have a conflict of interest. If AT&T were to provide a data processor with trouble-free and timely service, AT&T's data processing affiliate might lose business; if AT&T were to provide the data processor with indifferent, minimum tariff ser-

vice in an untimely fashion, AT&T's affiliate would have a good chance of acquiring the data processor's customers. In such a situation, the "system" would be the ultimate marketing solution.

The Ability of Carriers to Misuse Information

The many varied ways in which AT&T could tie its affiliate's offerings to basic transmission service can perhaps best be illustrated by reviewing customary practice in the computer services industry today and the problems associated with operating a time-sharing or remote-access data processing network. When a data processor or private user orders a leased circuit from an underlying carrier, the carrier is advised of the speed at which the line will be operated, the line conditioning that is needed, and the type of equipment that will be connected to the circuit. When a local loop is ordered, the carrier learns where the circuit terminates. With this very limited initial contact, the carrier learns a great deal about the structure of a data processor's network.

Bell Advertises It Must Understand Subscriber's Business

When a data processor or resale carrier reaches a certain size, it is assigned what is known as a national account manager. What this means in practice is that there is a team of people whose time is dedicated to serving a specific account. The team acts as if it were literally part of the customer's organization. They learn all about the customer, its needs, its programs, and its services; they help solve any and all communications problems; they help the customer select the most economic facilities available: and they handle orders for repairs, new circuits, and equipment. If they know that a user contemplates the inauguration of a new service, they will reserve circuits or other limited facilities so that service can begin promptly.

This relationship exists to a significant extent for all major users. In the past, the Bell System has prominently advertised on national television that it must understand the subscriber's business before it can efficiently discuss the subscriber's communications needs. Thus, it is customary for users, for example, to consult with their account representative about the technical feasibility and/or viability of various service offerings. It is not unheard of for this type of consultation to take place months, if not a year or more, in advance of the introduction of a proposed service. Research and development of a particular service will be pursued or abandoned on the basis of the opinion given by the carrier. Account managers also assist users in conducting developmental tests in the most economical way possible.

If AT&T were competing directly with data processors through a less-than-fully separated affiliate, it is highly unlikely that such cooperative planning would long survive (assuming that AT&T would choose to continue to aid its competitors). Indeed, data processors and other resale entities would be loath to provide AT&T with any more information than was necessary to obtain service. Research and development, new services, and new fields of endeavor certainly would not be discussed if it were known that this information would be used by the carrier's data processing affiliate for competitive purposes.

One result would be the less efficient use of circuits and facilities, since they would be chosen without carrier assistance. This, in turn, might retard the growth and sophistication of new vendors. Another result would be that resources would be devoted to research and development in greater amounts than necessary or on projects that may never be feasible due to already known (to the carrier) limitations in the communications network. In other words, secrecy and industrial intelligence would replace the cooperation which now exists between carrier and user.

Even in the face of such secrecy, AT&T would still acquire a great deal of valuable business information about its affiliate's competitors. The potential for the misuse of this information is great. If, for example, a carrier knew that a data processor had initiated a banking-related service, the carrier -- by simply watching the number and type of circuits being ordered -- could monitor the success of the new application. If it proved to be successful, the carrier could advise its affiliate to jump into the market before it had become saturated; the data processor would have effectively conducted, gratis, a market research and pilot program for the carrier's affiliate /7/. The recent restructuring of AT&T's marketing organization according to industrial sectors would exacerbate this type of abuse. The carrier's sales representatives who deal with banks would be ideally situated to advise these institutions of its affiliate's new banking service. This "advice" can take a number of forms.

The Ability of Carriers to Manipulate Service

The advantages described above which AT&T and other facility-owning carriers would enjoy are based solely on the knowledge and use of information about a data processor's operations. A review of the operational problems faced by data processors under today's structure indicates how more affirmative action on the part of a carrier could be used to induce users to transfer service from a data processor to the carrier's affiliate.

The Ability to Manipulate the Quality of Service

A major operational problem faced by users of leased private line circuits is caused by the fact that these circuits differ greatly in quality. Carrier tariffs only specify very broad and crude parameters of minumum service. Various levels of line conditioning can be ordered at an added charge to narrow, as it were, the window of acceptable performance, in terms of delay distortion, loss deviation with frequency, nonlinear distortion, etc. There are many other technical attributes of leased circuits, however, which are not specified in tariffs and which can dramatically affect the utility of a circuit for data transmission. Current tariffs similarly do not specify whether data traffic will travel by terrestrial or satellite links. The difference in prop-

agation delay (i.e., the time it takes for data to travel from point A to point B) can have a significant impact on the quality and efficiency of a data communications network, where time is measured in microseconds.

In addition, there are a number of technical services associated with private line circuits that are not available pursuant to the terms of a tariff. Sealing current, for example, is often provided by underlying carriers to help alleviate transmission problems on local loops. Loopback testing is also made available to data processors to determine the condition of a line. Since neither of these services is specified in any tariff, they need not be provided by the carrier.

It is doubtful whether a carrier would be willing, or could realistically be expected, to amend its tariff to include very detailed specifications with respect to minimum service, or to guarantee the availability of such services as sealing current, in light of the constant and unavoidable deterioration of circuits, increasingly limited resources, and the need to exercise managerial and technical discretion in the operation of the network. At the present time and under today's market structure, carriers generally are cooperative in locating and substituting quality replacements for less than satisfactory circuits.

First Call on Limited Resources

If AT&T, through its affiliate, were also a competitor faced with the existence of limited resources, however, it would undoubtedly assure that its affiliate had first call upon circuits with superior technical performance. In providing its affiliate's competitors with less satisfactory lines, AT&T would still be satisfying its tariff obligations. The result would be that customers of the carrier's affiliate would receive superior uninterrupted service. This in itself would be a definite competitive advantage. It could be leveraged, however, into even greater market power. The possibilities are endless, but one example demonstrates the point.

If the user of a competitor's data processing service were connected to the competitor's network with a technically deficient circuit, the user would experience countless difficulties, interruptions, and poor service. The data processor probably would explain that the problem was in the circuit, not in the data processing. Upon complaint to the telephone company, the user could be told that similar difficulties were unkown to users of its affiliate's service, that the only other available circuits were reserved for its affiliate's use, or that sealing current could rectify the problem but that such current was available only in conjunction with its affiliate's data processing service. Whatever was said or not said, the point could be made clear: "use the affiliate's service and your service will improve."

The Ability to Manipulate the Availability of Service

A carrier's control over the basic network would give its affiliate other competitive advantages. The number of leased circuits is finite and, under the best of circumstances, users expect a delay between the time a circuit is ordered and the time it is installed. Under today's structure, however, there is certain give-and-take. For example, if speedy installation is essential to secure a new customer, it is not unheard of for a data processor to "give up" a circuit or other piece of equipment to a carrier in order to get a needed line or local loop to expeditiously serve that customer. Needless to say, this type of flexible trading is not compelled by any tariff. If a carrier's affiliate were competing with a data processor for the same customer, it would have a positive disincentive to "deal." By routinely or selectively providing more prompt service to certain users, the carrier could gain customers that its affiliate might otherwise lose. Such preferential treatment would be particularly insidious in that it could continue indefinitely without any competitor ever learning of its existence.

The control over when service is delivered is an important competitive advantage. As is the case with technical specifications, however, this power can be leveraged even futher. Users can be told that local loops or leased circuits are unavailable and will be for some time. They also can be told or led to believe -- directly or otherwise -- that something might be available if requested in conjunction with a multiple order, i.e., one that involved data processing, terminal equipment, etc., in addition to the basic circuit. In other words, the carrier could use its control over basic communications facilities to induce users to select its affiliate's competitive services. As the availability of inter-city circuits becomes more limited -- which is the apparent trend today -- carriers will be able to exert increased leverage over users.

The Ability to Manipulate the Restoration and Maintenance of Service

Another difficulty faced by users of leased circuits is the problem of outages. For one reason or another, circuits go out. Generally speaking, all circuits cannot be restored at the same time. In other words, circuits ought to be restored in sequential order. At present, carriers appear to restore user circuits in an equitable fashion. If, however, the circuits of a carrier's affiliate were alongside those of a competitor on the same test board, it is not difficult to see how or understand why the carrier would give its affiliate's circuits priority. Again, this type of practive would be virtually impossible to detect. It could, needless to say, be used as a very effective marketing tool to induce users to utilize the services of the carrier's affiliate In addition to competitors, carriers could also give their own customers who operate private networks low priority for restoration. These users could also be advised in one fashion or another that if they used the services of the carrier's affiliate, restorations, and repairs generally, would occur at a much faster rate.

