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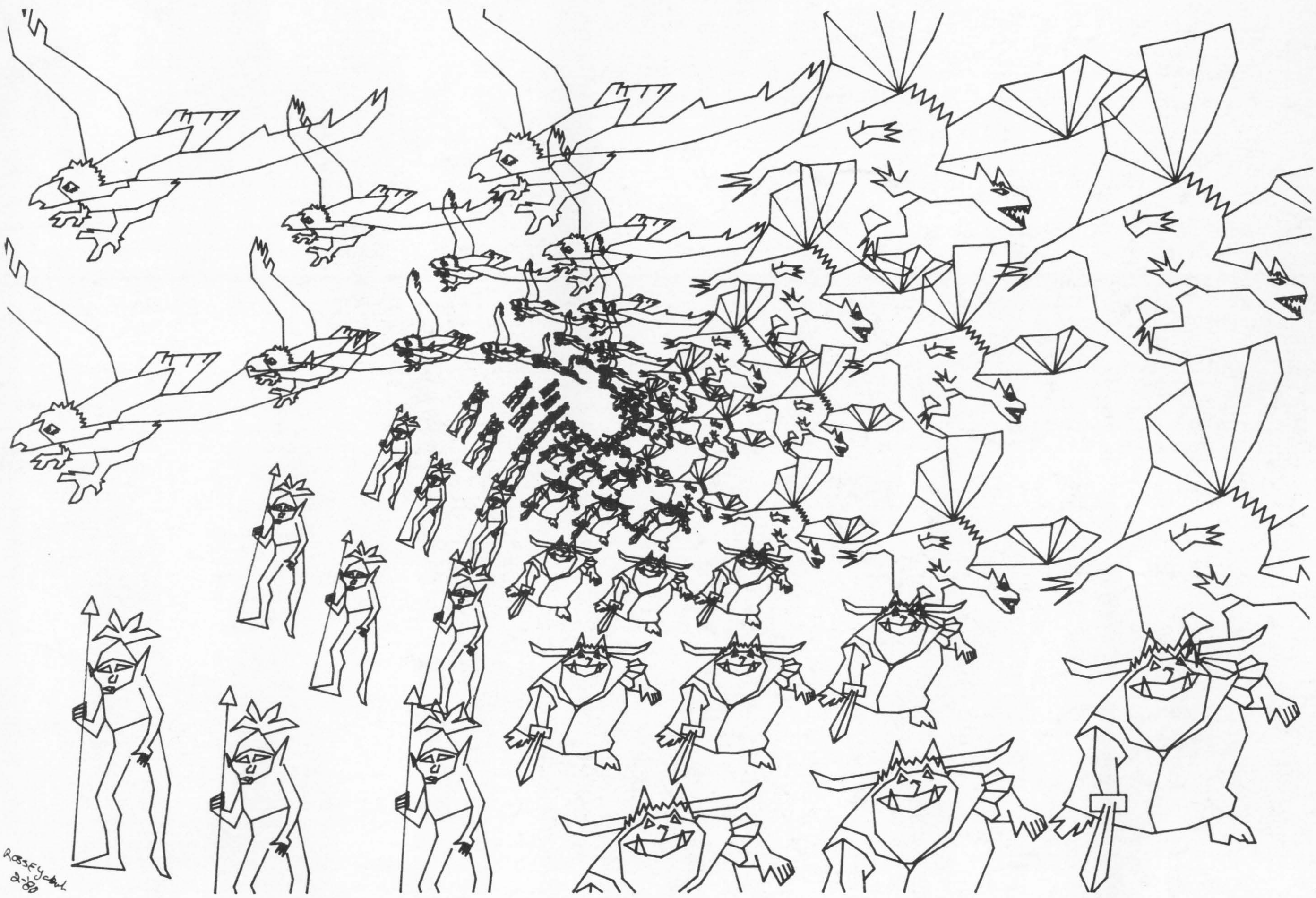

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The Computer Almanac and Computer Book of Lists — Instalment 20

Neil Macdonald
Assistant Editor

12 COMPUTER STORES IN BOSTON AREA (List 810701)

Compumart / 270 Third St., Cambridge, Mass. / 02142 / (617) 491 2700
Personal, small business, Apple
Computer Center / 730 Commonwealth Ave., Boston, Mass. / 02134 / (617) 739 1704
Personal, small business, Radio Shack
Computer City / 5 Dexter Row, Charlestown, Mass. / 02129 / (617) 242 4597
Personal, small business, Apple
Computer Exchange, 45 William St., Wellesley, Mass. / 02181 / (617) 237 4800
Personal, small business, Apple
Computer Shop / 590 Commonwealth Ave, Boston, Mass / 02134 / (617) 247 0700
Personal, small business
Computer Store / 1689 Massachusetts Ave, Cambridge, Mass / 02138 / (617) 354 4599
Personal, small business, Apple
Digital's Computer Store / 175 Federal St., Boston, Mass / 02110 / (617) 482 0900
Personal, small business, Digital Equipment Corp.
Computerland of Boston / 214 Worcester St., Wellesley, Mass / 02181 / (617) 235 6252
Personal, small business, Apple
Ferranti-Dege Inc / 435 Brookline Ave, Brookline, Mass / 02146 / (617) 232 2550
Personal, small business, Apple
Harbor Electronics / 365 Main St, Winthrop, Mass / 02152 / (617) 846 7132
Personal, small business, Apple
Verni Communications Inc / 106 Juniper Ridge Road, Westwood, Mass / 02190 / (617) 329 0593
Personal, small business
Xerox Store / 44 Federal St., Boston, Mass / 02110 / (617) 451 5800
Personal, small business

(Source: Neil Macdonald's notes)

5 COMPUTER STORES IN NEW YORK (MANHATTAN) AREA (List 810702)

Byte Shop East Inc. / 130 East 40 St.(at Lex Ave), New York, NY / 10016 / (212) 889 4204
Microcomputers, personal, hobbyist, educational, small business, hardware, software, 35 brand names
Computer Center / 31 East 31 St. (nr 5th Ave), New York, NY / 10016 / (212) 889 8130
Business computers, home, hobby, computer library, repair center
Computer Era Corp. / 1570 3rd Ave. (nr 88 St.), New York, NY / 10009 / (212) 860 0500
Microcomputers, complete business systems, software, maintenance, leasing, printers, terminal, modems
Computer Factory / 485 Lexington Ave. (nr 46th St.), New York, NY / 10017 / (212) 687 5000
Personal computers, complete business systems / Apple, Commodore, Texas Instruments, Compucolor, Atari, Centronics, Ohio Scientific, Heath, Xerox, APF, Anderson-Jacobson, Exidy, Data General, Superbrain, Minimax / sales, service
Datel Stores of New York / 1211 Ave. of the Americas (nr 49 St), New York, NY / 10036 / (212) 921 1110
Small business computers, peripherals, software, application support, education, maintenance, services

(Source: Neil Macdonald's notes)

140 CEMENT WORDS OF LANGUAGE, COMMUNICATION, AND DISCUSSION (List 810703)

Basically: the cement words expressing the relations between persons and information;

1. Speakers: I, my, mine, me, we, us, our, ours

2. Listeners: you, your, yours

3. Persons or Things Spoken of: he, him, his, she, her, hers, it, its, they, them, their, theirs, who? what? which? whom? whose? how? why?

4. Transmitting Communication: ask, say, said, tell, told, speak, spoke, call, talk, voice, sound

5. Receiving Communication: listen, read

6. Having Knowledge: know, understand

7. Not Having Knowledge: don't know, don't understand

8. Acquiring Knowledge: find out, discover, learn, invent

9. Losing Knowledge: forget, don't remember

10. Referring to Knowledge: remember, recollect, look up

11. Manipulating Knowledge: consider, think, study, think about, find, thought, knowledge, realize, opinion, idea, understanding, subject

12. Putting Out Knowledge: say, write, tell, inform, express, reply, print, pen, pencil

13. Items or Production of Knowledge: word, letter, term, phrase, idea, statement, page, message, story, note, answer, question, news, speech, language, demand, figure, paper, account, history, sentence, map, record, report, list, copy, problem, expression

14. Places Where Knowledge is Stored: brain, mind, memory, book

15. References of Words: name, mark, sign, signal, meaning, mean, sense

16. Attitudes about Knowledge: believe, doubt, consider, suppose, decide, opinion, guess, interesting, curious, why?

17. Comparing Attitudes about Knowledge: agree, argue, assert, disagree, declare, discuss, explain, explanation, claim

18. Surprise, Expectation: but, but then, yet, though, after all

(Source: Appendix 3 of "The Computer Revolution" by Edmund C. Berkeley, published by Doubleday & Co., Inc., Garden City, New York, 1962, 249 pp)

189 CEMENT WORDS OF SCIENCE IN GENERAL (List 810704)

1. Relevance: bears on, makes a difference, depends on, is related to, is relevant to, dependent on, connection, relation, in, with

2. Irrelevance: makes no difference to, has no relation to, is unrelated to, is irrelevant to, independent of, without

3. Existence: be, happen, occur, exist, do, lie, stay, keep, fact, event, real, actual, have, will, possible

4. Nonexistence: seem, appear, may, might, impossible

5. Entities: thing, act, person, object, idea, concept, system, situation, environment, circumstances, observation, matter, body, material, substance, article, subject, surroundings, world

6. Time: minute, moment, hour, day, week, month, year, afternoon, morning, evening, night, date, present, future, past, age, today, yesterday, tomorrow, time, period, spring, summer, autumn, winter, sudden, fast, slow, quick, already, always, ever, sometimes, never, now, often, soon, still, suddenly, usually, when, early, late, new, old, young, after, at, before, on, till, while, again, then, until, during

7. States, Events, Changes: event, state, condition, change, begin, start, stop, end, make, grow, develop, stage, turn, become, finish, continue, follow, go, course, come, will, process, step, development, history

8. Cause and Effect: reason, cause, effect, because, therefore, origin, purpose, result, for, why?

9. Manner: way, manner, method, varying, fixed, normal, usual, unusual, rare, common, necessary, sufficient, regular, how?

10. General, Particular: special, particular, general, example, instance, rule, law, sample, simple, complex, complicated, science

11. Construction: composition, part of, structure, organization, construction, made of, of

12. Probability, Possibility: chance, likely, unlikely, perhaps, possible, impossible, probable, certain, may

(Source: Appendix 3 in "The Computer Revolution" by Edmund C. Berkeley, published by Doubleday and Co., Inc., Garden City, New York, 1962, 249 pp)

(Editorial Note: There are two more lists of "Cement Words of Mathematics", and "Cement Words of Logic" in the same source. We plan to print them in the next issue of "Computers and People" on account of lack of room in this issue. - ECB)

7 FRONTIERS OF RESEARCH AND DEVELOPMENT FOR COMPUTERS AND THEIR APPLICATIONS (List 810705)

Reading machine / to teach illiterate and semiliterate persons to read, read well, and enjoy reading / reading teacher

Training machine / to instruct persons who do not know how to do some task just how to do it / job trainer

Idea processor / to process all the ideas in the language and discussion pertaining to a subject, as mathematics processes numbers / thinker, philosopher, expert, consultant

Recognizing machine / to look at or sense entities in their environments and determine what they signify / driver of a car, bus, or truck

Generalizing machine / to look at or sense a number of instances and see what meanings are to be deduced from those instances / researcher, scientist, cryptanalyst

Robot / to act with all the flexibility of the generalized animal body and to sense with all the variety of animal senses / generalized manipulator

Anti-danger machine / to sense heat, cold, opening, closing, motion, time of day, etc.; to deduce conditions of danger, intrusion, etc.; to report quickly / policeman, owner, guard

(Source: Neil Macdonald's notes)

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computers and people

formerly *Computers and Automation*

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

Articles on Computer Art in Place of Expositions: Announcement

"Computers and People" (and previously "Computers and Automation") has published 19 annual expositions of computer art (1962 to 1980). The time has come when we shall publish now the articles by authors on significant, interesting, new computer art; and no longer publish computer art which is far from novel.

