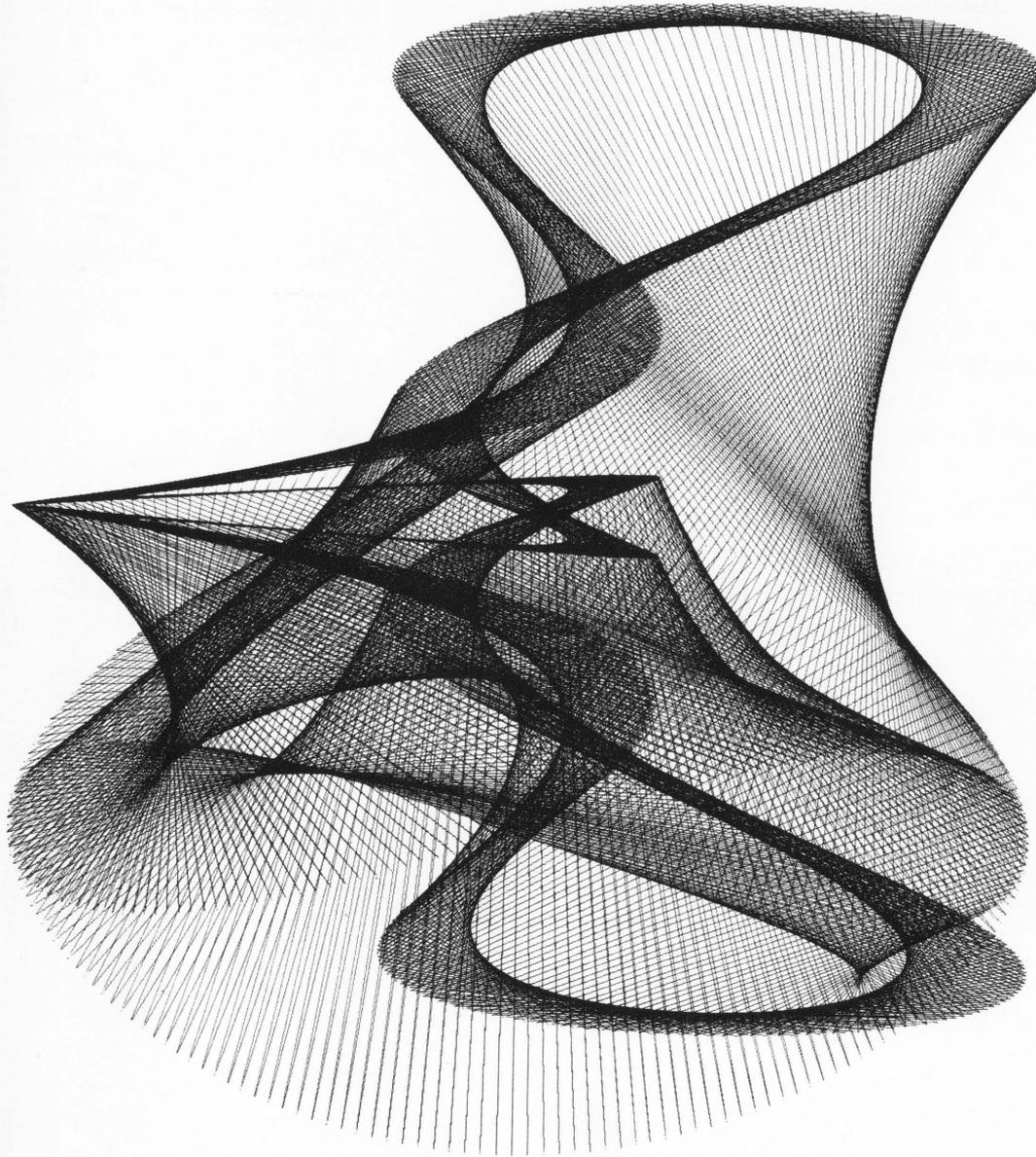


computers and people

February, 1976

Vol. 25, No. 2

formerly *Computers and Automation*



CLASSICAL URN, SEEN VIA COMPUTER

Newspeak and Computers /
*E. C. Berkeley, Leslie
Mezei, Paul Armer, . . .*

The Universal Product Code /
*T. V. Sobczak –
Ray Boche*

**The Computer Industry:
Oppressions and
Opportunities /**
W. F. Bauer

**The Future of
Telecommunications:
Competition and Computers /**
M. R. Irwin

**Information, Power and
Complexity – Part 2 /**
Abbe Mowshowitz

THE "UNBUNDLING" OF AT&T: Implications and Opportunities

THE YANKEE GROUP
 Harvard Square — P.O. Box 43
 Cambridge, Mass. 02138
 (617) 868-6139