The Ability to Manipulate the Technical Specifications of Service

Carriers could also favor their affiliates by manipulating information about technological changes in the network or about the introduction

(please turn to page 31)

Annual Index for Vol. 29, 1980 of computers and people

This index is organized by title, author, and subject. The following designations for issues apply: J–F, Jan.–Feb.; M–A, March–April; M–J, May–June; J–A, July–Aug.; S–O, Sept.–Oct.; N–D, Nov.–Dec.

(continued on next page)

Index – *Continued from page 19*

The Japanese Economic Challenge: Understanding It and Meeting It — Part 1

William S. Anderson
Chairman
NCR Corporation
Dayton, OH 45479

"The productivity problem in the United States can be attributed to structural deficiencies in our economic system rather than to any pronounced change in the traditional American work ethic."

This is the text of an address given at the University of Notre Dame on September 25, 1980, as one of the ITT Key Issues Lecture Series.

When I was invited by Dean Furuhashi to lecture on the subject of "Meeting the Japanese Economic Challenge," I was both pleased and apprehensive. To participate in this distinguished lecture series is an honor I deeply appreciate. On the other hand, I am well aware that the economic challenge facing America today is not a subject for which there are any easy answers.

Arnold Toynbee on the Rise and Fall of Nations

Arnold Toynbee once described the rise and fall of nations in terms of challenge and response. A young nation, he said, is confronted with a challenge for which it finds a successful response. It then grows and prospers. But as time passes, the nature of the challenge changes. And if a nation continues to make the same, once-successful response to the new challenge, it inevitably suffers a decline and eventual failure.

As we begin the last two decades of the 20th Century, the United States faces such a challenge. At stake is the industrial supremacy which this country has enjoyed for most of this century. And it is Japan, more than any other nation, which exemplifies the seriousness of the challenge to American industrial leadership.

Japan in 1944

Thirty-five years ago, as a witness at the war crime trials in Tokyo, I saw Japan at the low point of its long history. Its economy was shattered, its political and social fabric torn, and its people demoralized. Those of us who were in Japan immediately after World War II had serious doubts as to whether the nation would ever be a first-rate power.

Meeting the Challenge of a Lost War with New Responses

What has happened since then continues to astonish the world. In a little over three decades, Japan has become the most competitive nation on earth. It has not only caught up with the much better endowed industrial nations of the West; it has in many fields surpassed them. And it has done so by meeting the challenge of a lost war with fresh new responses.

Why have the Japanese been so successful? How did the United States lose its competitive edge? Can it be regained and, if so, how? And will the Japanese economic juggernaut be as awesome in the 1980s as it has been in the decade just ended?

These are the basic questions I should like to explore with you today.

In recent months the media have been flooded with attempts to explain the Japanese phenomenon. Everyone wants to know how the Japanese did it. There are, of course, scores of explanations. But it seems to me that Japan's post-war economic growth — the most spectacular the world has ever seen — is the direct result of two fundamental characteristics of the Japanese nation in the years following World War II.

The Japanese Sense of National Purpose

The first of these is Japan's unerring sense of national purpose and its establishment of clear-cut, readily understandable goals reinforced by a willingness to do what was necessary to achieve those goals.

I believe the second major ingredient in the Japanese success formula is the personality of the Japanese people themselves.

If we are to analyze the Japanese accomplishment, and learn some lessons from that accomplishment, then we must begin with an examination of those two factors.

What Every Japanese Understands

Just as every American understands that the United States is rich in natural resources, so every Japanese understands that Japan is one of the poorest endowed countries in the world. It is a country in which 115 million people are squeezed into an area only four times the size of the state of Indiana. It is a country which is almost totally dependent on other countries for oil, coal, iron ore, and most other natural resources. Japan can't even feed itself. Only about 15 percent of its land is suitable for agriculture, and therefore a third of its food supply must come from other nations.

Japan's attempt to enlarge its meager share of the world's resources through military aggression ended disastrously in 1945. Then, in one of the most abrupt turnabouts in all history, the Japanese people reversed direction. In essence, they said this:

"In Human Resources We Are Rich"

"In physical resources we are poor, and that will not change. But in human resources we are rich. Our challenge therefore, as a nation and as individuals, is to more fully utilize our human resources than any other country. We will import the raw materials we lack, and through hard work and imagination convert those basic materials into useful products — not only for the Japanese people but for international markets as well."

It was a "you and me against the world" kind of attitude. And the first step in translating that national consensus into an action program was to develop a unique new leadership structure — a structure in which government, business, and labor would form the powerful triumvirate which the world has since labeled Japan, Inc., not in a derogatory sense, as many Japanese fear, but with a sense of envy.

The New Structure: Japan, Inc.

The structure on which Japan, Inc., was built was beautifully simple. In the government sector, the Ministry of International Trade and Industry would develop and promote a national industrial plan. And the Bank of Japan and the Ministry of Finance would supply the capital and carefully control the purse strings in order to keep the new industrial plan on track.

Meanwhile, the doers — that is, business and labor — would be given a relatively free hand to utilize the inherent strengths of the capitalistic system. Taxation and government intervention would be kept to a minimum. Social programs would be deferred until Japan could afford them. Emphasis was to be on the future, not the past, or even the present.

In looking to that future, Japan's vision was clear. Modernization of its industry was given top priority. This required the importation of Western technology as rapidly as possible. The director of the Japan Economic Research Center, Nobuyoshi Namiki, recently gave credit where credit was due, and I quote:

The Game of Catching-Up

"We were quick to learn from the West — especially from the Americans. We were playing the game of catch-up, with a vengeance."

Other nations have also tried to play the catch-up game, but with conspicuous lack of success. Those nations also had a sense of national purpose and readily understandable goals. What made the Japanese different? To answer that question, I believe we have to look to the Japanese character and personality.

"Life, Liberty, and the Pursuit of Happiness and Knowledge"

According to the American Declaration of Independence, all men are endowed by the Creator with certain unalienable rights, among which are life, liberty, and the pursuit of happiness. If the Japanese were to rewrite that venerable document, I suspect they would amend it to read "life, liberty, and the pursuit of happiness and knowledge."

I hope you'll forgive me for quoting a Harvard professor here on the Notre Dame campus, but I believe that Dr. Ezra Vogel has summed up the intellectual curiosity of the Japanese as well as anyone could. This is what he says:

"In virtually every important Japanese organization and community — from the national government to individual private firms, from cities to villages — devoted leaders worry about the future of their organizations. And to those leaders nothing is more important than the information and knowledge that the organizations might one day need. It is not always clear why knowledge is needed, but groups store up available information nonetheless, on the chance that some day it might be useful. . .In Japan, study is a social activity which continues through life."

Nationwide Zeal for Learning

This nationwide zeal for learning exhibits itself in countless ways. Millions of Japanese are fluent not only in English but even in third and fourth languages; how many Americans or Britishers speak Japanese? Japan, with half the population of the United States, graduates almost twice as many engineers; that's a per-capita ratio of four to one. And in international testing programs, Japanese youth run rings around their American or British counterparts, not only in math and science subjects but in many other subjects as well. It's no exaggeration to say that Japan is today the most literate, best educated nation in the world.

Unquenchable Team Spirit

The second most striking characteristic of the Japanese people is their unquenchable team spirit. Nowhere is this more evident than in the relationship between management and labor.

Many years ago the chairman of General Motors Corporation created a furor by remarking that "What is good for America is good for General Motors and what is good for General Motors is good for America." If the chairman of Toyota were to make a similar remark in Japan today, I doubt if anyone would lift an eyebrow. In Japan, employees are as interested in the growth of their companies, and in the progress of the national economy, as they are in improving their own wages and benefits. They realize it is company growth and national economic growth which have made possible their own rapidly rising living standards.

Japanese Workers Unionized

I do not suggest that Japanese labor unions are weak or their members docile. To the contrary. A higher proportion of workers are unionized in Japan than in the United States. Workers are highly militant. I have had the harrowing experience of sitting in a car at the blocked entrance to NCR's factory in Oiso, surrounded by hundreds of unhappy employees who — to make sure I understood their displeasure — violently rocked the car from side to side before finally permitting me to enter the plant.

Yet long strikes are rare in Japan. In fact, the production time lost because of strikes is only about one-eighth of the days lost in the United States. The reason is that the vast majority of Japanese workers have learned that the team concept works as well on the production line as it does on the athletic field. Whilst they're perfectly willing to squeeze the goose that lays the golden eggs, during every spring labor "offensive", they are very careful not to strangle it to death.