Front Cover Picture

The front cover shows a computer art graphic programmed by Ross Yakulis, '81, a student in the Computer Art course of Professor Grace Hertlein, California State University – Chico, Art Editor of "Computers and People". Each drawing began with a grid and cursor input outline; it was then manipulated by a unique user-oriented, interactive, computer system called DRAWR for size, orientation, and direction.

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.

Editorial

Myths and Realities

Edmund C. Berkeley, Editor

Former Senator J. W. Fulbright, who was for many years chairman of the U.S. Senate Foreign Relations Committee, wrote a book of collected speeches "Old Myths and New Realities" published by Random House, New York, in 1964.

The first speech in that book was entitled "Old Myths and New Realities", and he gave it in March 1964. Much of what he said in that speech is even more valid today in 1981 than when he gave it. It begins:

((Beginning of Quotation))

There is an inevitable divergence, attributable to the imperfections of the human mind, between the world as it is and the world as men perceive it.

As long as our perceptions are reasonably close to objective reality, it is possible for us to act upon our problems in a rational and appropriate manner.

But when our perceptions fail to keep pace with events, when we refuse to believe something because it displeases us or frightens us, or is simply startlingly unfamiliar, then the gap between fact and perception becomes a chasm. And action becomes irrelevant and irrational.

There has always - and inevitably - been a divergence between the realities of foreign policy and our ideas about it. This divergence has in certain respects been growing rather than narrowing.

We are handicapped, accordingly, by policies based on old myths rather than current realities.

The divergence is dangerous and unnecessary -- because ....

((End of Quotation))

For more than twenty years, in the United States, considerable "myth-making" (lying, deceiving, "credibility gap", "disinformation", etc.) has flowed from the U.S. Government. The usual media of the U.S. have ably assisted in lying to the public. In Table 1 are listed just a few examples.

What are we to do? We, the people of the United States who are being lied to by our government and our press.

Table 1

RECENT MYTHS AND REALITIES IN THE U.S.

Liar / Subject — Myth / Reality

1. Pres. Dwight D. Eisenhower / U2 Spy Plane
   "weather reconnaissance" / spying, CIA action to prevent summit conference of Eisenhower and Krushchev in Paris
2. Pres. Lyndon Johnson / Tonkin Bay Resolution
   "N. Vietnam vessels fired" / they didn't
3. Warren Commission / Assassination of Pres. John F. Kennedy
   "Oswald, lone assassin" / conspiracy
4. Pres. R. M. Nixon / Watergate burglary
   "I was not involved" / he masterminded it
5. The Pentagon / Vietnam War American deaths
   55000 American deaths / over 100,000
6. Pres. Jimmy Carter, Kemeny Commission, Nuclear Regulatory Comm., etc./ Three Mile Island accident
   "nuclear fission energy is safe" / nuclear fission energy is dangerous
7. Pres. Ronald Reagan / El Salvador
   "the terrorists are communists" / the peasants are suffering genocide from fascists

It is not likely that any part of the government will help. The pressures from established organizations - governmental, business, professional, scientific, etc. - are regularly selfish, in favor of the status quo, everything as usual, never go out on a limb, never innovate, to hell with whistle-blowers.

We need a new organization of a new kind. The new organization must be INTERESTED in telling the truth, all the important truth. The new kind of organization is one that is NOT SUSCEPTIBLE to influence or bias by any part of government, business, computers, labor, medicine, law, religion, science, etc., where there exist vested interests. It might be called a "Commission for the Pursuit of Truth".

We invite ideas from our readers.

Announcement

People and the PURSUIT of Truth

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We seek to publish important information, facts, and significant questions to think about -- on topics that the regular media in the United States regularly suppress discussion of, such as:

Political Assassinations in the United States, and Why They Have Happened and are Happening

How Computers are Being Used for Perfecting Weapons of Mass Destruction

The Deliberate Cultivation of War Fever

The Promotion of Nuclear Fission Energy as "Safe" When it is NOT

How Computers are Being Used to Blacklist, Terrorize and Suppress

We have published "People and the Pursuit of Truth" since 1975. It has been devoted to:

- Facts, information, truth, and unanswered questions that are important to people, widely suppressed, and not adequately covered in the usual media in the United States

- Solutions to great problems that are functioning well in some countries or places, yet are almost never talked about in the usual media

Won't you subscribe or renew or send to a friend?

Yours sincerely,

Ed Berkeley

Edmund C. Berkeley, Editor
"People and the Pursuit of Truth"

GOODIES

Here are a number of important, interesting articles (almost all of them short, easy to read, full of ideas and insights, and constituting evidence) which we have published in prior issues (Volume 3 and 4) of "People and the Pursuit of Truth".

If you subscribe currently (before Sept. 15, 1981), the first one you request and specify is free. The rest are $2 apiece.

(1) The Coming Revolt of the Guards / Prof. Howard Zinn, Boston Univ.

(2) Pain, Shame, and Anger / Repr. Christopher J. Dodd Jr. (Conn.), U.S. Congress

(3) A Preliminary Report on Three Mile Island / Eliot Marshall

(4) Eight Persons Killed "On the Doorstep" of Giving Testimony to the House Subcommittee on Assassinations and the Schweiker Committee / Richard E. Sprague, Assoc. Editor

(5) 136 Tools for Working at the Truth / many authors

(6) The United States Treatment of American Indians / Marge Hackett

(7) The Framework of the Conspiracy Behind the Assassination of President John F. Kennedy / Nobuhiko Ochiai, newspaper reporter in Japan

(8) Countering Criticism of the Warren Report: Document 1035-960 / the Central Intelligence Agency (one of its papers dug out of it)

(9) The Broken Promise of the United States of Reparations to Vietnam / Richard M. Nixon, impeached former president of the United States (dug out of records)

At any time you may request your subscription to stop, and a refund will be sent to you for the unmailed portion.

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"When we invented the personal computer, we created a new kind of bicycle . . . a new man-machine partnership . . . a new generation of entrepreneurs."

Based on an interview leading to three full-page ads in many newspapers and magazines. These ads were of great general interest, and apply in many ways to other brands of personal computers than Apple. See note at the end of the article for some additional suppliers of personal computers.

Outline

1. What is a personal computer?

2. What is the difference between a personal computer and other computers?

3. How does the personal computer increase productivity on an individual level?

4. What are those 150,000 people doing with the Apples they have bought?

5. What are people going to use Apples for, ten years from now?

6. How is Apple Computer Inc. carrying on a Silicon Valley tradition?

7. Has Apple's entrepreneurial spirit permeated other aspects of the personal computer industry?

8. How is Apple going to maintain its leadership in the industry?

1. What is a personal computer?

Let me answer with the analogy of the bicycle and the condor. A few years ago I read a study... I believe it was in Scientific American...about the efficiency of locomotion for various species on the earth, including man. The study determined which species was the most efficient, in terms of getting from point A to point B with the least amount of energy exerted. The condor won. Man made a rather unimpressive showing about 1/3 of the way down the list.

But someone there had the insight to test man riding a bicycle, Man was twice as effieient as the condor! This illustrated man's ability as a tool maker. When man created the bicycle, he created a tool that amplified an inherent ability. That's why I like to compare the personal computer to the bicycle. The Apple personal computer is a 21st century bicycle if you will, because it's a tool that can amplify a certain part of our inherent intelligence. There's a special relationship that develops between one person and one computer that ultimately improves productivity on a personal level.

Today most people aren't even aware that the personal computer exists. The challenge of our industry is not only to help people learn about the personal computer, but to make the personal computer so easy to use that, by the end of this decade, it will be as common in our society as the bicycle.

That's one of the reasons I wanted to do this interview. I wanted to explain what a personal computer is, how it can help all of us make better decisions and how it will eventually impact all phases of society...from training dolphins to glaucoma research to growing a more nutritious crop of soybeans.

2. What is the difference between a personal computer and other computers?

The key difference is that one-on-one relationship between man and machine I was talking about, because the emphasis is on a personal interaction.

The whole concept is this: for the same capital equipment cost as a passenger train, you can now buy 1,000 Volkswagens. Think of the large computers (the mainframes and the minis) as the passenger train and the Apple personal computer as the Volkswagen. The Volkswagen isn't as fast or as comfortable as the passenger train. But the VW owners can go where they want, when they want and with whom they want. The VW owners have personal control of the machine.

In the 60s and early 70s, it wasn't economically feasible to have the interaction of one person with one computer. Computers were very costly and complicated; 50 people had to share one computer. Back then, you could have the passenger train but not the Volkswagen. But with the advent of microelectronics technology, parts got smaller and denser. Machines got faster. Power requirements went down. Finally, electronic intelligence was affordable. We finally had the chance to invent the personal computer, to invent the "intelligent bicycle."

Basically, Steve Wozniak and I invented the Apple because we wanted a personal computer. Not only couldn't we afford the computers that were on the market, those computers were impractical for us to use. We needed a Volkswagen.

People like us were the initial market for the personal computer. After we launched the Apple in 1976, all our friends wanted one. By the time

Apple II was on the market in mid-1977, the demand for the personal computer had already begun to skyrocket.

Today, we've sold over 150,000 Apple personal computer systems. That's because Apple recognized this passenger train/Volkswagen relationship about 2 or 3 years before anyone else. When we designed Apple II, we wanted to offer the benefit of a $15,000 computer or a $100,000 timesharing system with a computer that costs as little as $1,500. Obviously, one of the differences between a personal computer and other computers is price. Another difference is size.

I'd like to use another analogy here: the big motor and the fractional-horsepower motor. When the first motor was invented in the late 1800's, it was only possible to build a large and expensive motor, just like it was with the early computers. Those motors were used to power entire shops, with pulleys and belts running throughout the shops to drive the individual machines scattered within. Only with the advent of the fractional horsepower motor could horsepower be brought directly to where it was needed.

With the portable Apple, you could say we invented the first fractional-horsepower computer. The Apple is small enough to go where you need it. You can get the information you need on your desk, in your office, in the lab, the school or the home. In other words, Apple broke down the huge monolithic computer into small, easy to use parts. We made the computer friendly. So, like the fractional horsepower motor distributed horsepower to where it was needed, the personal computer can distribute intelligence to where it's needed. Ultimately, it will be this distribution of intelligence that will change the way we all make our decisions.

3. How does the personal computer increase productivity on an individual level?

Personal computers will increase productivity because personal computers are tools, not toys. For example, in the last 15 years, there have been only four tools that actually have increased the efficiency of the office worker: the IBM Selectric typewriter, the calculator, the Xerox machine, and the newer advanced phone systems. Maybe that portable cassette player you're using could be number five. Like all those inventions, the personal computer offers its power to the individual.

In the 80's the personal computer will do as much for the individual as the big computers did for the corporation in the 60s and 70s. Today, Apple's putting the power of computing into the hands of people who might never have had the chance to use it before.

We at Apple call our personal computer a third wave tool. Toffler, in his latest book, writes that the first wave was the invention of agriculture...made possible by the tools of agriculture. The second wave embraced the tools of the industrial revolution. The personal computer is a third wave tool to help every individual deal with the complexities of modern society.

You know, about 10 million bicycles will be sold in America this year alone. When we start thinking of a personal computer as a bicycle, a Volkswagen or a fractional horsepower motor, we start to realize what kind of effect 10 million of these typewriter-size machines is going to have in our own lifetime.

Apple has sold over 150,000 personal computers. What are people doing with them?

4. What are those 150,000 people doing with the Apples they have bought?

Let's talk about two general points before we get into specific applications. First, a personal computer is more than just a small "big" computer. Let me explain that by going back to the analogy of the large horsepower motor and the fractional horsepower motor.

You see, the fractional horsepower motor was one of the breakthroughs of the industrial revolution. It was more than just a small "big" motor because it gave the people freedom to apply affordable horsepower directly where it was needed. The fractional horsepower motor created uses for horsepower that were never possible or imagined with the large horsepower motor, and made portable tools a reality. It's been less than 100 years since its invention, and the enormity of its impact surrounds us. The average American household contains no less than 50 fractional horsepower motors.