by:
 Howard M. Anderson
 Charles L. Jackson
 Harry Newton

The "three waves" effect of the AT&T antitrust suit; the near term, the period during the suit, and post suit

- Opportunities for the computer terminal market
- The multiplier effects on specialized common carriers
- The impacts on data communications, value added networks
- End User analysis and the paradox of counter-valuing interests
- Probable strategies of Long Lines, Western Electric, the operating companies, Bell Labs, and AT&T
- "Unbundling" and the interconnect market
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- The question of jurisdictional authority and cost basis rate structuring
- Technological innovations and expected market share
- The Unbundling of Western Electric — Threat or opportunity for telephone suppliers

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Model? _____
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by Edmund C. Berkeley, Editor

Can a computer be used to deal with "Newspeak" with conditions that resemble the language George Orwell depicted in his book "1984"?

7 Newspeak and Computers — A Discussion and Argument [F]

by Leslie Mezei, Paul Armer, Gerard Salton, Erwin Tomash, and others

Who sets up the computer's dictionary? Why not apply computers to detect bias and other factors? Can a synonym replacer effectively translate Newspeak? and some more questions.

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by Dr. Thomas V. Sobczak, Director Information Processing, Waldes Kohinoor Inc., Long Island City, N.Y.

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16 The Universal Product Code — a Defense [A]

by Ray Boche, Computer Center Director, California Polytechnic State University, San Luis Obispo, Calif.

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by Dr. Manley R. Irwin, The Yankee Group, Cambridge, Mass.

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Front Cover Picture

The front cover picture, "Classical Urn, Seen Via Computer", is a drawing done with a Univac 70/7 computer on a Calcomp drum plotter. The basic figures consist of line segments between two curves. The user may assemble the basic figures controlling relative position, size, density, and other parameters. The drawing is from J. H. Bevis, Dept. of Mathematics, Georgia State University, Atlanta, Georgia, 30303.

Recent Articles in

People and the Pursuit of Truth

(A monthly magazine devoted to facts, information, truth, and unanswered questions that are important to people, widely suppressed, and not adequately covered in the usual American press; published by Berkeley Enterprises, Inc., 815 Washington St., Newtonville, Mass. 02160)

Who Killed President John F. Kennedy? Why? How? / Richard E. Sprague

The People and the Congress of the United States Have Been Deceived – 2 Parts / Hortensia B. Allende

The Secret, Illegal, and Powerful Control of the United States Government by the Military-Industrial Establishment – 2 Parts / Colonel L. Fletcher Prouty

The Shooting of Governor George Wallace: Why? / R. Frank Salant

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NOTICE

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

Newspeak and Computers: What We Do Depends Upon What We Think

"Newspeak" is the language that George Orwell made famous in his great book "1984", the language in which eventually it would not be possible to think subversive thoughts, nor other thoughts that Big Brother did not approve of:

The purpose of Newspeak was not only to provide a medium of expression for the world-view and mental habits proper to the devotees of Ingsoc, but also to make all other modes of thought impossible.

— From "Appendix — The Principles of Newspeak", in "1984" by George Orwell.

Most of us have shuddered at that prospect. We have either hoped or trusted or believed that in the United States and in other democratic countries, we were far from that condition. Of course, most of us have also believed that in countries that were not part of the "free world" ("communist countries") this condition was common; and it was natural to expect that you were told only what "they" approved of your being told, and that what you read in the newspapers was only what "they" permitted you to read. For example, in the People's Republic of China, Americans visiting there after intercommunication began under the administration of former President Richard Nixon found out that the Chinese generally did not know nor believe that Americans had walked on the Moon.