The Japanese Were Determined to Make Japan Respectable Again

The Japanese are also a proud people, and I use that term in its best sense. As you know, "face" is terribly important to most Orientals, especially the Japanese. World War II ended in international humiliation for Japan. Whether consciously or subconsciously, the Japanese people were determined to make Japan respectable again. What better way to do so than to achieve excellence in everything they undertook? In an economic sense, this translated into no more shoddy merchandise, whose only merit was a lower price tag. Instead, the Japanese vowed to make better cameras than the Germans, better watches than the Swiss, and better radio and television sets than the Americans.

Quality: A National Preoccupation

Quality became a national obsession because every Japanese recognized that quality products would not only bring the top dollar required for sustained economic growth but at the same time would restore their country's prestige among nations. And in only a few years, the label "Made in Japan" became the symbol of excellence in a long list of goods — ranging from heavy industrial equipment to everyday consumer products.

Quality in itself, of course, is meaningless if it's lavished on products which no one wants. The Japanese were quick to recognize this. Indeed, their ability to define what the market will buy is probably unequalled by any other country.

Researching Markets

This is no accident. The Japanese research a potential market to an almost unbelievable extent. They listen carefully to what the consumer is saying. Then they give him the kind of product he wants, not the kind of product they think he should want. The focus is also on providing greater value to the customer. As a result, Japanese products tend to be better featured than many of their counterparts manufactured in Western Europe or the United States.

Japanese companies also search relentlessly for new applications for older products. No opportunity is too small or remote to be explored. Let me cite a single example:

If you've had occasion to use one of the instant-bonding "super" glues — the kind that will glue your fingers together if you're not careful — the chances are it came from Japan. The Japanese took a 25-year-old product, originally developed in America for industrial use, repackaged it, and created a new, 100-million-dollar consumer market.

Patience

Creating new markets, or penetrating someone else's existing markets, requires patience. This the Japanese have in abundance. One of the characteristics which most distinguish top Japanese management is the emphasis they place on thinking long term rather than short term.

Soichiro Honda: "We have done what presidents should do ..."

On the occasion of his retirement, the founder of Honda Motor Company, Soichiro Honda, was able to say, and I quote:

"The deputy president and I have not signed any papers nor attended any executive committee meetings for the past 10 years. We have done what presidents should do; we have spent our time correctly judging future trends. That is our job. The details of day-to-day operation we leave to the responsible personnel."

This is in sharp contrast with the operating style of most American and European business managers. In the West, long-term corporate strategy tends to play second fiddle to short-term performance. The shareholder owners of the company want results now, not five or 10 years from now. And the management that fails to report consistent progress from quarter to quarter quickly falls out of favor with the investment community. The result is a strong temptation to avoid costly investment in basic research and to shy away from new markets which over the short term would only detract from profitability.

Profit and Loss: the 10 Year View

This is not to say that the typical Japanese manager is disinterested in short-term results; to the contrary, the Japanese businessmen I've dealt with are just as closely oriented to the profit-and-loss statement as their Western counterparts. The difference is that the Japanese business manager is less likely to lose sight of what his company could be doing five or 10 years out, provided the proper investment for that future is made today.

In this attitude he is in close harmony with the average Japanese, who is also strongly future oriented — in contrast with the "now" attitude so prevalent today in Western countries.

Saving for a Rainy Day

The typical Japanese household sets aside 20 percent of its total income for a rainy day. That is the highest rate of personal savings of any country. It compares with a personal savings rate of less than 5 percent in the United States, which is the lowest of any developed nation. This, of course, helps explain why gross capital formation in Japan is approximately the same as in the United States, even though the U.S. economy is twice as large as the Japanese economy.

When one economic system is generating twice as much per-capita funds for investment as another economy, all kinds of favorable things begin to happen. New industries can be started and old industries brought up to date. And Japanese tax laws actively encourage an already thrifty people to become even more so.

The actual figures on industrial investment are sobering. During the past year Japan's investment in new plant and equipment has totaled 17 percent of Gross National Product. That compares with only 7.5 percent here in the United States.

The Worship of Productivity

But perhaps the greatest catalyst for Japan's remarkable economic achievements has been its near-obsession with finding new ways to increase personal and group productivity. Indeed, the Japanese people come very close to worshiping productivity. We see this in virtually every industry in which they have chosen to compete. The most dramatic recent example is the phenomenal growth of the Japanese auto industry. Twenty years ago Japan produced fewer than 100,000 automobiles a year. Today the Japanese auto industry has accelerated past the European auto industry and is now on the verge of overtaking America's auto industry as well.

In automobiles — as in steelmaking, camera production, or almost any other Japanese manufacturing operation — productivity is nothing short of amazing. The latest study I've seen shows that Toyota is producing 50 cars per man year compared with fewer than 20 cars per man year for any European manufacturer.

How have they done it? That's what the president of the Ford Motor Company wanted to find out. So he sent whole teams of people to study this latest Japanese miracle. They reported that it's largely a matter of productivity-oriented methods and management, plus an unusually high degree of automation.

Five Organizational Levels vs. a Dozen

At Toyo Kogyo, where Mazda cars are manufactured, there are only five organizational levels between the production-line employee and the vice president in charge of manufacturing. This compares with a dozen layers of management in a typical European or American auto company.

The Ford study teams also found that the Japanese workers maintain their production equipment so carefully that machine breakdowns almost never occur. As a result, Toyo Kogyo can get by with carrying only one or two hours' supply of parts inventories to keep their production lines running. This compares with parts inventories for as much as three weeks in the plants of their American and European competitors.

Clockwork Supplying

In addition, suppliers are closely keyed into the production system. The supplier of ornamental trim, for example, drives his loaded truck right into the assembly plant and personally unloads it at the production line. Then he picks up the empty containers, puts them back on his truck, and — believe it or not — actually tidies up the area before returning to his own plant for more parts.

This clocklike approach drastically reduces factory space requirements. It lowers overhead and material-handling costs and reduces the number of employees required to turn out a given number of cars. To quote the president of Ford Motor Company, where the concept of the production line was born:

"All the Japanese have really done is to take Henry Ford's basic principle — that is, keep the production line moving in a continuous, rhythmic, dedicated process — and go a few, admittedly brilliant steps further."

Innovative use of supplier capabilities is widespread in Japanese industry. Nippon Steel, with half as many employees as U.S. Steel, achieves approximately the same output. Part of this is due to Nippon's more modern plant, but the biggest factor is that the Japanese steel company makes extensive use of low-wage subcontractors. This holds down their own labor costs and results in more steel per dollar of wages.

Subcontracting to Small Suppliers and Even Families

In many industries, the Japanese go even farther. In the electronics industry, for example, many small subcontractors farm out much of their work to even smaller firms or sometimes individual families. As we meet here today, approximately 180,000 Japanese are busy producing electronic components in their homes for these subcontractors, who in turn supply subassemblies to the major electronic manufacturing companies.

Small wonder, then, that the Sonys and the Matsushitas are able to keep their total labor costs low, even though their pay scales are now comparable to those in this country and Western Europe. And in the process millions of jobs are

created for men and women who otherwise would probably be unemployed.

Euthanasia for Dying Businesses

In the never-ending quest for greater productivity, the Japanese do not shy away from killing off dying products and industries. They are constantly asking themselves, "Is this the kind of product or industry in which we can be truly competitive? Or is this something we should get out of, so that we can use our capital and human resources more productively?"

Once dominant in transistor radios, the Japanese have happily forfeited that market to lower-labor-cost countries. They have replaced it with the higher-technology market of color television sets and, more recently, videotape recorders.

Such periodic product transitions are possible only because of the high educational level of the Japanese people. They "transplant" more easily into higher-technology jobs.

The "shape up or ship out" attitude, with which national planners view declining industries, is reinforced by Japan's financial structure. Commercial banks, which are the principal source of capital, simply refuse to finance a dying industry or company. Thus, it must either phase into more productive endeavors or eventually go out of business.

The Choo-Choo Tricycle

The quest for productivity is almost a national game. Far-out concepts are encouraged. Akio Morita, president of Sony, has said that he "loves to hear crazy ideas." And employees at Honda use their free time, plus company grants and facilities, to turn their dream inventions into reality — even the ones which Honda says "are only good for a laugh."

Consider the Choo-Choo cycle. It's a giant tricycle, on which the rider peddles furiously to generate electricity. This in turn heats a boiler, which in turn produces steam, which in turn powers what Honda describes as "the world's most inefficient vehicle."