The personal computer is more than just a small "big" computer for the same kind of reasons. It brings intelligence directly to where it's needed: at the personal level. It lets you use that intelligence in creative ways you never imagined. And it's a portable, easy-to-use tool that everyone can afford.

But the most important thing, Apple isn't just a window into intelligence like the big computers or the timesharing networks of the 60s and 70s. The Apple is a realization of a man-machine partnership that lets an individual interact one-on-one with a computer. 100% of the Apple's computing power is available at your fingertips. Apple's computing power is totally dedicated to doing what you want. You can customize the Apple to work for you in ways a big computer never could.

The second point is that, unlike the camera or the stereo which are dedicated to just one function, the Apple is truly a general purpose tool. One minute the Apple can help educate elementary school students on math drills - the next minute, that same Apple does financial modeling - the next minute, it encourages artistic creativity via color graphics.

We originally underestimated the enormous creativity people would use in applying our general purpose tool. Apples are now being used for literally tens of thousands of applications that we never imagined. This general purpose, flexible nature is the reason that the personal computer will be a long-lasting tool with an ever-expanding number of applications.

"You still haven't answered the question, Steve. What are those 150,000 people doing with their Apples?"

Okay, now I'll give you a few specifics. There was a sewing machine repairman in England who almost went out of business because he didn't know how many different parts he had in his inventory. He'd buy more stock than he needed, and run out of parts he thought he already had in stock. That repairman couldn't afford a $15,000 computer to help him manage his business, but the $2500 Apple system he could afford literally saved him. The Apple system supplies him with vital information in a form he could easily understand. He finally had a chance to see how his business really worked, so he could recognize the inventory problem - what it was doing to his business - and how to solve it.

Another example: A financial analyst and consultant considers his Apple II as his business partner. He uses his Apple for everything from statistical analyses and company modeling to creating charts and graphs for his newsletter. His Apple allows him to test assumptions and ask "what if?" questions. So his Apple is the tool that gives him the opportunity to dissect a problem before committing to firm, final decisions. But the partnership with his Apple doesn't end at the office. He takes his Apple home on weekends and when he's through with his financial analyses, his kids use it.

More examples? Loyola University's emergency medical center uses Apples to process ambulance reports in one-tenth the time it usually takes. In Florida, one company actually puts Apples in the back of a van and drives around from supermarket to supermarket every day. At each supermarket they enter the prices of certain grocery and produce items into the Apples. This information is then correlated and made available to consumers, so that they can plan the most nutritious meals at lowest possible price. The bottom line is, that company is providing consumers with a service that never could have been possible before the advent of a portable, powerful Apple personal computer.

But a really good example of how Apple not only eliminates drudgery but frees people to concentrate on creative solutions is how we use Apples at Apple. Everyone uses Apples here. We don't even buy typewriters for our secretaries anymore - they use Apple systems.

We freed our secretaries to do more sophisticated tasks by improving their productivity. They're learning skills like departmental budgeting, sales analyses and forecasting - and those skills let them make the jump into other parts of our organization. Some of our secretaries are just as computer fluent as the people we hire right out of business school. So, not only do our secretaries have the freedom to do more rewarding, enriching tasks - they have the chance to get involved in solving important problems that can ultimately affect the success of Apple as a company. And that means I have more time to creatively explore and implement business strategies. All of us at Apple are experiencing the satisfaction of this man-machine partnership that frees people to do what they do best: think conceptually.

5. What are people going to use Apples for, ten years from now?

The Apple isn't some futuristic dream, it's a creative tool people are relying on right now. The personal computer is changing lives today.

A personal computer isn't only a tool for people in business. There's a whole generation of kids growing up learning how to use the personal computer as a problem-solving tool - 97% of the students in Minnesota have the opportunity to solve problems with an Apple. But Apples aren't just being used to teach computer science courses. Students from Alaska to Mexico learn physics, mathematics, spelling and a slew of other subjects on their Apples. And kids who have problems learning how to read and write are actually overcoming their disabilities with the personal computer Apple's colorful graphics that make it fun to learn; so problems these kids have are being dealt with successfully in a very innovative way.

As all these students who are now using Apples grow older, they'll integrate the personal computer into their life as a friendly tool, just like their bicycle. And those kids are the ones who will create the applications we at Apple haven't even dreamt of.

By the end of the decade, the personal computer won't be a mystery to anybody. Society will realize that the opportunity for a man-machine partnership is well within everyone's reach. Let's put it all in perspective for you: five years ago, the personal computer didn't even exist. Yet, as of this interview, personal computing has statistically reached one in every 100 American households - and there are 72 million households in America! By the end of the 80's, that figure will be one in ten.

The vast penetration of the personal computer into our society not only is inevitable, it's real. I feel privileged to be a part of it all, and to see the results in my lifetime.

6. How is Apple Computer, Inc. carrying on a Silicon Valley tradition?

Silicon Valley is the finest example of the American entrepreneurial, risk-taking culture. You won't find this kind of culture anywhere else in the world. Hewlett-Packard started here. Intel invented the microprocessor just eight miles from where we're sitting now. The heart of the semiconductor industry is here. Woz (Steve Wozniak) and I grew up in this Valley. Bill Hewlett and Dave Packard literally were our heroes when we were growing up, so it just follows that Apple would carry on the tradition.

Like a lot of entrepreneurs, Woz and I didn't consciously set out to start a company. We tried very hard to convince two other established computer companies to fund us while we developed the personal computer. We spent a lot of time got nowhere. Ultimately, we had no choice but to do it ourselves.

Today, that entrepreneurial spirit still exists throughout the company. That's one of the reasons Apple's been able to attract and retain some of the finest technological talent in the world. Our people want to work in an entrepreneurial environment - and they also want to help create a product that will affect the lives of millions of people.

7. Has Apple's entrepreneurial spirit permeated other aspects of the personal computer industry?

Definitely. Right now, there are over 170 small-to-medium-size entrepreneurial companies supplying software packages and hardware peripherals designed specifically to work with Apple systems.

An Apple is a general purpose tool. It's the software packages and hardware peripherals, offered by Apple and these other companies that help the user tailor the Apple to his or her specific needs. It's the combination of Apple, software and peripherals thtat gives someone a personal computer solution. The more solutions available, the more Apples we sell. Here's an example.

Say an engineer who works full time at a large corporation buys an Apple. That person decides that, in their spare time, they can create a useful piece of software that other Apple owners might want to buy. Hypothetically, that engineer can manufacture the program for $10, the retailer would buy it for $25 and in turn sell it to the customer for $50.

If just 10% of Apple's installed base (over 150,000 owners) buy this program in the first year, that engineer would sell 15,000 copies. That's a $15 profit per copy, and that's a $225,000 total profit in just 12 months! And the only necessary capital equipment to make this possible was one Apple system that cost less than $5,000!

This phenomenon couldn't happen if the Apple didn't exist. In the past, it was possible for an entrepreneur working on a large computer or time-shared system to write a piece of software. But there were three major roadblocks. There was a very small installed base to sell the program to, so the entrepreneur had to sell the program for maybe $1,000 or more per copy to show any profit. There was no distribution channel through which to sell this program, so they would have to hire salesmen which, of course, they couldn't afford. Finally, they might not have been able to write the program at all because you can't take a time-shared system home to create a program in your spare time.

That's why this phenomenon couldn't happen if the Apple didn't exist. Our installed base is large, the entrepreneur's capital equipment cost is small, and there's an existing chain of software distribution through the retail dealers.

Apple pioneered the retail distribution of personal computers. To do this, we helped create a network of over 2,000 dealers worldwide. These dealers own their own business. They are the entrepreneurs who distribute the products of an entrepreneurial industry.

8. How is Apple going to maintain its leadership in the industry?

Our industry is still in its infancy. It's continually evolving. Rather than just a series of events happening in the industry - new products, new companies coming and going - there's an underlying process going on here, a process to which Apple is committed: the integration of computers into our society on a personal level. We think that process is going to take 10 to 15 years. Let me give you two examples of processes like the ones I'm talking about, which we've all witnessed in our lifetime.

When was the last time you saw a mimeograph machine or used a piece of carbon paper? You don't use either today because of the invention of the Xerox machine - a tool that has radically altered the way we all work. Yet the first Xerox machine was introduced only 20 years ago, in 1960.

Second example: HP introduced the first hand-held scientific calculator, the HP-35, in the early 70s. In less than 10 years, the world's largest manufacturer of slide rules stopped making slide rules altogether. We believe the integration of personal computers into society will have an even greater effect than the calculator or the Xerox machine.

We also believe Apple's continuing success and leadership position will result from innovation, not duplication. Innovation in products and marketing as well as in distribution.

For example, we've learned that one of the factors in the growth of our marketplace is that it takes about 20 hours to get truly fluent with your Apple. We'd like to reduce that to under an hour. The way this will be accomplished is to spend a larger portion of the computer's computational power on what we call the "user interface." The user interface is the way the computer and user interact with each other. Future Apple systems will spend more of the computer's intelligence to translate or adapt information in a way people are already familiar with, instead of forcing people to adapt to the computer. Let me illustrate this:

Look at any desk in your office. You'll see stacks of paper, the telephone, a calculator and a typewriter. The people sitting at these desks must intuitively understand concurrency - several things occurring simultaneously. They understand priority - stacks of paper on a desk, with the one on top being most important. And they understand interruption - the phone rings, a memo gets put on top of a stack, etc.

But if you went up to any one of them and asked if he or she could define concurrency, priority and interruption - you would probably get a blank stare. Yet people intuitively understand things that they're not cognizant of; we all know more than we know we know.

Today, to use a personal computer, you must deal with these already-familiar concepts in a new way. Tomorrow, the computer will adapt itself to the way you're used to dealing with concurrency, priority and interruption - not vice versa.

(please turn to page 22)

Year One of the Future Bell Telephone System: 1980 — Part 2

C. L. Brown
Chairman of the Board
American Telephone and Telegraph Co.
195 Broadway
New York, NY 10007

"We shall be changing our business on a scale unmatched in any business I know of."

Based on the annual report to the stockholders. The first part of this article appeared in the May-June, 1981 issue of "Computers and People".

Advance Calling

As a result of this intelligence the network will have the ability to furnish a wide variety of new services. For example, one contemplated service, Advance Calling, would enable customers, by dialing a set of numbers, to record a message and direct the network to transmit it to a designated telephone at a designated future time.

Motorists Automatically Calling to the Nearest Open Station

The ability to "program" the network offers the possibility of many other services. An auto club, for example, could have a single nationwide telephone number which motorists in trouble could call and be automatically connected -- not to some answering center half a continent away but -- to the nearest, open service station. Another application would enable customers to instruct the network that they want to receive only calls from certain telephone numbers. Yet another capability would let customers direct the network to forward their calls to another location -- whether it be a neighbor's home or a hotel in a distant city. They simply would keep a network data base informed of the telephone number where they can be reached.

We have the technical capability to provide these and other such services through the nationwide network. We were concerned, therefore, when the Federal Communications Commission's Computer Inquiry II Decision appeared to require that some of these services would have to be offered through a separate subsidiary and not as regular network service. We expressed to the Commission our concern that such a requirement could prevent the general body of users from enjoying the benefits of advanced technology and, in effect, freeze the network's capabilities at its present level. We are encouraged that the Commission, in response, has indicated that under certain circumstances it might waive the separate subsidiary requirement and permit the enhancement of basic network services.

Lightwave Laser-Powered Communication

Other technological advances in the network will keep communications apace with the requirements of the Information Age.

Calls in Smyrna, Georgia are now being speeded on pulses of laser-powered light along hair-thin glass fibers instead of copper wires. The transmission medium of the future -- lightwave -- is no longer in the trial stage. It is in and working. Some 25 miles away, a Western Electric factory is producing miles of glass fiber that will be used in the first segment of the lightwave system that will link the major cities along the Northeast corridor -- a 611-mile route from Boston to Washington.