Nowadays in the United States, we are far less sure of the collection of beliefs spread abroad than we used to be. In recent years we have had a long course of instruction in how to lie, and how to deceive, in big ways and little ways, from many branches of the United States government and from many of the biggest corporations.

Former President Nixon among others, has given us instruction. He has given us a new meaning of the word "inoperative": it is applied to a presidential explanation that is proved to be false. He has given us a new definition of "executive privilege": the privilege of not obeying the law, as for example in not surrendering records or files when subpoenaed by a court of law. Even under the administration of President Gerald Ford, "foreign aid" is in reality "aid to American armament makers to sell arms" (in particular, arms that the Pentagon no longer wants very much). The people who think "aid to Turkey" implies "aid to New York" first, are told that "the interests of national security" prevent any such action.

The technical development of Newspeak in the United States and elsewhere is well described in an interesting and important book, called "The Mind Managers". This is written by Herbert I. Schiller, a professor of communications at the University of California in San Diego, and published by Beacon Press, 25 Beacon Street, Boston, Mass. 02108, 1973, hard-bound, 214 pages.

Here are some quotations:

America's media managers create, process, refine, and preside over the circulation of images and information which determine our beliefs and attitudes and ultimately our behavior. When they deliberately produce messages that do not correspond to the realities of social existence, the media managers become mind managers.

Messages that intentionally create a false sense of reality and produce a consciousness that cannot comprehend or wilfully rejects the actual conditions of life, . . . are manipulative messages.

Manipulation of human minds . . . is "an instrument of conquest". It is one of the means by which "the dominant elites try to conform the masses to their objectives."

By using myths which explain, justify, and sometimes even glamorize the prevailing conditions of existence, manipulators secure popular support for a social order that is not in the majority's long-term interest.

When manipulation is successful, alternative social arrangements remain unconsidered.

What can we do?

Well, for one thing, we can use computers to help us out of the fog of Newspeak, the fog of a vocabulary which consists of misleading or deceptive terms. In our own computer installation there is a computer program which we call the Synonym Replacer. It replaces a word or a phrase by a synonym. And it enables rapid automatic removal of quite a fair amount of Newspeak. Programs similar to the Synonym Replacer are a part of every compiler. The operating instructions are: (1) Make a table of synonyms; (2) Apply the Synonym Replacer. For an example, see Figure 1 on page 7.

The deliberate, clever fog of almost all ordinary reporting, publicity releases, and advertising in the United States is one of the most serious problems facing all people of goodwill in this country.

What we do depends upon what we think. What we think depends by and large upon what is published and spread abroad. The application of computerized synonym replacers could be of very considerable help in realizing and understanding what is really going on.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

Newspeak and Computers — A Discussion and Argument

Editorial Note: The foregoing editorial was originally written for the November issue of "Computers and People". In October, I showed it to one of my valued advisors and good friends. He said that this editorial was far outside the proper sphere of this magazine; that it contained derogatory political judgements; that it was badly written; that the space should be devoted instead to really constructive ideas about how computers could be used to benefit people. He was very emphatic.

I did not agree with my friend. I wondered how widespread was his viewpoint. So, I sent copies of the editorial to a number of other persons, both in and out of the computer field, to find out what they would say about it. The accompanying note tried to steer clear of my own viewpoint; it said: "I am considering the enclosed editorial, "Newspeak and Computers", for the December issue. Do you have any comments? I would appreciate them. I enclose easy reply means." The easy reply means consisted of a reply envelope and a slip of paper, 3" by 5" — to encourage short, quick replies.

Here is what those who replied said about it. Not one of my respondents said that the editorial should not be published. So we present here quite a fair amount of interesting and important discussion.

We invite our readers to participate in this discussion. We hope to publish additional comments. If this subject stirs you, please write us and say what you think. Not much is more interesting in a computer magazine than an important, controversial computer-connected subject, and uncensored discussion of it with no holds barred. Computers can be used to increase Newspeak or to reduce Newspeak; and so this subject is clearly in the domain of this magazine. —E. C. B.

ELABORATION OF COMPUTER APPRAISAL OF TEXT

From: *Leslie Mezei*
Don Mills, Ontario, Canada

Due to the mail strike here, I only got your "Newspeak and Computers" editorial recently.