To many Westerners, all this may seem rather silly. But for the Japanese, it obviously works. In addition to the industries I've already mentioned, the Japanese zeal for innovation and productivity works in audio equipment, musical instruments, bicycles, sports equipment, machine tools, photocopy machines, and many other products not commonly associated with Japanese culture or capabilities.

In only a few short years, Japan has become a competitor the like of which the world has not seen before. If we compare the competition for international markets with a football game — as seems appropriate here at Notre Dame — we must acknowledge that the Japanese have fielded quite a team. In fact, at this point the score is Japan 35 and the Western nations maybe 14.

Is the game in danger of turning into a rout? To answer that question let's do a little Monday-morning quarterbacking. Let's review what has happened here in the United States since the underrated team from the East began knocking the socks off the leader of the Western Conference.

What Ails the Industrial Engine of the United States?

Until the mid-1960s, the American economy towered above that of any other nation on earth. Yet in the past 15 years America's industrial engine has begun to knock, sputter, and display other alarming signs of impending breakdown.

Has this great economic engine been pushed too hard? Has it been poorly maintained? Has it been applied to the wrong tasks? Have we been trying to operate it on too lean a mixture?

I believe the answer is yes to all these questions.

The truth is we have been careless caretakers of an economic system which for many decades created more wealth for more people than any other system in history. And the "we" includes all of us — government, labor, business management, and the public at large. It is the story of a legacy mismanaged — to such a degree that the United States faces the last two decades of this century with apprehension and fear.

Earlier, I referred to Japan's strong sense of national purpose and the willingness of the Japanese people to do what was necessary to achieve that country's goals. In contrast, the United States of the past decade has been a nation of sharply conflicting national goals.

The Role of Government

Consider the role played by government:

Under the delusion that government could guarantee every American a higher and higher standard of living every year, solve not only this country's social problems but also those of the rest of the world, and at the same time create a totally risk-free life for every citizen, the United States embarked on a bureaucratic crusade — at the national, state, and even local levels — which has been unprecedented in history. The cause was a noble one — no one disputes that. But unfortunately the Utopian dream was based on several false premises.

In the perspective of 1980, the most obvious miscalculations were (a) that the wealth of the United States was limitless and (b) that the economic engine would somehow run a little faster each year to compensate for the increasing demands being placed on it.

Expectations Exceed Real Output

The scenario that followed is well known. I shall not dwell on it here, other than to point out that by the mid-1960s America's expectations began to substantially outrun its real output of goods and services. And to make up the difference, the

federal government simply increased the supply of money.

Economist Paul Craig has pointed out that in all the years from the founding of the United States to the year 1966, the money supply grew from zero to 171 billion dollars. Yet today it has swollen to more than twice that — approximately 385 billion dollars. That is an increase of well over 200 billion dollars in 13 years.

During the same 13 years the federal deficit, not counting this year's deficit, has totaled 190 billion dollars. Dr. Craig suggests that the similarity of those figures — a federal deficit of 190 billion and the pouring of more than 200 billion into the money supply — is almost enough to make one develop a theory!

Yet even today, as the nation suffers under double-digit inflation which is on the verge of moving higher, we continue to hear from supposedly responsible public officials that OPEC is the root cause of America's inflation.

Since 1973 American Productivity Less than One Percent a Year

Suppose that whilst the printing presses at the Treasury were operating overtime, somehow the American economic engine had continued to run faster and faster each year — as it did in the 1950s and the early 1960s, when productivity gains were averaging 3 or 4 percent a year. Would that have made a difference?

It would have made a tremendous difference. But unfortunately, just the reverse happened. From 1968 to 1973 the annual productivity increase declined to less than 2 percent. Since 1973 it has averaged less than one percent. And for the past year and a half, productivity has actually declined. In the second quarter of 1980 the decline was approximately 3 percent.

That is not only crippling our output of goods and services; it is making America's products less competitive in markets abroad, which is one of the reasons the United States has lost 23 percent of its share of the world market in the past 10 years.

The dilemma of declining productivity, as you know, has been laid at many different doorsteps. We are frequently told that Americans have lost the will to work, and that coffee breaks, retirement parties and other social rituals, plus a high rate of absenteeism, have sapped the output of our factories and offices.

My Personal Observation: "The American employee works as hard as his Japanese or German counterpart."

But my personal observation is that, on the whole, the American employee works as hard as his Japanese or German counterpart. So I think we have to probe deeper than that. And when we do, one conclusion is inevitable:

The productivity problem can be attributed primarily to structural deficiencies in our current economic system rather than to any pronounced change in the traditional American work ethic.

Consider, for example, the area of industrial innovation. Perhaps more than any other factor, it was industrial innovation which made the United States the most productive nation on earth. Innovation created not only a wealth of new products and new services but entirely new industries.

The Computer Industry: A Classic Example of Industrial Innovation

The industry my own company is a part of — the computer systems industry — is a classic example. Thirty years ago, the computer was a laboratory curiosity; today, it has become a 100-billion-dollar business which during the 1980s is expected to become the world's fifth largest industry, exceeded only by the energy, automobile, steel, and chemical industries.

The computer industry — like nuclear power, aviation, television, instant photography, and satellite communications — is a high-technology industry spawned in America which grew out of this country's dedication to research and development.

R&D Expenses are Declining

Yet ever since the mid-1960s, the percentage of R&D spending to Gross National Product has been declining. Expenditures for basic R&D — the kind of research that gives birth to new industries — has dropped from 34 percent of total R&D allotments to only 25 percent today.

So far as R&D is concerned, we are like the farmer who every year sets aside a smaller amount of seed corn for the next year's crop, and then wonders why his production is falling off.

Erosion of Industrial Plant

Comparable erosion has occurred in the American industrial plant. During the past 10 years many of America's factories have become obsolete or at best obsolescent. The average age of the machinery used in American plants today is 12 years. This compares with an average equipment age of seven years in the plants of our principal competitors.

We lag in automation as well. Japanese industry, with less than half the total output of American industry, has installed approximately 45,000 computer-controlled factory robots, compared with 5,000 here in the United States.

In this, the world's richest country, industry has been living on a low-calorie diet. The amount of capital invested per worker grew only 1.5 percent a year from 1963 to 1975. In Japan, the annual increase in capital investment per worker during the same period was 10.1 percent — seven times as much.

Now the U.S. Has to do the Catching-Up

The tables have clearly turned; now it's the United States which must do the catching up —

and on a massive scale. It's estimated that the U.S. steel industry alone needs to invest almost 5 billion dollars annually during the 1980s just to stay reasonably competitive with foreign steel producers.

What has happened to the American zeal for creating new ideas and opening new industrial frontiers? What has eroded this country's genius from producing more goods, more efficiently, for more people — generation after generation?

Disincentives

The causes of this industrial decline are, of course, legion. But it's surprising how many of the reasons for our current economic problems can be summed up in a single word. That word is "disincentive." In fact, I think it's fair to say that no other country has yet devised so many disincentives to innovation and productivity in such a short period of time.

In discussing these disincentives, I must reluctantly return to the role played by government. I say "reluctantly" because it is not my purpose — nor would it be fair — to make our elected officials the scapegoat for all of America's problems.

Lack of Consensus

In the final analysis, a democratic government reflects the consensus, or lack of consensus, of the people it governs. And for the past decade the United States seemingly has lacked a sense of direction. Meanwhile, government has focused on ways to redistribute the wealth created by earlier generations, and to achieve through brute force the pet social engineering schemes of bureaucrats.

In pursuit of these nebulous objectives, government has:

- Engaged in a 15-year spending spree, which besides saddling the public with unprecedented inflation, has grossly distorted the earnings of business and industry. So much so that most of the profits being reported today are consumed in meeting the rising costs of staying in business, rather than in productive new investments.
- Government has also established a tax system which gives little incentive to business and industry to invest in R&D and new plants and equipment, and which simultaneously discourages personal savings.

Endless Maze of Regulations Draining $100 Billion a Year

- It has intervened in almost every phase of business operations with an endless maze of regulations which, by conservative estimates, are currently draining over 100 billion dollars a year from industry's basic function of providing goods and services.
- It has discouraged expansion by American business into overseas markets — by lack of any consistent trade policies, by ill-advised attempts to use exports as a club to force other countries to practice American concepts of morality, and by outmoded anti-trust laws which effectively prevent many American companies from competing successfully with powerful foreign consortiums.

The list of indictments could go on and on. As economist Lester Thurow has pointed out, the U.S. economy today is bleeding from "a thousand cuts."