Lightwave communications not only offers greater call-carrying capacity on cable that takes up far less space, but it also represents another step toward an all-digital network. While the telecommunications network today is largely analog -- carrying signals in wave form -- the language of computers and other data devices is digital: pulses rather than waves. We are moving toward an all-digital network. Our long distance electronic switching systems are digital. Many of our transmission systems are also digital. In recent years, the cost of digital communications systems has become increasingly competitive with those of analog. Digital communications offers the advantage of being able to carry not only voice but also data at much higher speeds and with greater accuracy than analog systems. Ultimately the network will offer end-to-end digital "connectivity", providing voice, image and data communications capability for both residence and business users. Thus the basic switched network will readily be able to handle the voice, data, video and facsimile requirements of the Information Age.

Satellite Communication

The nationwide network blends a variety of technologies -- wire, coaxial cable, microwave, satellite and lightwave. And it is in a continuous state of expansion and improvement. AT&T Long Lines, which manages the nationwide network and our international long distance facilities, awarded a $137 million contract to Hughes Aircraft Company for the construction of three new satellites and related ground station facilities. The first of these satellites will be launched in 1983. The satellites will be owned by the Bell System and will be used for long distance calling as well as data and video services. The new satellites will have 20 per cent more capacity than those currently in use and will offer network managers additional flexibility in routing traffic through the nationwide network.

Technology: Microelectronics

The technique of placing thousands of electronic components on a chip as small as a tenth of an inch square is by no means the sole preserve of Bell Laboratories, though Bell Labs scientists performed much of the pioneering work in the field. But Bell Laboratories is in the forefront in developing new methods that can put even more components -- and hence more capability -- on these chips. New X-ray lithographic processes, for example, enable Bell scientists to draw experimental circuit elements less than a micron (one thousandth of a millimeter) wide. These processes, and others being explored, yield very large scale integrated circuits that pack on a single chip the capability of several racks of electromechanical switching equipment.

Tiny devices such as these are being used throughout the telecommunications business. Integrated circuits are used in electronic switching systems to store data and help process calls. They are used as the brains for a wide variety of "smart" terminals -- from automatic dialers to business switchboard consoles. They are used to eliminate echoes on satellite and other long distance circuits.

Testimony to the increasing importance of microelectronics in our business is the growing amount of production facilities devoted to their fabrication. The Western Electric Company is producing a wide variety of these devices at both its Allentown and Reading Works in Pennsylvania. Gearing for the future, Western Electric announced plans to construct a plant in Orlando, Florida that promises to be one of the most advanced large scale integrated circuit production facilities in the country.

Photonics

Bell Laboratories continued in 1980 to search for ways to enhance the capabilities and reduce the cost of lightwave communications. In Sacramento, California, for example, a new long-wavelength lightwave system -- powered by light-emitting diodes rather than lasers -- was tested. The longer wavelength of this experimental system minimizes signal loss and reduces the number of signal regenerators needed on long routes.

In New Jersey, Bell Labs scientists tested lightwave systems in an ocean simulation laboratory. New developments in the production of glass fibers offer the prospect of transoceanic lightwave systems of larger capacity and lower circuit cost than our latest submarine cable systems.

Software

As more and more intelligence is being built into the telecommunications network and in a wide variety of communications terminals, there is a parallel growth in the need for software programs that provide the instructions for these computers and microprocessors.

Today about 30 per cent of the work at Bell Laboratories involves software development. Software specialists design programs for switching centers, for "smart terminals", for data communications systems and -- no less important -- for the hundreds of computer-based operations systems that the Bell System uses to help manage its operations. These operations systems monitor the performance of the network, track inventories, size and site new switching centers. More and more, these systems are becoming an integral part of the network itself.

One indication of the growing importance of software design and development is Western Electric's five-building software complex under construction in Lisle, Illinois. This complex will house 2,400 computer programmers and others involved in providing software to the Bell System. Another measure is the rapid growth in computer terminals at Bell Laboratories. In 1970, there were only a few hundred computer terminals in use at Bell Labs. Today, there are some 15,000, more than one for each member of its technical staff.

The Bell System continued in 1980 to invest heavily in the technology of the future, spending nearly $1.4 billion for research and development work performed by Bell Laboratories and Western Electric.

Business Services

But technology alone is not sufficient to guarantee success in the marketplace of the future. Technology will have to be matched to the needs and opportunities of the market.

As business grows increasingly complex, as it seeks to offset rising costs and to enhance productivity and as it extends operations both domestically and internationally, managers look more and more to electronic information systems to help assure command of their operations. The Bell System recognizes that success in the marketplace of the future depends on the effectiveness with which it can provide "systems solutions" tailored to particular needs, industry by industry, company by company.

Automatic Energy Reduction

In 1980, for example, we announced a new communications system that not only meets the special voice and data communications needs of hospitals -- bed status, medication and diet instructions, emergency communications -- but also enables hospitals to cut their energy costs by as much as 20 per cent. At the heart of this system is an electronic Dimension PBX that is programmed and equipped to monitor and control energy consumption. The Dimension PBX system enables the customer to adjust automatically -- or even shut down -- heating, lighting and air conditioning systems in various parts of the building as desired.

The first such system was put into service in Savannah, Georgia in September, 1980.

A similar Dimension PBX system -- tailored to the requirements of hotels and motels -- is at work in many locations around the country. In addition to providing improved communications, it has cut administrative and operating expenses -- in one instance reducing energy costs alone by 28 per cent.

Teleconferencing

Rising energy costs have prompted many businesses to turn increasingly to communications as an alternative to travel. The Bell System provided a variety of teleconferencing arrangements in 1980 that permitted conferees in widely scattered locations to meet by phone and exchange graphic information. The Gemini electronic blackboard, for example, is used to transmit information written in one location for video display at all points in a conference network.

Business today is spending $18 billion on data communications services and the market is expected to reach more than $90 billion by the end of the decade. Data communications systems that are swift, accurate, reliable, economical, readily compatible with most computers, easy to use and adaptable to changing needs are crucial to running a modern business.

To that end, we extended Dataphone Digital Service -- which provides private line digital transmission with speeds up to 56 kilobits per second -- to 18 additional cities. This network now links 78 cities.

We also tailored data communications systems to the needs of customers using a wide variety of data communications technologies. Our recently introduced Dataphone II service, for example, gained exceptional market response because customers can readily add more "sophistication", expanding their networks to meet individual, specific needs as their data communications requirements grow more complex. Customers also made increased use of our latest and most capable Dataspeed terminal set -- the 4540.

More and more, the Bell System's services for business will take the form of comprehensive systems integrating virtually all aspects of information flow, encompassing voice, video, data storage, retrieval, processing and distribution, word processing and electronic mail. Characteristically, these systems will be custom tailored to meet the individual needs of each business they serve.

Home Communications

Changing lifestyles, economic pressures -- such as rising energy costs -- and advancing technology are moving the home communications market in much the same direction: toward information-communications systems. We expect to equip the home of the future with facilities that meet a wide variety of needs: information, education, entertainment and -- as in business -- the control of energy consumption.

The Bell System is conducting a number of trials aimed at discerning the needs of the home communications market of the future.

In Coral Gables, Florida 160 homes were equipped to enable customers to access -- and to have displayed on a TV screen -- information materials in a data base supplied by Knight Ridder Newspapers. The information covered a wide range -- restaurant reviews, current events, educational material and shopping guides. Customers were also able to place orders for certain goods and services.

Another trial, scheduled for Austin, Texas in 1981, will equip customers to dial up for video display directory services information and a variety of other computerized data. This is the second trial of electronic information services.

Automatic Reading of Electricity Meters

A third trial will involve two energy companies and 1,000 customers of Southern Bell in Charlotte, North Carolina. A system linking their homes with the utilities will enable consumers to control their energy consumption. The utilities can use the system to read meters remotely, detect tampering and shut off service when customers move. The trial starts in 1981.

As the Bell System's network grows more versatile, so do its telephones. The Bell System's recently introduced Touch-a-matic "S" telephone is a good example. An all-electronic telephone, it stores up to 12 telephone numbers, each of which can be dialed by pushing a single button.

Shopping by Telephone

Customers appear to enjoy increasingly the opportunity to shop for telephones in our Phone-Center Stores. In 1980 nearly half of the telephones added to our residence lines were sets that customers took home from these stores and installed themselves. In response to growing customer interest, we sought -- and received in virtually every jurisdiction -- regulatory permission to sell rather than lease our Design Line telephones.

Almost a decade ago, the Bell System set out to develop a proficiency in marketing to match its accomplishments in technology. That commitment serves us well today. The Bell System's operations and marketing forces are now deployed to match the key segments of the markets they serve: business, residence, public services and directory services. In addition, we have enhanced the professional level of our staff. We have intensified our marketing training program. We have taken significant steps into the general consumer market with our 1,800 Phone-Center Stores. We have also developed industry specialists who know their industry's particular operating problems and information needs intimately. Thus, they are equipped, on the one hand, to apply the Bell System's technology to their particular industry's problems and, on the other hand, to acquaint the Bell System's technologists with the needs of the market.

Policy Developments

Nineteen-eighty was marked by a number of significant regulatory actions and legislative proposals that portend fundamental changes in the structure of the telecommunications industry and the ways its products and services are supplied. More and more it appears that public policy will look to marketplace forces to regulate our business, while retaining regulation in its traditional form only to the extent it is needed to assure universal service and efficient management of the nationwide network.

To that end, the Federal Communications Commission issued a landmark decision in its Computer Inquiry II. This proceeding initially addressed the degree to which the merging of the technologies of communication and computation might require a redefinition of the role of regulation. The Commission's decision, however, covered a wide range of issues raised by the advent of competition in the telecommunications industry.

Advent of Competition in the Telecommunications Industry

While the order requires us to do so through one or more separate subsidiaries, it would permit the Bell System to compete on fair terms in the market for terminal equipment. No longer would we have to seek regulatory approval of our rates, while our competitors price as they please. Significantly, the Commission construes the 1956 Consent Decree that concluded the antitrust case the Justice Department brought against AT&T in 1949 in a way that would permit the Bell System to offer services embodying data processing -- what the Commission calls "enhanced services" -- and thus be able to compete in the information markets.

Telecommunications legislation, while actively pursued throughout the year, failed at the last to reach the House or Senate floor for a vote. Although the Senate and House bills differed in particulars, they conformed in broad outline. All had three elements in common:

-- assurance against cross subsidy of the Bell System's competitive services by its monopoly services,
-- fair access to the public switched network for all suppliers of communications services,
-- and removal of constraints on the Bell System's freedom to compete in unregulated information markets.

Congressional Legislation

While some have questioned the need for legislation in light of the FCC's Computer Inquiry II Decision, the Bell System believes that the authority of Congress is needed to establish the ground rules for a competitive telecommunications industry. National telecommunications policy needs to be set forth unequivocally. That can be done only by Congress.

One thing seems certain about this industry: it will be widely competitive. The fact of competition imposes some new economic requirements on the Bell System, and, in some cases, the general public as well. It requires repricing of products and services -- pricing them according to cost and market conditions rather than on "value of service" considerations. And it requires recovering capital more quickly through depreciation rates that reflect the shorter service lives of plant due to rapid changes in technology and market conditions.

Measured Local Service

As part of its repricing efforts the Bell System moved to extend measured local service -- as distinguished from flat rate service -- to more residential and business users. Under measured service, customers are charged on the basis of the number of local calls made, their duration, distance, and time placed. Measured service helps keep down basic monthly charges for service, permits customers to pay only for what they use and enables the telephone companies to recover their costs more rapidly and from those who use the service the most.

We also proposed restructuring of Interstate Wide Area Telecommunications Service (WATS) rates to relate prices more closely to costs. This proposal is being studied by the FCC. Should this change go into effect about 90 per cent of WATS users would pay less, while 10 per cent -- the heavy users -- would pay more. Although overall company earnings would not be affected, the new pricing structure would meet the requirements of the competitive environment.