I like it. Anatole Holt has long been saying that the computer is primarily a communication device. You are suggesting that it also be used as a decoding tool. Great.

Let us elaborate on the system a bit further. Have a list of words and phrases which are to be highlighted by underlining or some other means. A subset of these would be provided with automatic equivalents as suggested in the editorial. At the same time, word counts could also be obtained to help as a bias detector. This could include classes such as positive/negative, friendly/hostile, referring to military matters, etc. They would have to be marked as such on entry into the system or based on tables developed for the purpose.

A text editing system could be easily modified to include such facilities. Each user would have to be able to build up resources for his or her own particular field of interest, and be able to flexibly change them and add to them. Not only would this help to scrutinize the letters and articles of others, but we can turn the instrument on ourselves to become more clearly aware of our own habitual tendencies and biases. For example, those of us sensitive to the built-in male bias of our language could be helped to find the words which imply that the person referred to is always male.

(1) Passage with Newspeak, INPUT

CONGRESS HAS VOTED \$1 BILLION OF FOREIGN AID
TO COUNTRY X IN THE INTERESTS OF THE NATIONAL SECURITY
OF THE UNITED STATES AND THE FREE WORLD

(2) Synonym Table

AID TO AMERICAN ARMAMENT MAKERS TO SELL ARMS: FOREIGN AID
POLITICIANS AND THE MILITARY INDUSTRIAL COMPLEX: NATIONAL SECURITY
CAPITALIST WORLD: FREE WORLD

(3) Passage with Newspeak Removed, OUTPUT

CONGRESS HAS VOTED \$1 BILLION OF AID TO AMERICAN ARMAMENT
MAKERS TO SELL ARMS
TO COUNTRY X IN THE INTERESTS OF THE POLITICIANS AND THE MILITARY
INDUSTRIAL COMPLEX
OF THE UNITED STATES AND THE CAPITALIST WORLD

Figure 1

WHY DO AMERICANS STAND FOR BEING FOOLED SO MUCH?

From: Ruth Pirkle
New York, N.Y.

I think the editorial is excellent, both interesting and thought-provoking. I often wonder why people in this country stand for being fooled so much. The reason seems to be that they easily get distracted and then go their ways. This editorial fights an evil, and is crusading rather than attacking.

APPROPRIATE FOR "COMPUTERS AND PEOPLE"

From: Judy Callahan
Waltham, Ma.

I think the editorial is significant and appropriate for "Computers and People".

THE SYNONYM REPLACER IS A GIMMICK AND WON'T REALLY WORK

From: Paul Armer
Stanford, Ca.

Re the proposed editorial, "Newspeak and Computers", my comments are that the first few paragraphs are reasonable, but the Synonym Replacer is a gimmick. Like machine translation, it won't really work. I'm sure that you are not using it routinely. So I don't think you've answered "What can we do?"

WHY NOT TRY IT ON POLLUTION ABATEMENT CONTROL ARGUMENTS?

From: Terry Miller
Annandale, Va.

Rather than the example shown, why not one of pollution abatement controls for industry? Your example works both up and down, depending upon your bias.

A CUTE ENDING

From: Gerard Salton
Ithaca, N.Y.

I am not sure how realistic your editorial is, but I enjoyed reading it. I thought the end was really cute.

TRANSLATE NEWSPEAK IN ADVERTISING!

From: Pete Johnson
Boston, Ma.

Your editorial is an absolute "must publish". Let's start applying the translation of Newspeak in the field of advertising.

LOOKS GOOD

From: Jack Biddle
Rosslyn, Va.

Your editorial on "Newspeak and Computers" looks good.

NO OBJECTION TO PUTTING THE BEST FOOT FORWARD WHEN ONE HAS A FREE PRESS

From: Erwin Tomash
Woodland Hills, Ca.

I found your editorial, "Newspeak and Computers", quite provocative. I am afraid the comment card

which you enclosed is not large enough and that you will have to make do with this letter. As the saying goes, I don't have time to make a brief comment. I can make a longer comment more quickly and easily.