Business Leaders Not Preparing Their Companies for the Winds of Change

I wish it were possible to say that business is blameless in this multiple, persistent wounding of the economy. But such is not the case.

Most business leaders have been quick to unmask the folly of much of the legislation of recent years. However, we have been less than adept in preparing our own companies for the winds of change which began sweeping through almost every industry in the 1970s.

- We have allowed our plants to turn out too many shoddy products under the mistaken impression that the consumer will buy anything so long as it's made in the USA.
- We have tended to subordinate long-range planning to short-range expediency.
- We have devoted too much time and too many resources to shoring up eroding markets, and have not paid enough attention to emerging new markets.
- We have preached about the need to keep the spirit of enterprise alive, but we've often been overly cautious when the time came to actually put our chips on the board.

Peter Drucker: "In an Inflationary Environment, Figures Lie."

- And all the while, we have reassured ourselves as to the wisdom of our course by reporting record revenues and earnings. We have chosen to ignore the realistic dictum of management consultant Peter Drucker that in an inflationary environment, "the figures lie."

Labor Deluded in Thinking They Can Fight Against Productivity

And what of organized labor? Again, labor — along with government and business — must accept a share of the blame for America's industrial decline.

As the experience of Japan has demonstrated, labor has as much at stake in achieving improved productivity as management, or the nation as a whole. Yet many unions continue to fight tooth and nail against productivity-enhancing changes. Instead, they have clung tenaciously to outmoded work practices that narrowly define who can do what — when, where, and how. In many industries these rigid work rules have locked companies into a style of operation which is totally inadequate for meeting the competitive realities of today.

Along with government and much of business, labor has also succumbed to the illusion that

America's economic growth is an automatic, never-ending process. The overriding philosophy at the bargaining table has been to squeeze the last drop out of the bottle and to let someone else worry about how the bottle is to be refilled.

Delusions in Automatic Cost of Living Increases

This "pass-along-the-problem" approach is nowhere more evident than in the cost-of-living provisions written into labor contracts covering millions of employees — provisions which have helped increase hourly labor costs in the auto industry, as only one example, by 20 percent in the past year alone. Yet we are now hearing cries of bewilderment over the unprecendented influx of Japanese-built autos in the U.S. market, at a time when over 200,000 American auto workers are out of work.

The Decline and Fall of Athens

Many years ago, the historian Edward Gibbon explained the decline and fall of the ancient city of Athens in a few chilling words. He said:

"In the end, more than they wanted freedom, they wanted security. They wanted a comfortable life. And in their quest for it all — security, comfort and freedom — they lost it all. When the Athenians wanted finally not to give to society, but for society to give to them; when the freedom they wished for most, was the freedom from responsibility, then Athens ceased to be free."

Can the United States escape a similar fate? I believe that depends, in large measure, on whether this country can regain the competitive edge it has lost in recent years.

Step 1: Recognition of the Seriousness of the Problem

Certainly the first step in meeting the economic challenge posed by Japan and other international competitors is to recognize the seriousness of the problem. And evidence is mounting daily that Americans in all walks of life are indeed aware that the nation's industrial engine badly needs a major overhaul.

The message has even reached Washington. As the presidential and congressional campaigns begin building to a peak, each of the presidential candidates — along with every other office-seeker — has sensed the deep concern throughout America about the future direction of the economy.

Almost overnight, "reindustrialization" has become the buzzword of 1980. It is now a favorite theme not only of candidates for political office,but of television specials, radio talk shows, articles in prestigious magazines, town meetings, and even discussions at cocktail parties.

Many liberals are beginning to sound like conservatives. And conservatives are as pleasantly surprised as a professor who discovers at the end of a long lecture that his class has actually paid attention to what he's been saying.

This is all very encouraging. But catchy phrases and red, white, and blue bumper stickers proclaiming the national will to revitalize the American economy will not solve the economic problems which have been building for 15 years.

Facing Some Hard Choices

It is regrettable, but true, that the mammoth rebuilding task everybody is talking about will require making some hard choices — by government, by business, and by labor. Also, by the tens of millions of other Americans, young and old, who are not part of the power structure.

On November 4th — after the bands have stopped playing, and the last of the campaign oratory has faded away — will the national consensus on the need for rebuilding America's industrial base also begin to fade away in the face of those hard choices? That, of course, is the unanswerable question.

We must proceed, however, on the assumption that the American people — like the Japanese people 35 years ago — will in fact demonstrate a willingness to do what is necessary to breathe new life into the national economy. Certainly that is the one mandatory requirement for reversing the United States' economic decline.

The Japanese Challenge is Only the Tip of the Iceberg

The dilemma facing America today transcends the issue of meeting the Japanese economic challenge — important as that issue is. The Japanese challenge is but the tip of the iceberg; it is highly visible because of the 9-billion-dollar trade deficit with Japan anticipated for this year, and because Japanese-made products are flooding the American marketplace.

But the bulk of the iceberg is still unperceived in many quarters. It is not only Japan which is challenging America's traditional leadership in scores of industries; it is other industrialized countries as well, plus many lean and hungry developing countries.

I'm not suggesting that the Japanese challenge should be underestimated, or that the Japanese experience is without lessons for the United States. It is indeed the most pressing challenge of the moment, and we can benefit by emulating a number of Japanese practices. But we cannot expect Americans to behave like Japanese. Japan is a highly homogenized society, with a history and a culture which are alien to the history and culture of the United States. It is basically a group-oriented society, whilst the United States has been, and remains, essentially individual-oriented.

A Framework for Forming Consensus

It seems to me therefore that America's response, both to the Japanese challenge and the broader worldwide challenge, must be built on American strengths, American values, and the American political and social structure.

Business Week magazine has defined the challenge in the most succinct terms I have seen:

The United States, it says, must develop a "consensus-forming framework under which government, business, labor, and other interest groups — without compromising their traditional goals — can agree on tradeoffs that would both strengthen the economy and, in the end, prove beneficial to all."

I think we would all agree that government must be the chief architect in designing and developing such a framework. It is the country's elected officials, and the governmental departments they control, who must establish the necessary priorities. It is government which must create a favorable environment for such an effort.

Can Government Do This?

The public mandate for overhauling the world's largest economy is unmistakably clear. What is less clear is whether government is equal to the task. Admittedly, it will be a task of awesome complexity.

- As a first step, it will require a major shifting of governmental emphasis, including the slowing down of attempts to create an egalitarian society and the speeding up of efforts to generate economic growth. To achieve this massive redirection, government will have to greatly increase its planning and coordinating capabilities.

- It will also require acceptance of the fact that any viable program to rebuild the national economy must reduce, to some extent, the level of personal consumption during the initial years of the revitalization effort. There are no magical recipes for creating a larger pie overnight. If a larger slice of the Gross National Product is to be allotted to productive investment, each of the remaining slices of the pie will have to be reduced accordingly. And that must start at the governmental level — specifically with a meaningful reduction in the federal budget and corresponding monetary restraint — reinforced by comparable fiscal restraint by state and local governments.

Futility of Propping Up Dead Industries

- Any successful rebuilding effort must also recognize the futility of trying to prop up low-skilled, labor-intensive industries, whose products must compete with comparable products manufactured at a fraction of the U.S. cost in low-wage developing countries. Here, too, a change in emphasis will be required — away from traditional attempts to increase blue-collar employment and toward the creation of new jobs in knowledge-intensive industries. This will necessitate major investments in job retraining programs, and, at a more basic level, reorientation of the nation's educational system.

- The rebuilding program will also require a concentrated effort to increase America's exports. This includes the establishment of appropriate export incentives and the removal of current disincentives, plus a revision of anti-trust laws so that American versions of the highly successful Japanese trading companies can open new markets abroad.

Research and Development

- Most important of all, it will require greater stimulation of research and development to create new products, new industries, and new jobs and greater capital investment in new plants and equipment so that those products — and existing products — can be manufactured more efficiently than their counterparts abroad.

I've listed several philosophical concepts which in my view are necessary if government is to serve as the catalyst for reversing the recent slippage of the U.S. economy. These concepts are, of course, easier stated than implemented. And their implementation would be viewed with varying degrees of enthusiasm by various interest groups.

Yet on one phase of their implementation there appears to be widespread agreement; namely, that increased investment is the indispensable key for unlocking America's potential for economic growth. The problem is not only to accelerate the rate of capital formation, but to make sure that the additional capital flows into productive channels.