Subsidy of Local Service by Long Distance Service

One of the most critical areas, in making the transition to a competitive environment, has yet to be resolved: that is, the impact of competition in intercity service upon the price of basic service. Telephone company long distance rates today are structured essentially as they have always been. To keep the price for interstate long distance calls affordable even along routes that are very costly to serve, we average the nationwide cost of service. This means that rates along highly trafficked routes are higher than they might otherwise be. Moreover, long distance rates include a substantial contribution -- about $12 billion in 1980 -- to help cover the costs of local service. This structure made sense in the regulated monopoly world in which we used to operate. That world no longer exists. As competition in long distance service grows, such a rate structure becomes increasingly vulnerable, permitting competitors to pinpoint markets where they can undercut our prices even though our costs might be lower. In addition, while our competitors -- who bypass our long distance facilities but connect to our network for local distribution -- pay a local contribution charge, this charge makes a far smaller contribution to local service than do the rates for our own like services. Again this permits competitors to offer lower rates than ours.

The Bell System believes that fair competition requires that competitors bear an equitable share of the contribution to support local rates. Over the long run, however, this subsidy to local service will only encourage the construction of facilities that by-pass the telephone network altogether. What is needed is a reasonable transition period for the reduction and ultimate elimination of this subsidy and an interim mech-

(please turn to page 22)

A Computer Game Board Patent Issued to Fidelity Electronics

Public Relations Dept.
Fidelity Electronics Ltd.
8800 NW 36th St.
Miami, Fla. 33178

"Patent infringement proceedings are being considered against a number of companies, representatives, distributors, wholesalers, and retailers."

1. News Release
May 8, 1981

The Board of Directors of Fidelity Electronics, Ltd., announced today that the United States Patent and Trademark Office has issued Patent No. 4,235,442 issued Nov. 25, 1980, to Fidelity Electronics covering eletronic board game systems such as games normally played between two competitors, wherein the "game" substitutes for the second competitor.

Fidelity officials believe that the patented invention is a significant advance, and also announced that the company fully intends to protect its exclusive rights against infringers.

Patent infringement proceedings are being considered against a number of companies, representatives, distributors, wholesalers, and retailers.

A copy of U.S. Patent No. 4,235,442 can be obtained by writing to the Patent Dept., Fidelity Electronics, Ltd., 8800 NW 36th St., Miami, Florida 33178.

2. From the patent:

Four sheets of drawings showing a board, a set of some 12 keys with labels, and a flowchart of noun blocks such as "central processing unit", adjective blocks such as "player's king in check", and verb blocks such as "store move and value".

Inventor: Ronald C. Nelson, Forest Park, Ill.

Fields of Search ... about 9 codes.

References cited: 10 U.S. patents, 1968 to 1979; one French patent, 1975.

Publications cited: 4, in Electronic Design, Electronics, Popular Electronics, and Popular Science.

Abstract: An electronic board game system for a game normally played by two players, such as chess, in which the game makes respective moves to moves by a player, displays the moves, and in which the position and identity of each piece can be displayed, as well as other indicators.

Background of the Invention

The present application relates to electronic board games and more particularly to games normally played between two competitors which permits solitary play with the game system substituting for the second competitor.

One area of attraction associated with data processing apparatus has always been the ability to have the computer play games against human competitors. Advances in data processing technology continue to make this area of computer use more available to those persons who do not have access to or are not trained to operate sophisticated equipment. The popularity of many video games is merely illustrative of the intense interest in this area.

One game which has always intrigued those involved with computers is the game of chess. The variations and permutations involved in the game of chess are sufficiently great and have limited the use of computers for chess playing to relatively large scale high-powered devices. However the recent advances in the microprocessor capability have resulted in techniques in which it is mathematically possible to have an electronic opponent play an interesting game of chess for at least non-expert human opponents.

For example, programs for playing chess have been developed for implementation on programmable calculators such as the Hewlett-Packard 9810A. Such programs are available from that company and are described, for example, in an article by Alan A. Wray entitled "A Chess Playing Program for the 9810A" published by that company. Other interesting publications on computer chess playing include a book by David Levy entitled "Chess and Computers", Computer Science Press, 1976; a paper entitled "The Greenblatt Chess Program", by R. D. Greenblatt, D. E. Eastlake III and S.D. Crocker in Proceedings, Fall Joint Computer Conference, 1967; and "Chess-Playing Programs and the Problem of Complexity", by A. Newell, J.C.Shaw, and H.A.Singer at pages 39-70 of "Computers and Thought", McGraw Hill, 1963.

These and probably other articles describe some of the basic techniques utilized by computers in evaluating chess moves in order to play a basis ((sic)) competent game against a non-expert human opponent.

However, in order to implement such a chess game, it is not just sufficient to have a technique for the computer to evaluate the possible chess moves it might make. It is also necessary to produce a device capable of being operated by a person who understands the game, but not necessarily computers, and which provides the necessary input and output responses to permit the game to be played, as well as features and capabilities to make the device attractive and practical. Such features should be incorporated and available while retaining simplicity of operation and maintaining reasonable cost limitations.

Summary of the Invention

In accordance with the present invention there is provided a practical, computerized chess game in which the game system is the opponent for a human player. The electronic board game system in accordance with the present invention provides means for the player to enter moves by identifying the specific position from which a move is to be made and to which a move is to be made, and for entering that move into the system. The system responds by checking the validity of the move, by making the move in memory, and by then making all possible responses to that move and evaluating those responses in accordance with suitable stored evaluation criteria, e.g., the type described in the articles and embodied in the Hewlett-Packard program referred to above. As a result of this evaluation one of the moves is selected as the most suitable response and the system is capable of effecting that move in the board memory and of displaying that move to the player who makes the corresponding move manually on the game board.

The system in accordance with the present invention provides a capability of displaying additional information such as each position of the board which contains a piece, the identity of the pieces at that location, whether the player's piece is in check, and whether the game system has lost. Thus in accordance with one aspect of the present invention the system sequentially displays in response to a manually entered request the coordinates of each position containing a piece and the identity of that piece and continues to sequentially display such information until such time as a move is made by the player.

As part of the move evaluation, the system provides an absolute evaluation output which indicates that the game has ((sic)) lost, i.e. the game's king is in check, and cannot get out of check, and provides an output indicative of this result for displaying to the player the fact that the computer has lost. An additional output is also provided to display to the player the fact that the player's king is in check after the computer game has made its move.

Thus, there is provided in accordance with the present invention an electronic game which provides an interface between game evaluation criteria and a player, which accepts various inputs from a player and provides various outputs to the player, resulting in a system that embodies a playable interface between the computer game itself and the player who may understand the game but not the sophisticated electronics required.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description and one embodiment thereof, from the claims and from the accompanying drawing in which each and every detail shown is fully and completely disclosed as a part of this specification in which like numerals refer to like parts.

Brief Description of the Drawings

Fig. 1 is a plan view of the game for use in conjunction with the game playing system of the present invention;

Fig. 2 is a block diagram of the major components utilized in the game of the present invention; and

Figs. 3-5 are operational flow diagrams of the system incorporating the present invention.

Description of Preferred Embodiment

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

A game system incorporating the present invention may be embodied in a compact unit 10 which includes a game board 12, ...

3. News Release
May 29, 1981

Fidelity Electronics,Ltd., has filed suits against two companies for infringement of its electronic games patent, No. 4,235,442 ...
A suit was filed on May 22, 1981, in U.S.District Court in Cleveland, Ohio, against Tryom, Inc. A second suit was filed on May 26, 1981, in U.S.District Court, Dallas, Texas, against Applied Concepts.

Fidelity is seeking a permanent injunction in both cases against further infringing activities and an award of damages as provided in the patent statutes. ...

Fidelity Electronics is the world's largest developer and manufacturer of microprocessor-based board games. Its Challenger series electronic games are marketed in the United States through approximately 2500 retailers. In addition, Fidelity games are sold in more than 72 nations around the world ... Among recent products are the Champion Sensory Chess Challenger, Decorator Challenger, ... Voice Bridge Challenger, Backgammon Challenger, and ... Checker Challengers. ...

(please turn to page 27)

The Specific Ideas that the Discussing Computer Must Deal With: Brick-Words, Cement-Words, and Frameworks of Statements

Edmund C. Berkeley
Editor
Computers and People

"The most important section of the common everyday vocabulary, for our purposes, consists of the cement-words, the little words which like cement are almost certain to appear in nearly all discussions and arguments expressed in English, words like "the, of, its, and". . . The computer must be able to recognize easily the ideas expressed in the cement-words and their combinations."

Taken from Chapter 10 of "The Computer Revolution" by Edmund C. Berkeley, published by Doubleday & Co., Garden City, NY, 1962, 249 pp. Chapter 9 was reprinted in the May-June 1981 issue of "Computers and People".

Outline

1. Context
2. Degree of Technicality of Context
3. The Common Everyday Context
4. The Cement Words
5. The Cement Words of Discussion
6. The Cement Words of Science in General
7. The Cement Words of Mathematics
8. The Cement Words of Logic
9. Cement Words and Cement Ideas
10. Programming a Computer for Understanding Language and Engaging in Discussion

Assuming then, as the last chapter sought to establish, that a computer can deal with ideas, understand them, and discuss, what specifically has to be done to make this happen?

What are the specific ideas that a computer must recognize if it is to discuss?

Suppose we agree that the computer "knows" what to do about the mathematical ideas of 2, 3.14159...,PLUS, and SQUARE ROOT; exactly what is the computer to do about ideas other than mathematical ideas?

Let us take a simple example to make even clearer the nature of the problem which we are concentrating our attention on. Take for example the two sentences:

1. All mantelops hile.
2. Mantelopicity is a sure sign of hilation.

Even though we do not know what a mantelop is, nor what hiling is, we do know because of the nature of the English language, that these two sentences are "saying the same thing". They have the linguistic form:

1B. All X's Y. (Or: All X's do Y.)
2B. X-icity is a sure sign of Y-ation.

and the "thing that is said", the logical meaning, is that:

> The class of X's is contained in the class of things that Y (or do Y).

Here then is an example of the kind of operation which we are asking the computer to perform in regard to ALL the words and sentences that occur in language: the computer needs to be programmed to recognize the ideas that occur and the "things that are said" in any text or discourse (or string of expressions) furnished to it.

1. Context

Perhaps the first important indication that human beings use for going from expressions to meanings is CONTEXT, the situation or environment in which the expression appears. For example, if we are thinking of the context of the game of bridge, the expressions "deck, shuffle, trick, honors" take on unique meanings related to bridge. We easily think first, and quickly, of a deck of cards, not the deck of a boat; of shuffling the cards, not of an old man shuffling along the sidewalk; of a trick consisting of four cards, one collected from each player, not a mean trick or a playful trick; of the honor cards of a suit of cards, not of a student on the honor list.

To program the computer, it would be easy to give the computer a section in its memory in which would be stored a long list of labels for contexts. Associated with the idea-labels stored in other sections of the machine, would be context-labels. Then the procedure for determining the appropriate idea-labels for a string of expressions coming in to the machine would be to match the context-labels tagging the words, and select for the context the one whose label occurred most often.

Within any one context, the problem of determining ideas is relatively easy. Most ideas are tagged with single-meaning words. Ideas are then made clear and definite, and we approach the happy state in which we can readily calculate with idea-labels. In the game of chess, for example, the following words all have a neat one-to-one correspondence with ideas: "king, queen, bishop, rook, knight, pawn, black, white, board, square, rank, file, diagonal...." In fact, the list of the special words belonging to chess is only 30 or 40 terms long. The words which belong specifically to a given context can conveniently be called BRICK-WORDS; and the remaining words which may be used in a great many contexts and which put brick-words together can conveniently be called CEMENT-WORDS.

Sometimes a piece of writing will clearly state its context, using a phrase like "in the field of..." or "this paper deals with..." But most of the time the context of a piece of writing is not stated explicitly at the start. The procedure then is to read the first half-dozen lines of the piece of writing, notice the brick-words, and deduce the context from matching context-labels for the brick-words.

A computer could do this. It would examine the first half-dozen lines of a piece of writing, and perform a matching program upon the context-labels of the meanings of the words. It would then choose, as a result of the program, the context which was alluded to by the context-labels most frequently occurring.

The number of the more important contexts that a computer may eventually be expected to deal with may be estimated from the number of contexts listed in a large dictionary, perhaps 1000 to 2000. Here is a listing of some of the contexts recognized in a certain college dictionary as affecting the specialized meanings of words:

Table 1

CONTEXTS -- SAMPLE LIST OF 23

Accounting	Anthropometry
Acoustics	Antiquities
Aeronautics	Archeology
Agricultural Machinery	Architecture
Agriculture	Arithmetic
Alchemy	Armor
Algae	Art
Algebra	Astrology
Analysis	Astronomy
Anatomy	Astrophysics
Ancient History	Automobiles
Anthropology	

But for any one (rational) discussion, the computer would only need to deal with a single context.

2. Degree of Technicality of Context

The nature and degree of the technicality of a context changes from time to time as the interest of a society changes. In the study of stones, for example, at the earliest stage there were for brick-words only words in common everyday use such as "rock, stone, pebble, gravel, sand, mud, clay, gold". After a time different species of stones began to be identified but not systematically: "quartz, feldspar, mica, Iceland spar". Finally a third wave of interest occurred, and a new flock of names appeared, like "jeulandite, apophyllite, zeolite, stilbite"; these terms regularly made use of the suffix "ite", coming from the Greek and meaning rather generally "one of" or "belonging to".

Corresponding to any context is a VOCABULARY, or glossary, the collection of brick-words, the set of words which when taken together label rather well and rather adequately all the ideas which that context is especially concerned with. The scientific organization of knowledge about some territory of the world such as physics results in a vocabulary in which all the information gathered about the subject can be discussed.

3. The Common Everyday Context

Of all contexts the main one bearing on our present purpose is what we may call the common everyday context. Here is where we place the words and ideas that we and everybody else use most of the time for all ordinary affairs; all the words that nobody would consider high-brow, difficult, unusual, or specialized.

What is the vocabulary of the common everyday context? We can find this vocabulary, with some fuzziness at the borders, in: (1) the vocabulary of Basic English, a set of 850 English words proposed by the English scholar C. K. Ogden for an international language; (2) a list in "Practical Linguistics" by D. Pittman, published in 1948; (3) the commonest words in "The Teacher's Word Book of 30,000 Words", published by Teachers College. See the list in the "Computer Almanac and the Computer Book of Lists" (CACBOL) published in this issue.

4. The Cement Words

The most important section of the common everyday vocabulary, for our purposes, consists of the cement-words, the little words which like cement are almost certain to appear in nearly all discussions and arguments expressed in English, words like "the, of, its, to, and". For, if we are to accomplish discussing and arguing by a computer, and if we are to calculate the answer to an argument by means of a computer, then the computer must be able to recognize easily the ideas expressed in the cement-words and their combinations.

It is convenient to recognize four classes of cement-words grouped under: (1) language, communication, and discussion; (2) science in general; (3) mathematics; and (4) logic.

What are these cement-words, and what do we do with them so that a computer can operate with them?

5. The Cement Words of Discussion

Beginning with our earliest days, our ears are filled with the sounds of people discussing. Words and phrases that are associated with discussion surround us all our lives. Let's listen to some of the commonest of them:

"What do you think about that?"
"I would agree to that."
"I don't understand you."
"What did you say?"
"If you'd like to know, I'll tell you."
"I don't know what you are talking about."
"I wonder why he is so curious. He's always asking questions."

And clearly we could go on and on with many examples.

Such expressions occur in writing too, and help to make it more interesting. Here is an example from a book:

"Our investigations into...have led to some very disturbing conclusions. First, we have found that even if...could be said to be..., this could in no way imply that they were also .... Next we found that...could not possibly give...because the assumed relation between... does not in fact obtain. Finally, we were forced to the uncomfortable conclusion that most ...as hitherto obtained were not...at all but some sort of...."

Even though I have dropped out the "brick-words" that refer to the subject matter that the author is talking about (and left in some of the cement-words that refer more to logic than to discussion), you and I find the framework interesting. Something is actively going on here. It is lively. In fact, it is discussion.

There are about 100 very common cement-words of discussion (see CACBOL). In order to program a computer to handle discussion, we have to consider these words. The subject is essentially the relations between persons and information. The subject includes: speakers, listeners, and persons spoken of, the three "persons" of grammar; communicating, "speaking, talking", and receiving communication, "listening, reading".

In regard to knowledge, the cement-words express:

Table 2

DISCUSSION -- CEMENT-WORDS -- 10 SUBDIVISIONS

- Having knowledge: "know, understand, think, realize, see"
- Not having knowledge: "didn't know, don't understand"
- Acquiring knowledge: "find out, learn, discover"
- Losing knowledge: "forget"
- Referring to knowledge: "remember, recollect, look up"
- Manipulating knowledge: "consider, think about, study"
- Putting out knowledge: "say, write, tell, inform"
- Items or production of knowledge: "letter, word, term, phrase, idea, statement, page, message, story, book"
- Places where knowledge is stored: "brain, mind, memory"
- References of words: "meaning, sense, mark, name"

In regard to the attitudes of a person about knowledge, these cement-words express such ideas as "believe, doubt, consider, suppose". They express attitudes about not knowing, such as curiosity and seeking information: "why, curious, interesting".

When two or more persons are comparing their attitudes about knowledge, these cement-words express such ideas as "claim, argue, assert, agree, disagree, discuss".

Finally, these cement-words include a group of ideas that express surprise, and expectation. Usually the ideas are combined in words expressing logical relations. For example, "It rained, but I went" means "It rained and -- you would not have expected it -- I went."

Characteristically, in the process of discussion the minds of participants reach out and try to understand, even try to anticipate. And during this process the indications of knowledge, belief, curiosity, inquiry, and expectation, are all a help to human beings in reaching explanation and acquiring understanding.

If a computer is to discuss satisfyingly for human beings, the ideas expressed by the cement-words of discussion need to go into the programming of discussion in a computer.

6. The Cement Words of Science in General

The second group of cement-words consists of words like "because, happen, probably, made of, become, tomorrow", and are roughly classified under the heading of "science in general". This means science independent of any particular field, such as physics ("heavy, red") or biology ("sweet, smell"). By science we mean verified facts and laws based upon observation and arranged in an orderly system.

About 150 of these cement-words are shown in CACBOL.

Perhaps the most basic of all general scientific ideas is relevance, or relatedness, and its opposite, irrelevance or unrelatedness. Common ways for expressing relevance are "bears on, makes a difference in, is related to, depends on, is relevant to". The opposite is "makes no difference to, has no relation to, is irrelevant to, is unrelated to".

Perhaps the next most basic idea is existence, and its opposite nonexistence. These ideas are referred to in the cement-words such as "be, fact, happen, occur, event, real, actual".

Cement-words that relate to time have been perhaps arbitrarily put in the category of cement-words of science, while cement-words that relate to space have perhaps arbitrarily been put in the category of cement-words of mathematics. Cement-words of time include "minute, yesterday, date, after, sometimes", etc.

Words that refer to change, events, states, and conditions are here included. The thing A may change all the way and become B, and so A stops, B starts, and B replaces A. Common words include "become, turn into, stop, start, replace, modify".

7. The Cement Words of Mathematics

The third group of cement-words to be recognized consists of the cement-words of mathematics. In almost all the sentences that we say, in almost all of the thoughts that we think, we make use of ideas that are either actually or essentially mathematical. Even in the last two sentences just written, mathematical ideas occur not only in the word "third" but also in the "s" of plurals, the relation "in", and the numerical idea "almost all".

About 230 of the cement-words of mathematics are shown in CACBOL. Because of the study which mathematical ideas have received for more than 2000 years, it is rather easy to classify the cement-words and to translate them in phrases into mathematical and computable expressions. The table presents the cement-words in eight classifications: place and position ("at, top"); shape, form, structure ("flat, hole"); size, magnitude ("big, short"); comparison, degree ("more, equal"); indefinite numbers and measurements ("few, much"); definite numbers ("three, plus"); order ("second, pattern"); and variation and approximation ("roughly, depend on").

8. The Cement Words of Logic

The last group of cement-words consists of those which belong to logic, reasoning which is non-numerical or which underlies mathematics. The ideas present in these words are exceedingly important; no sentence can be uttered without using them. The meanings of these words are analyzed, clarified, and calculated with in the subject of mathematical logic. Even in the last few sentences I have just written, some of these ideas are used; they appear in the words "the, of, consists of, group, belong to, is, not, or, and".

About 170 of the cement-words of logic are shown in CACBOL. These ideas have received thorough study by such logicians and mathematicians as Aristotle, George Boole, Bertrand Russell, Ernst Schröder, A. N. Whitehead, and W. V. Quine. These ideas can be fairly easily classified, and Table 3 presents the words in a number of classes.

Table 3

LOGIC -- CEMENT WORDS -- 13 SUBDIVISIONS

Reports on Statements	yes, not so
Connectives of Statements	and, that is, assuming
Name, Meaning	label, stand for
Assertion	be, have
Properties, Classes, Abstractions	sort, example, -ness
Relation Connectives	of, in regard to
Variables	we, this, such
Operators on Variables	all, none, the
Relation of Equal or Unequal	same as, other than
Relation of Like or Unlike	similar to, unlike
Relation of Membership or Inclusion	in, excluded from
The Rest or Remainder	and so forth, etc.
Miscellaneous Properties and Relations	complete, contradict

9. Cement Words and Cement Ideas

In considering the cement-words of language, we should notice that there does not exist a one-to-one correspondence between cement-words and cement-ideas. In other words, a given cement-word may refer to one or more cement-ideas, and which one it refers to may differ from context to context. And, vice versa, a given cement-idea may be expressed in one or more different ways by cement-words, and the way it is expressed may differ from context to context.

For example, take the word "but" as it occurs in the sentence "it rained but I went." The word "but" expresses two cement-ideas. One is the assertion of both of two sentences, the idea of logical AND. The other idea is a specification in regard to expectation: "contrary to expectation", "in spite of that".

Consequently, in the lists of cement-words the same cement-word may occur several times in different parts of the lists. This is to be expected. Since the grouping of cement-words is roughly in accordance with groups of ideas, a cement-word may need to be listed in more than one place.

The variation of expression of a cement-idea from context to context raises the question "Is a cement-idea a definite entity?" Yes, it is. Logical AND for example is a definite entity (just as definite as any mathematical idea) in the sentence "It rained AND--YOU WOULD NOT HAVE EXPECTED IT--I went." Arithmetical AND is a separate and different definite entity. In the sentence "2 AND 3 make 5", this AND is the same as PLUS and just as definite. But arithmetical AND, which is a connective between numbers, is not the same as logical AND, which is a connective between statements.

Just how are the seven hundred or so cement-words to be translated into cement-ideas so that a computer can deal intelligently with the ideas?

This is a most important and interesting question, but the answer to this question is not yet known and is besides outside of the territory of this book.

But we can say some things about obtaining the answer. First, we would take a context, like chess for example, and make a large collection of the cement-words and phrases and sentences used in talking about chess. Second, we would make clusters of paraphrases, where we would gather maybe 20 or 30 or 40 different ways of "saying the same thing in other words". For each cluster of paraphrases, it would be reasonable to specify some abbreviation (human's symbol or computer's code) to represent the idea. Third, we would experiment on a computer with programs using these codes, and see if the computer could converse and discuss chess reasonably and, shall we say, entertainingly, making use of the codes. Wherever there were instances of stupidity or deafness or nonsense, we would try to improve the program, improve the computer's recognition of the ideas. Fourth, we would carry out the same process with half a dozen other contexts.

We would wind up with a set of cement-ideas. And we shall find probably a number of territories, like the algebra of classes, logic, the algebra of states and events, mathematics, etc., where the cement-ideas will be clarified and become calculable. In fact, the first step in any kind of calculation is settling on paraphrases that are interchangeable. "A pair of" is interchangeable with "a brace of", "two of", "a couple of", "a set consisting of two members of", etc. Having decided that the set of paraphrases all mean the same thing, we can adopt a symbol standing for that thing, that idea.