Meaningful Incentives for Research and Development

The most powerful tool for achieving those objectives is tax reform — to be specific, tax reform in three primary areas:

First, current tax laws should be amended to provide meaningful incentives to spur research and development. Studies show that high-technology industries generate triple the growth rate, twice the productivity rate, and nine times the employment growth of low-technology industries. America has long been the world leader in high technology. That leadership is now in jeopardy, primarily because R&D expenditures, as a percentage of Gross National Product, have shown virtually no real growth in the past 10 years.

Second, current tax laws should be revised to permit more rapid depreciation of capital investments in new plants and equipment. Current depreciation schedules are inconsistent with the real world — not only because replacement costs have soared, but because of the speed with which most industries, especially high-technology industries, are changing. As only one example, my own company will have to invest almost 400 million dollars in the 1980s to stay competitive in semiconductors, which are the basic building blocks of computers and other types of information-processing equipment

(to be continued in next issue)

Dwyer – *Continued from page 16*
of new basic service offerings. The result would be that the competitors of the carrier's affiliate could be expending funds and resources on projects that might be made obsolete by a change in the network or that might not be possible due to a shortage of circuits. A related practice would be the selective structuring of protocols, interfaces, etc., by the carrier so as to render many competitive offerings -- other than those of its affiliate -- incompatible with the basic network.

The Personal Factor

Another factor which cannot be overlooked is the personal one. If AT&T's affiliate were less than fully separated, it would be difficult to expect the carrier's employees to treat competitors the same way that they treated the individual sitting in the next desk or office who worked "for" the carrier's affiliate. Similarly, if sales representatives were permitted to share business offices, it would be difficult to expect a sales person not to offer -- directly or indirectly -- better or more prompt service if a customer went next door and ordered all of its needs from the carrier and its affiliate. It could also be expected that one sales representative might tell another to delay the purchase and repair orders of a competitor in order to enable the carrier's affiliate to secure an existing customer of that competitor.

The foregoing abuses could easily become institutionalized if a carrier periodically and routinely transferred employees between its competitive and common carrier organizations. The personal factor could also be reinforced if the carrier adopted a promotion policy that considered all employees at the same time and in the same fashion, regardless of their particular corporate assignment at a given moment. "Team players" who contributed to the entire corporate family could be rewarded; those who advanced the parochial needs of their particaular corporate employer could be penalized.

The Appropriate Remedy

The divestiture of AT&T's competitive activities from its regulated endeavors is the only sure means of preventing AT&T from engaging in the foregoing abuses in competitive markets. Only such a remedy will remove both the incentives and the opportunities for AT&T to misuse its monopoly power in competitive markets. In the absence of divestiture, AT&T should be permitted to enter competitive markets only if subject to meaningful structural separation. Although a structural remedy will not eliminate the incentives for AT&T to engage in anticompetitive conduct, it will limit the opportunities for abuse and make their detection easier.

Meaningful Separation of Personnel, Etc.

In order for a structural solution to be successful in limiting anticompetitive conduct, there must be meaningful separation of personnel and of physical, as well as intangible, assets. A simple proscription of commonly owned assets and commonly employed personnel will not be adequate. It must be assured that one corporate entity is not permitted to function solely through personnel and facilities -- technically separate -- that are provided pursuant to contract by another corporate entity, regardless of whether that contract is arm's-length or otherwise. Further, joint undertakings in which one corporate entity lends its market power and resources to another -- in any form -- must be prohibited. Finally, to the extent that affiliates are permitted to deal with each other, they must be required to do so on a basis that eliminates the possibility of anticompetitive abuse.

Although H.R. 6121 purports to rely on structural separation, the "fully separated subsidiary" prescribed by the bill is in fact less than fully separated. As a result, AT&T and its affiliate will be able to engage in many of the abuses discussed above. Although the bill does not permit parent and affiliate to share common employees, the bill is silent as to inter-corporate transfers. Employees could be hired and trained by one AT&T affiliate, then transferred to another. This would be an obvious source of cross-subsidy. Subsequent transfers and promotions of personnel, together with other loopholes in the bill, could also be used to transfer privileged information between parent and affiliate.

Under the bill, AT&T and its affiliate can also share the use of property and transmission facilities. Whether it be business offices, trucks, or the central offices of the Bell System Operating Companies, parent and affiliate will be able to operate as if they were joint venturers. This joint use of property will reinforce AT&T's existing incentives to cross-subsidize and to manipulate monopoly transmission facilities to induce users to subscribe to AT&T's competitive service offerings.

Common Name and Logo

The bill's approbation of the joint use of property extends to the use of a common name and logo. The Bell System logo is perhaps the most widely recognized symbol in the United States. It was paid for by monopoly ratepayers. Allowing this symbol to be shared by parent and affiliate will prove to be a continuing source of cross-subsidy. It will also create opportunities for tying. The opportunities for both abuses will be perpetuated by the allowance in the bill of common institutional advertising.

Common Financing

Another element of separation prescribed by the bill is seriously flawed. It relates to the financing of the affiliate. Although the subsidiary is technically required to maintain its own financial structure, the bill allows AT&T to aid the affiliate in a number of ways. AT&T can, for example, guarantee the debts of its affiliate with the assets paid for by monopoly ratepayers. Similarly, AT&T may provide its affiliate, either directly or indirectly, with substantial financing at below market rates.

Privileged Access to Basic Research

An AT&T affiliate will also benefit from privileged access to the basic research performed by Bell Telephone Laboratories -- an insitituion

supported by monopoly ratepayers. Similarly, AT&T's affiliate will be able to rely upon Bell Telephone Laboratories and Western Electric as perennial suppliers of applied research, development, and manufacturing for components and subassemblies. These innocuous sounding devices are the most important part of computer processing equipment. Since these devices can be developed and manufactured in such a fashion as to be of use only to AT&T's affiliate, AT&T can use these items as a vehicle for cross-subsidization and the privileged release of information about the network.

Common "Management Guidance"

Under the separation prescribed by H.R. 6121, AT&T's affiliate will also be able to acquire "management guidance" and a host of other services from its parent. When these and the other shortcomings of the separation prescribed by the bill are taken into account, it becomes readily apparent how damaging AT&T's entry into the computer services industry would be. These shortcomings of the bill are all the more troubling since they appear to be firmly set "in concrete." The bill inexplicably circumscribes the ability of the Federal Communications Commission to prescribe additional or different structural safeguards, regardless of AT&T's response to competition. In a dynamic marketplace, such a straitjacket on the Commission's authority is clearly out of place.

H.R. 6121 Will Severely Threaten Competition

In view of the foregoing, it should be clear that H.R. 6121 will severely threaten competition in the computer services and other competitive industries.

The bill should therefore be substantially amended. In the absence of such changes, the bill should not be enacted.

References

1. See Baldwin & McFarland, "Tying Arrangements in Law and Economics," 8 Antitrust Bull. 743, 775 (1963).

2. H.R. Rep. No. 1747, 91st Cong., 2d Sess. 18 (Conference Report), reprinted in (1970) U.S. Code Cong. & Ad. News 5569.

3. "Bank Holding Company Act Amendments: Hearings on H.R. 6778 Before the House Comm. on Banking and Currency," 91st Cong., 1st Sess. 92, 93 (1960) (statement of Ass't Attorney General Richard W. McLaren); id. at 733, 735 (statement of Robert Pitofsky); "One-Bank Holding Company Legislation of 1970: Hearings on S. 1052, S. 1211, S. 1664, S. 3823, and H.R. 6778 Before the Senate Comm. on Banking and Currency," 91st Cong., 2d Sess. 238, 239-40 (1970) (statement of Ass't Attorney General Richard W. McLaren).

4. Standard Oil of Cal. v. United States, 337 U.S. 293, 305-06 (1949).

5. Northern Pacific R. Co. v. United States, 356 U.S. 1, 11 (1958).

6. C. Kaysen & D. Turner, Antitrust Policy 157 (1959).

7. The same could be done if a particular marketing effort proved to be a disaster. If only a minor network change were required to improve a competitor's service that was poorly received, the carrier's affiliate could be advised how to correct the problem and then market the service successfully. □

Berliner – *Continued from page 9*

amount of red paint, or more complicatedly the number of families with 3 children living within 2 miles of a large city center. The C's represent the unit cost or value of each Fi, in the problem situation. Finally the Ai's represent the importance of the term i, given certain global information about the present situation.

A Teaching Environment

It can be seen that this type of structure lends itself readily to a teaching environment. Mistakes can be made because of failure to:

(1) Recognize an Fi or variable as an important facet of the problem.

(2) Recognize the relative importance of each Fi to the other F's or variables in the problem. This is the contribution of the C's.