10. Programming a Computer for Understanding Language and Engaging in Discussion

We are now ready to re-examine two of the questions we asked earlier:

1. How shall we program a computer to recognize ideas and discuss and argue with them?
2. What shall we do with the cement-words so that a computer can operate with them?

We shall try to answer these questions, in part if not completely:

First, the programmer specifies a particular context, such as Acoustics, or Zoology.

Second, the programmer tells the computer idea-labels for the ideas referred to by the brick-words or their synonyms. The idea-labels may be adopted standard terms or they may be symbols.

Third, the programmer gives to the computer idea-labels for the frameworks of cement-words which express or assert relations. Here are some examples of frameworks of cement-words:

1. All -- are....
2. The purpose of these questions from the point of view of...was to have information available as to how....
3. With respect to...the situation is similar: very little...is -- from...
4. It is reasonable to assert that in... there was virtually no...of -- by --.

It will be a long task to translate the hundreds of cement-words in their usual combinations into exact ideas, and assign to them idea-labels, so that the computer can "understand" each kind of sentence given to it. But it is a finite task. Once done, in fact, the solution will apply to all kinds of discussion and argument in all kinds of contexts, because the cement-words are inevitably used in every context.

Finally, the programmer assigns to the computer purposes in discussion. In the case of an argument, the computer should be able to test it for its agreement with certain rules:

1. The argument should be free of internal contradictions.
2. The argument should be logically complete, without gaps.
3. Any conflicts with given statements should be printed out.
4. All special terms should be defined using only terms earlier defined.
5. The argument should be free of contradictions of established scientific principles.

In the case of an explanation, the computer should be able to turn a poor explanation into a good one:

1. An appropriate amount of description and illustration is given for each new term or proposition.
2. The explanation should proceed from the more simple to the more complex.

In the case of a conversation, still other rules could be given to the computer similar to those used by a person who wishes to be interesting and entertaining yet not talk about subjects that his hearers have no knowledge of.

Are these future developments too extraordinary to be believed? No; on the contrary there are great needs in present-day society for just this kind of ability in computers. As soon as this ability is programmed in computers, you and I and everybody else will be able to have such wishes fulfilled as these:

- I wish someone could read this for me, and tell me what is in it.
- I think I am opposed to this proposal but I wish I knew what it's really about.
- That argument sounds convincing--I wish I knew if I could believe it.

Different people can go through logical arguments and reach the same conclusions, and the way in which different people understand language is programmed into them by their education and experiences. Therefore, computers also can do this sort of thing, and can discuss logically and entertainingly and usefully. □

Jobs – *Continued from page 11*

But this leads to an interesting paradox: to make a computer easier to use requires a more sophisticated computer. And the more sophisticated the personal computer, the more expensive the personal computer. As this trend manifests itself - and it will - you should expect prices of useful personal computers not to decline over the next few years while we develop and perfect this new technology.

It's always been Apple's objective to build the least-expensive, useful personal computer - not necessarily the cheapest. We build tools, not toys. Ultimately, you will get more Apple power for the same dollar.

But that's just part of the Apple strategy for maintaining our leadership position in the 80s. Obviously, I've only been talking to you conceptually about what's going on at Apple. Ultimately, the Apple must adapt totally to the way people work. The Apple has to change, not the Apple owner. And that's exactly what Apple is planning through the next decade.

Editorial Note: Among other suppliers of personal computers are:
Tandy Radio Shack
California Computer Systems
Digital Microsystems
Texas Instruments
Commodore, etc.
More than 100 computer dealers offer personal computers and service that keeps them working. □

Brown – *Continued from page 15*

anism that is fair to customers and all competitors. In 1980 the FCC proposed an interim access charge plan and initiated a joint board of federal and state regulators to study this problem. □

People Movers and Computers

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"Current vehicles in people mover systems for Automated Guideway Transit (AGT) range from small 3 passenger cabins to 100 passenger modules that resemble trolley cars."

Outline

1. The Public Transportation Industry
2. The Beginning of Exploration of Computer Technology = BART
3. Smart Transit: The Emergence of AGT (Automated Guideway Transit)
4. The Weight Factor
5. The Central Control Facility
6. Two Dozen AGT Systems in the World
7. Dallas-Fort Worth Airport: 12 miles
8. Morgantown, West Virginia: 7 miles
9. Lille, France: 8 miles
10. Osaka and Kobe, Japan: sum, 10 miles
11. Ridership
12. Cost per Mile of Single Lane Guideway
13. Headways
14. The Frontier of People Moving

1. The Public Transportation Industry

Advances in electronic computing and communications have brought breathtaking and radical changes in the way we live and work. But they have been slow to bring about progress in the way we move around in urban areas. One reason is that the public transportation industry after World War II has been in decline. Transit ridership dropped sharply during the 1950s. It was largely taken over by the public sector in the 1960s and became highly subsidized and increasingly expensive in the 1970s.

Early use of computers in the transit industry was to assist in administrative activities--mostly payroll, accounting, and inventory management. In the 1960s, however, use of computer technology for the actual control of train movements began to be explored.

2. The Beginning of Exploration of Computer Technology = BART

A major result of the exploration was BART--(short for Bay Area Rapid Transit) the metropolitan rail rapid network of San Francisco and surrounding communities. Essentially, computer controls and technology were superimposed on sixty-year old subway technology. Hardware was stretched to its limits in terms of large trains, high speed, rapid acceleration, and two-mile station spacing. But BART continues to have some operational problems, and each train is now run with an attendant who can override the computerized controls.

3. Smart Transit: The Emergence of AGT (Automated Guideway Transit)

During the same decade, other research efforts turned to designing communications systems into transit hardware itself. In these developments, computer hardware has been employed in vehicles, guideways, and stations to automate all routine aspects of vehicle movements. These systems resemble automated elevators, in which "vehicles" follow electronic slots that run up and down elevator shafts. In fact, these new computer-based transit systems are sometimes called horizontal elevators, more often people movers. In the transit technology community, they are often referred to as "automated guideway transit", or AGT.

The automation of vehicle movements results in a number of basic changes in the operations and economics of transit service. The absence of vehicle drivers means that the labor portion of operating costs is not highly dependent on the number of vehicles in the system. Instead, there is a tendency to use a large fleet of smaller vehicles. Current AGT vehicles range from very small three-passenger cabins to 100-passenger modules that resemble trolleycars.

4. The Weight Factor

These small vehicles weigh less than conventional rail cars. This reduces the structural requirements of the guideway, allowing AGT guideways to be less bulky and less expensive, AGT is thus smaller in scale than conventional rail transit and better able to fit into an urban environment.

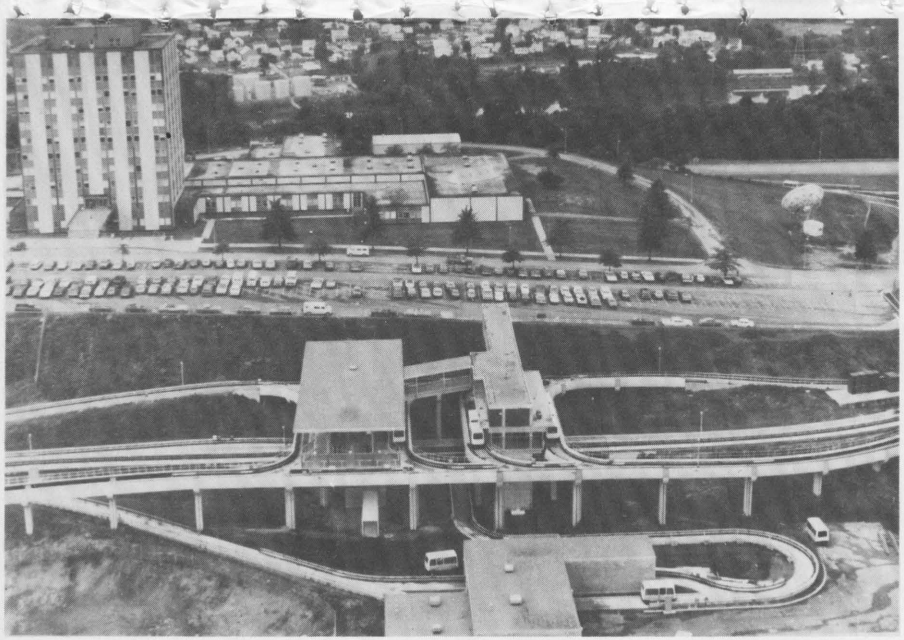

Figure 1: A station on the Morgantown, WV AGT, the most technologically advanced people mover.

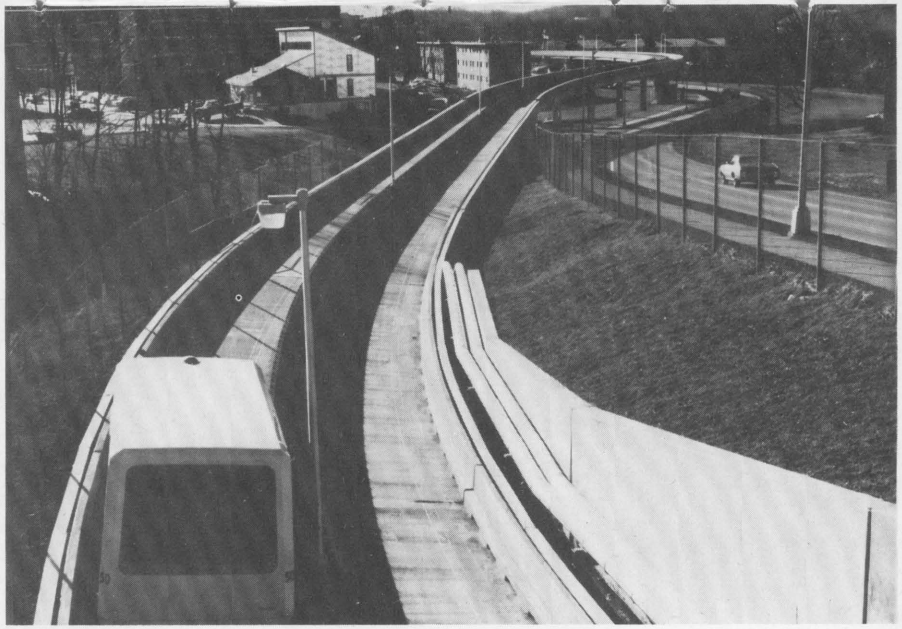

Figure 2: The Morgantown, WV people mover connects three campuses of the West Virginia University, and a small downtown shopping district.

Figure 3: The Dallas-Ft. Worth airport has the largest people mover system, covering 12.5 miles of guideway.

Figure 4: This control center at Dallas-Ft. Worth airport keeps track of 53 stations and 67 vehicles.

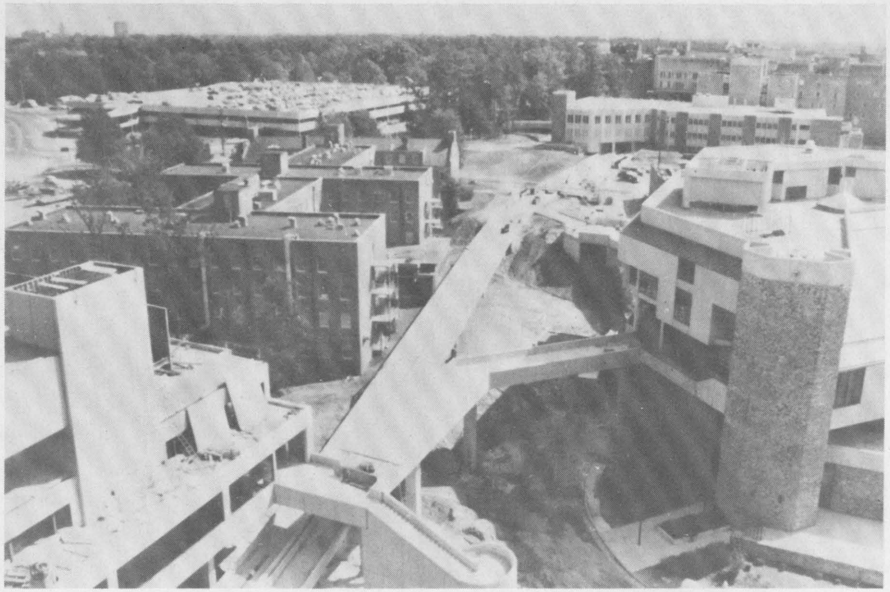

Figure 5: When Duke University Hospital expanded, older facilities were connected with new ones by means of an AGT.