(3) Understand how the global context, the milieu, environment, or situation raises or lowers the utility of Fi. This is the contribution of the A's.

□

CACBOL – *Continued from page 2*

10 COMPLETE UTTERANCES OF 7 WORDS (List 810311)

Who pays the piper calls the tune.
If some is good, more is better.
The rich become richer, the poor poorer.
Smoking is prohibited in this waiting room.
The mills of the gods grind slow.

The next station stop is New York.
Illumination in these premises should be extinguished.
Turn out all lights before going home.
Doctor, I am in trouble with nightmares.
Love me now ere 'tis too late.

(Source: from "Challenges to Investigators of Artificial Intelligence" by Neil Macdonald)

(please turn to page 34)

Computing and Data Processing Newsletter

CORPORATIONS AND THEIR SOCIAL RESPONSIBILITY

Elizabet Goepel
University-Industry Research Program
610 Walnut St., No. 1215
Madison, WI 53706
(608) 263-2840

From recycling cans to sponsoring public television programs, American corporations spend millions annually on what they consider their social responsibilities.

But what does the public think about these activities?

A study from the University of Wisconsin-Madison suggests that corporations would do best with some audiences not to stress their profit-margins. "What's good for General Motors" is not necessarily what the public thinks "is good for the country."

Two students at the School of Journalism, Byron Reeves and Mary Ann Ferguson, judged the responses of 147 university students and 14 public relations professionals to different versions of corporate social responsibility.

The researchers randomly separated the subjects into three groups, and gave each group a different style of the annual report of a hypothetical manufacturer of pens. Each style expressed one of three views of the company's responsibility to society. In Style 1, the company represented itself as a profitable organization serving the public by maintaining its own economic health and perpetuating the free market system. In Style 2, the company stressed its support of charities and self-help programs such as employee education, and its sponsorship of a TV program on American culture. In Style 3, the company said it was deeply committed to solving society's problems including pollution and employment discrimination.

From the responses gathered, Style 1 was the least popular. Style 2 was the most popular. Style 3 was a close second. This study may be some of the first hard data on reactions of the public to three versions of the social responsibility of corporations.

TEXAS INSTRUMENTS GIVES $115,000 COMPUTER SYSTEM TO UNIVERSITY OF TEXAS AT AUSTIN

Joyce Pole
News and Information Service
Univ. of Texas
Box Z, University Station
Austin, TX 78712
(512) 471-3151

Texas Instruments Inc. has donated a "mid-large" computing system to the Department of Computer Sciences at the University of Texas at Austin. This is a DS 990 Model 8, including a central processor, a memory of 1/2 million bytes, a medium-speed line printer, and 2 disk drive units each of 50 million bytes.

Dr. Al Dale, department chairman, says:

"The TI system will be used by several hundred UT undergraduate students in a programming lab course required of all computer science majors. They will get more hands-on experience because the system is interactive. By the time they graduate, they will have experience in 6 different computer environments.

"In the 1980 fall semester, the department had 801 undergraduate majors, 29% more than in 1979. Undergraduate enrolment should continue growing. The demand for computer scientists far exceeds the supply. It is widely recognized that increased support of research and education in computer sciences is of critical national importance. Industry is able to encourage research, and help insure a flow of qualified computer scientists."

Dr. John R. Hanne, TI assistant vice president, says:

"Austin has become one of the major computer and electronics centers in the country. In the last 10 years, Austin has exploded, becoming almost a second Silicon Valley, like the San Francisco Bay area in California."

ENERGY IN NETWORKS FOR DATA COMMUNICATIONS IS BECOMING AN IMPORTANT COST

Cornelia Yelin, Manager
Public Relations
Frost and Sullivan, Inc.
106 Fulton St.
New York, NY 10038
(212) 233-1080

Users who have not given much thought to the rising costs of energy for their own data communications networks may be in for an unpleasant surprise.

The power consumed by all significant datacomm components:

- acoustic couplers
- code converters
- data security units
- front-end processors
- line drivers
- multiport modems
- multiplexers
- voice digitizers, etc.

can translate into an annual cost increase of of $5,000 to $10,000. This is a conclusion from a new market report by Frost and Sullivan, entitled "Energy Efficient Data Communications Networks." The report also presents a case study where replacing hi-energy consuming devices with lo-energy ones produced a saving of $8000 a year. Other strategies, such as automatic shut-off and start-up depending on power cost, the use of microprocessors, etc., may be invoked also.

THE FLYBY OF SATURN BY VOYAGER 1 – PART 2

Neil Macdonald, Assistant Editor

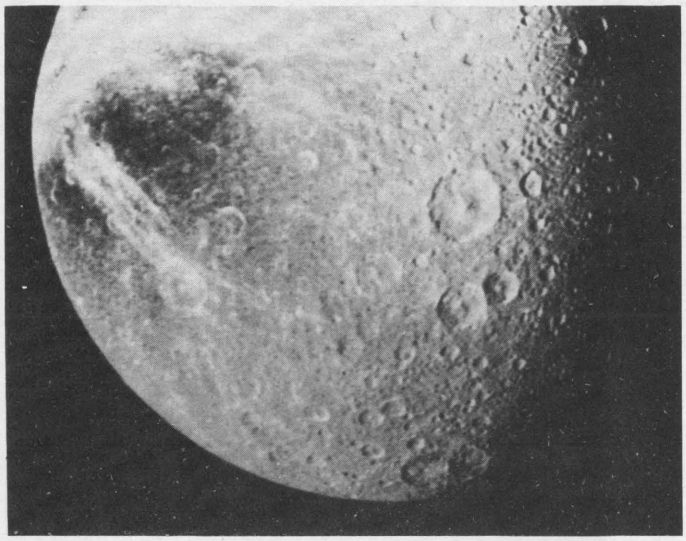


Figure 2 – The Saturn satellite Dione: showing impact craters, bright rays, topographic ridges and valleys, and fault troughs. Picture taken Nov. 12, 1980, from 149,000 miles, by Voyager 1, space probe of NASA.

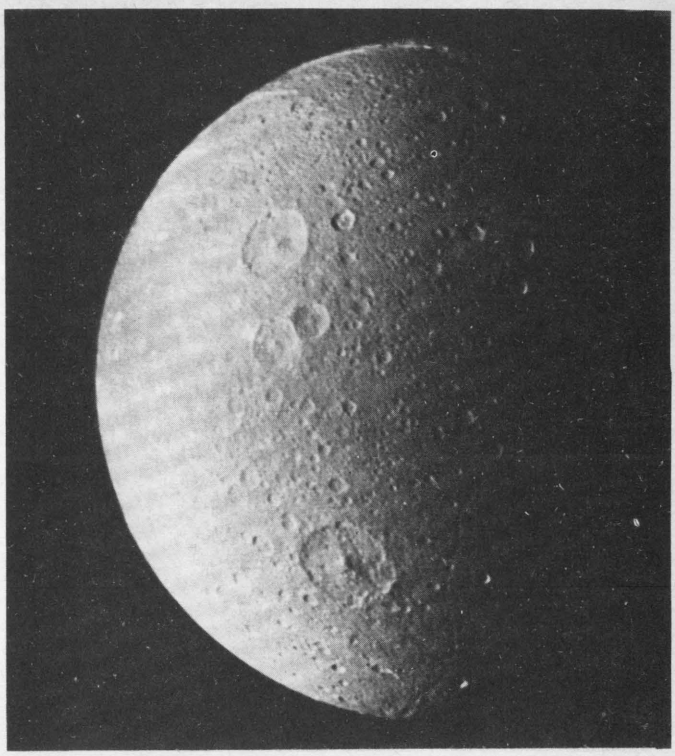


Figure 3 – The saturn satellite Dione. A later picture taken Nov. 12, 1980, from about 100,000 miles. Notice the remarkable fault. The largest crater is about 62 miles in diameter, and shows a well developed central peak.