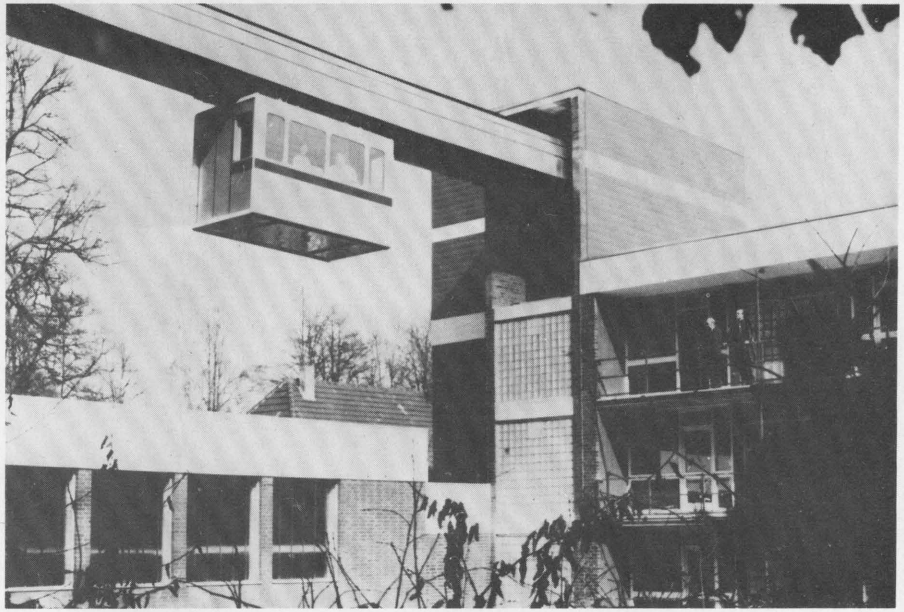

Figure 6: In Ziegenhain, Germany this people mover also operates as a simple shuttle between hospital facilities.

Figure 7: A shopping complex in Pearlridge, Honolulu, Hawaii is the site of this "horizontal elevator".

Figure 8: These cars are part of a planned automated transit line in Lille, France which will be the first AGT network of four lines.

In its simpler forms, AGT is a smaller scale version of rail transit, providing automated service along a single route with stops at all stations. Vehicles or trains of vehicles are run at intervals (headways) of from one to five minutes. In more advanced systems, stations are built off the main guideway so that stopped vehicles do not block the flow of other vehicles. This permits a denser flow of vehicles along the guideway. Furthermore, by bypassing stations, each vehicle can potentially travel directly to its destination. Also, vehicles can be routed over different branches of an entire network. Elaborate networks to serve particular travel needs can be designed. Operations are system-wide and dynamic relative to the bulkiness of rail operations. From the passenger's point of view, this results in first class service.

5. The Central Control Facility

AGT controls are hierarchical and centralized in a main facility, where staff interface with data displays and command the equipment. Video screens present data on vehicle, guideway, and station status, trip requests, and other vital functions. Operating data are automatically recorded for administrative use. Strategic station and guideway areas are surveyed by closed cable television systems. Operating staff usually can communicate with passengers by means of two-way voice systems. They can respond to abnormal situations and emergencies as they arise.

6. Two Dozen AGT Systems in the World

Currently there are two dozen operating AGT systems in the world. Eleven of them are recreational--located within zoological gardens or theme parks, such as Disneyworld. Six are in airports, linking separate terminals to one another or to hotels and remote parking facilities. There are two people movers operating as simple shuttles in shopping complexes and another two within hospital complexes. The Duke University Hospital expansion took place by connecting an older hospital facility to a new addition some 1200 feet away. (See Table 1)

7. Dallas-Fort Worth Airport: 12 miles

All of these people movers except one are small--having less than two miles of guideway and usually fewer than twenty vehicles. The exception is the Dallas-Fort Worth Airport, which has a system of 12.5 miles of guideway, fifty-three stations, and sixty-seven vehicles. It is the largest people-mover installation in existence and has off-line stations.

8. Morgantown, West Virginia: 7 miles

The most technologically advanced people mover is in Morgantown, West Virginia (population 30,000). It connects three campuses of the West Virginia University as well as the small downtown shopping district. It is composed of 6.6 miles of guideway, five stations, a central control and maintenance facility, and seventy-one vehicles. Overseas, there has been more progress in the implementation of urban people movers. These systems resemble automated versions of trolleys more than the American AGT systems described above.

Table 1

LOCATIONS OF PEOPLE MOVERS IN THE WORLD, 1981

U.S.A.:	Bronx Zoo, NY
	Hershey Park, PA
	Busch Gardens, VA
	Morgantown, WV
	King's Dominion, VA
	Duke University, Durham, NC
	Carowinds, NC
	Atlanta Airport, GA
	Disneyworld, FL
	Tampa Airport, FL
	Orlando Airport, FL
	Miami Airport, FL
	Houston Airport, TX
	Dallas-Fort Worth Airport, TX
	King's Island, Ohio
	Fairlane, MI
	Minnesota Zoo, MN
	Disneyland, CA
	Magic Mountain, CA
	Calif. State Fair, Sacramento, CA
	Seattle-Tacoma Airport, WA
	Pearlridge, Honolulu, HI
France:	Lille
Japan:	Osaka
	Kobe
Germany:	Ziegenhain

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9. Lille, France: 8 miles

In the French city of Lille (population over one million), work on a 7.8 mile (12.6 km) automated transit line linking a new town to downtown Lille began in 1977. Partially elevated and partially underground and with sixteen stations, this is the first of a planned network of four lines. The French government is providing 40 percent of the funds, and the rest is being raised by a payroll tax. Service on the first segment of the line may begin this year; the line should be in full operation by 1983.

10. Osaka and Kobe, Japan: sum, 10 miles

In Japan, two experimental people movers connect major new port (industrial and residential) developments on reclaimed land to the cities of Osaka and Kobe. Both projects were implemented by municipal development agencies with assistance from the Japanese government. On-board "watchmen" monitor trains and passengers, although train movements are automated. In Kobe (population 1.3 million), the people mover connects a downtown train station to the new port development with 5.6 miles (9.3 km) of elevated, single-lane guideway. As shown in Figure 4, the system has four stations along the double-lane section and five stations along the single lane loop on the new island. Ridership is expected to be about 70,000 per day, with almost double that figure during the first months of operation due to the major port exposition held in conjunction with the opening of the people mover in February of this year.

The Osaka (population 2.7 million) people mover links a station of the city's subway to a new port development with 4.0 miles (6.6 km) of elevated double guideway. Eight stations are provided. Construction started in 1978, and service began in Osaka this spring as well.

11. Ridership

In 1980 three new AGT systems began carrying passengers. This doubled the average number of daily trips on AGT systems from about 100,000 to over 200,000. This total is small by the standards of the public transportation industry. It is roughly equivalent to the metropolitan bus operations of Wilmington, Delaware. The opening of the two Japanese systems this spring and expected start-up in Lille, France and at the Orlando Florida airport should double this figure in 1981 to over 400,000 trips per day.

Data on system reliability have not been systematically collected. Most evidence shows that AGT operations are meeting or exceeding stringent performance specifications that were written into contracts. Safety records have been excellent. To date only one fatality has occurred, when a trespasser strayed onto an airport people mover guideway.

12. Cost per Mile of Single Lane Guideway

Comparisons between AGT costs and conventional transit system costs are difficult. They perform somewhat different functions and have different capacities. Existing AGT systems are small; they have not yet benefited from economies of scale that may be realized in larger operations and as a result of maturation of the AGT industry.

Since AGT systems have numerous cost components, can provide different levels of service, and have unusual design features, it is difficult to generalize about capital costs. Useful comparison figures are based on estimated costs of reproducing each installation in 1980. To adjust for differences in size of installation, the "unit cost"--or total cost per mile of single lane of guideway--is also used.

"Unit costs" for AGT systems vary from over $27 million per single lane-mile to under $7 million, or even lower in the case of some recreational installations. Costs of recent rail transit, which carries higher volumes of passengers than AGT, range from over $16 million to as high as $73 million per single track-mile.

Studies by the U.S. Department of Transportation have calculated operating costs of five AGT systems in terms of "equivalent place-miles." This is the cost of moving a given amount of vehicle space, which was judged to accommodate one passenger, over one mile of guideway. Adjusted for inflation, these operating and maintenance (O&M) costs may be used. Bus and rail O&M costs per place-mile rose from an average of 29¢ in 1976 to 33¢ in 1979; AGT costs dropped from 33¢ to 31¢. This drop appears to result from the accumulation of operating experience and the lower sensitivity of AGT operations to general inflation.

In summary, AGT capital costs are substantial but less than those of rail transit. Operating costs are comparable, and trends are encouraging. AGT seems to be an efficient way to link up activity centers with at least moderate volumes of travel among them.

13. Headways

One AGT system operating today runs vehicles at fifteen second headways. More advanced systems are projected to run at headways of a few seconds or less.

14. The Frontier of People Moving

The frontier of this new technology lies in further development of computer software and hardware. The requirements are (1) assuring the safe and reliable performance of each vehicle, (2) operation at close headways, and (3) efficient management of a large fleet of vehicles over extended networks. □

Fidelity – *Continued from page 17*

4. Editorial Note by Edmund C. Berkeley

As a chess player for more than 50 years, and as a computer person for more than 40 years, I find it hard to see how chess or any board game can be played with a maxicomputer, a minicomputer, or a microcomputer, without an interface between the computer and the human player.

I find it hard to see how the "invention" described above is in any way not in the public domain and in the published and known state of the art.

I find it hard to see how the Patent Office can issue this patent as an "invention".

"Computers and People" invites comments and discussion of this subject, especially from the persons at Fidelity Electronics who are considering patent infringement proceedings to protect "its exclusive rights". □

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Computing and Data Processing Newsletter

"SEMI-ENGLISH" AND "SEMI-CHINESE" FOR TECHNICAL TRANSLATION

Brian Groom
c/o "The Financial Times"
10 Cannon St.
London EC 4, England

(Based on a report March, 1981)

A potential major breakthrough in the use of computers for language translation has emerged as the byproduct of some research. This research was designed to find the minimal English needed by the world's scientists to communicate at a technical level.

Mr. Peter Nancarrow, Literary and Linguistic Computing Centre, Cambridge Univ., "converts" technical information accurately - but without grammatical niceties. This saves a computer from being "taught" to analyze syntactically.

He has converted Chinese into what he calls "semi-English" in paleontology, botany, pharmacology, and soil mechanics; and has experimented in converting English into "semi-Chinese" and "semi-Norwegian". These "semi-languages" are comprehensible to experts for whom the conversions are intended.

At present a translator of Chinese into English may charge £6 or more per 100 words, while Nancarrow's computer cost is about 20p per 100 words.

He connected an "Ideomatic" Chinese character encoder, a computer, and a terminal that could handle 11,000 Chinese characters. He used: direct substitution of English words for Chinese characters; block substitution of patterns of words; and analysis of text to aid pattern identification.

This procedure may provide information on how scientists think; it is based on logical rather than grammatical relationship between ideas. A byproduct has been converting untreated English into comprehensible Chinese.

Announcement

The decision to omit "Number Puzzles" and the "The Frustrating World of Computers" is for this issue only. If you like these features, please tell us. If you would rather give up these features so as to have more space for articles etc., please tell us. – ECB, Editor