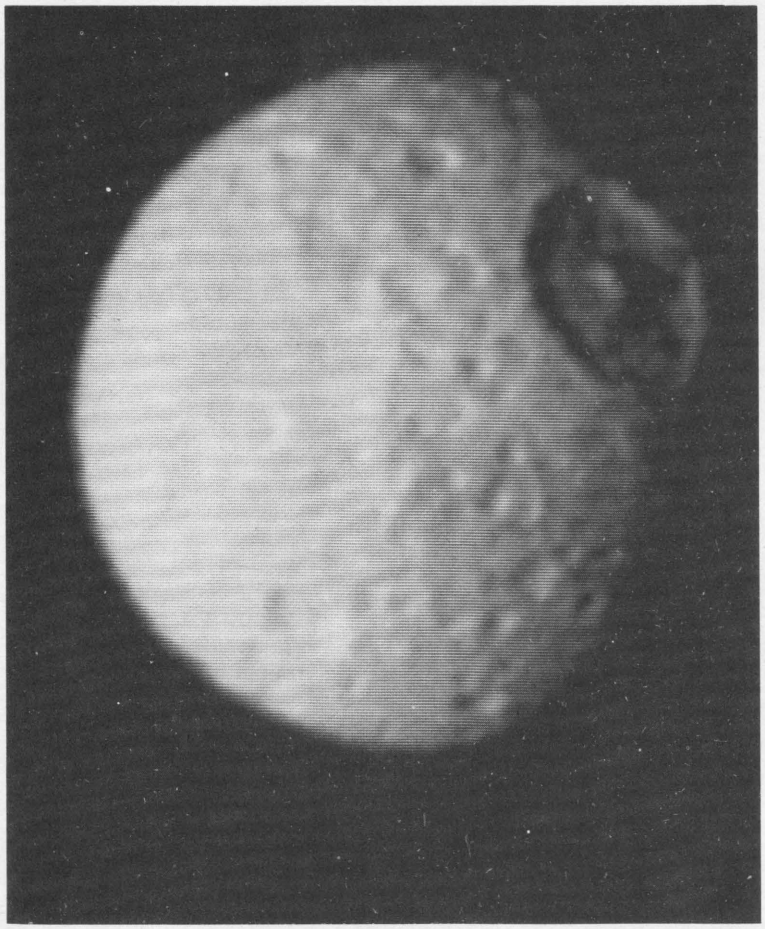


Figure 4 – The Saturn moon Mimas. Picture taken Nov. 12, 1980; range, about 264,000 miles.

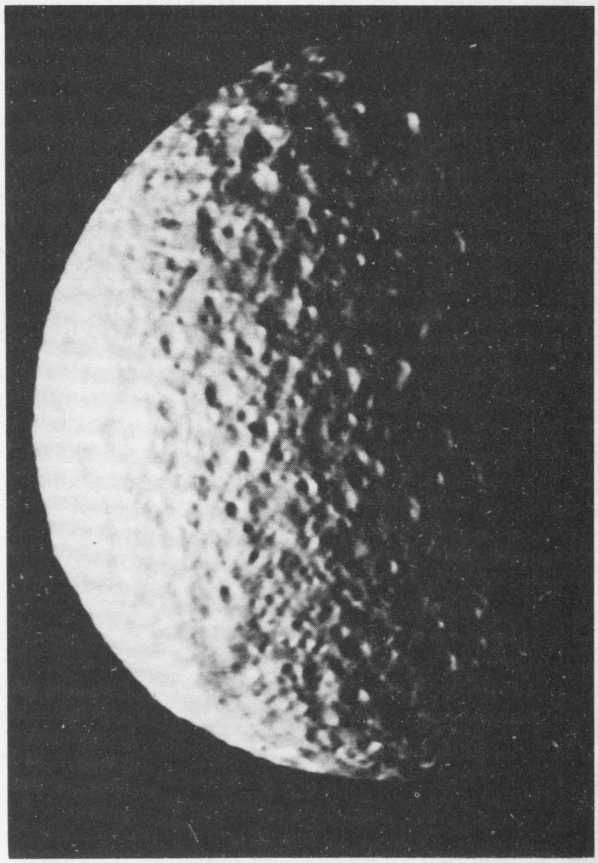


Figure 5 – The Saturn moon Mimas. Picture taken by Voyager 1 on Nov. 12, 1980, range about 80,000 miles. The very heavily cratered surface implies 4 billion years of age.

Lias – *Continued from page 13*

will become centers for national information exchange. Local networks will link into regional networks and regional services will interlace across the nation.

The next two tables reflect the whims of John Q. Public. "Information Commands", Table 3, and "Information Instincts", Table 4, come from my notes, originally written in 1970. At that time they appeared to be bizarre, even embarrassing. But it is remarkable how close they are to reality now.

Table 3

Information Commands

Inform me
Tutor me
Quiz me
Drill and Practice me
Game me
Comic Book me
Conference me
Movie me
Riddle me
Lecture me
Entertain me
Compare for me
Condense and Summarize for me
Simulate for me
Diagram for me
Surprize me
I want my goods and information services to be here, now, instantly!

Table 4

Information Instincts

1. All data assembled in my lifetime should be available instantly. In my business, all company history should be available instantly.

2. All information in all libraries of the world should be available instantly upon request, like a wristwatch or wallet.

3. Information should be thoughtlessly rearrangeable, whether alphabetic, numeric, phonetic-oral, visual-graphic, motion, etc.

4. I want to manipulate data free of charge. I live in an information age with incessant demands for facts and reports. Therefore, this is necessary as a freedom or birthright. Do not provide this service on the basis of wealth or class. Everyone deserves it including me.

5. Few if any rules should govern the use of information systems. Like television or telephones, don't explain how it works. With no more than five knobs, let me use it.

Will Universities Keep Their Place in the Sun?

Nearly every electronic medium is computer-assisted in 1980. These lists seem reasonable, and almost fulfillable - if not at once, then soon.

The video screens on our white walls will get larger and larger - and more necessary. Information from somewhere will dance across them. The world's knowledge will be re-orchestrated. Universities with vision will have their place in the sun.

Table 5

The Largest Academic Computer Installation

California State Unversity and Colleges /
$50 million hardware investment /
Bid awarded September 1980

- Increases number of student terminals from 1751 to 2747

- 19 CSUC campuses

- 74,000 students used computers in 1976-77; 166,000 students expected to use computers in 1981-82; one terminal for every 60 students

- 21 Control Data Cyber 170/700 computers tied together statewide

- Supports research, timesharing, and PLATO CAI

- PLATO courseware covers 800 subject areas

- PLATO carries more than 5000 hours of instruction

- 2000 teachers and other professionals have contributed to the system

□

CACBOL – *Continued from page 31*

6 LAWS OF GENERAL SCIENCE (List 810312)

Raven's Raving No. 4
The best things in life aren't things.

Parkinson's Law of Delay
Delay is the deadliest form of denial.

Searle's Sage Sample:
The cussedness of inanimate objects is beyond understanding.

The Tarnished Golden Rule
Do unto others and do it fast.

The Tarnished Golden Rule, Corollary 1
Do unto others before they do unto you.

Winston Churchill's Commentary on Man
Man will occasionally stumble over the truth, but most of the time he just picks himself up and stumbles on.

(Source: "1001 Logical Laws", compiled by John Peers, publ. by Doubleday & Co. Inc., Garden City, NY, 1979, 189 pp)

□

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.)

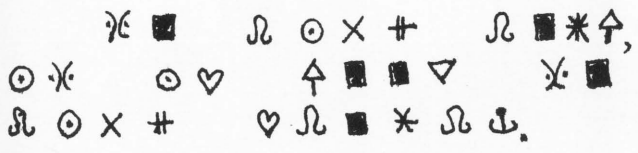
NAYMANDIJ 8103

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

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 8103



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, expressed 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 8103

```
      T H E R E
  *     I S N O
  -------------
    L R F S A K
    F T O N F
  T L A A E F
A N F T N D
-------------
= A E A K L R O O K
```

KFL = RST

88992 25546 13920 89992

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

SOLUTIONS

NAYMANDIJ 8101: Column 8: over 6.
MAXIMDIJ 8101: Times that are are better than times that were.
NUMBLE 8101: Closed fist gets closed eye.

Our thanks to the following people for sending us solutions: Roland Anderson, Stockholm, Sweden – Maximdij 8009 and 8011, Numble 8009 and 8011; Abe Schwartz, Jamaica, NY – Numble 8101; Steven Shulman, Edison, NJ – Maximdij 8101, Naymandij 8101; Steve Werdenschlag, Livingston, NJ – Naymandij 8101, Maximdij 8101, Numble 8101.

The Frustrating World of Computers

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

IT ALSO PREDICTED FORD, MCGOVERN, AND CHRYSLER WOULD WIN TOO ——

OH, THERE IS THE PROBLEM, IT SUBTRACTED YOUR BANK BALANCE FROM YOUR ACCOUNT NUMBER, —— AGAIN.

DON'T SPREAD THIS AROUND BUT —— IT WAS THE ONE THAT CAME UP WITH THE NINE DIGIT ZIP ——

IT MAY BE SMALLER AND MORE COMPACT BUT IT MAKES LARGER, MORE ELABORATE ERRORS ——