Certainly there can be no doubt on anyone's part that the threat from Newspeak as used by governments and other large powerful institutions in our society is real. It follows that calling attention to the threat, as you have done, is of real value. Coupling Newspeak and computers is another matter, and this poses some problems for me. I'll go into that a bit more fully later on.

First, some minor comments about Newspeak itself and its usage. I do feel that we here in the United States still enjoy the benefits of having a relatively free press. This is evidenced quite clearly by the entire Watergate episode. Another example is the current investigation of the CIA and other elements of our Intelligence establishment. Because of this, I don't think it quite correct to draw a tight parallel between Newspeak as practiced in totalitarian states and attempts to use Newspeak in the democratic states where a free press exists.

I, for one, don't object to even large powerful institutions putting their best foot forward. To me this is not equal to outright falsehood. I suppose that I rely upon other competitive institutions with a different viewpoint within the society to see to it that gross distortions are corrected. It seems to me that in today's complex society with its broad spectrum of social issues there is no "received truth". There is not even a right or wrong. Since there really are several sides to each question, it seems unfair to categorize a forceful presentation of one view as untruthful simply because it happens to be different.

I recognize that not all large institutions are equally powerful. Also that they all do not have equal access to the media through which viewpoints are projected. The result is that the correction process I refer to above may be slow, incomplete and less balanced than what I might like.

As an example of differing viewpoints, your comments on the subject of American armament makers reveal that your apprehension of the situation is not quite in accordance with mine. In my view, American armament makers have been established and are maintained by our government to insure that our national defense needs are met. In conformity with the private-property-free-enterprise characteristics of our economic system, these armament makers function as a part of the private sector, are organized as corporations, and are owned by shareholders. Their operations are almost entirely controlled by the government and their sales of arms to foreign countries are completely controlled by the government.

I fully agree with you that most of the time "foreign aid" is a euphemism for "military aid". But I remind you that this aid is voted on by Congress and is used to further the foreign policy of the United States. The role of the armament makers in setting this policy is minimal. It seems to me that arms sales are manipulated in accordance with foreign policy, which is quite proper in my view.

I have not read Professor Schiller's book, "The Mind Managers". So, I will restrict my comments to the philosophical point that there is in reality no way to present any idea without managing it. There are "media managers" in every society and there have

(please turn to page 12)

The Computer Industry: Oppressions and Opportunities

Walter F. Bauer, President
Informatics, Inc.
21050 Vanowen St.
Canoga Park, CA 91303

"It is time we considered whether bigness is not in and of itself wrong, especially if it is totally unbridled. ... Unfortunately, to many people, anything said against large corporations appears to be anti-American."

The purpose of this article is to issue a warning and a challenge. The warning is that competition in our industry is being seriously threatened. The challenge is "What are we doing about that threat?" The threat I refer to is that stemming from the concentration of economic power which is derived from market share and financial leverage. The threat comes from a number of sources: singly, IBM, and collectively, the supercorporations of the country. My comments relate mostly to IBM, for that threat is most imminent and most consequential to us.

The threat is to us individually and to our system; it is a threat to those of us who have tried to build our own enterprises in this industry; it is a threat to our continued employment as professionals; it is a threat to our country's technological leadership; and it is a threat to our financial, free enterprise, capitalistic system, or at least it is symbolic of the threat to that system.

The question of the concentration of market power in our country and the subset question of IBM's market power should be discussed and aired in a rational, unemotional way. While I can claim no lack of prejudice, I hope that my remarks can be classified as rational and unemotional.

Let me turn first to our opportunities.

Many Attractive Opportunities

Our opportunities are many, and they are attractive. Software products and data services activities have grown 20-30% per year and are forecasted to continue to do so. The purchase of a software product is an accepted (even a more attractive) alternative to building the product in-house. Application products in business have shown a sudden acceptance in the marketplace beginning about two years ago. The general ledger and accounts receivable systems now being successfully sold will be joined by an impressive phalanx of others: systems for product distribution, cash management systems, shareholder management systems, production control systems — to name only a few. Meanwhile, software products for utility purposes such as those for data management continue to do exceedingly well.

Similarly, data services opportunities continue to develop. Two or three years ago, it was the ad-

venturous, large company — the one who experimented with "one of everything" — which had a data terminal in use. Today, these companies and many others could not get along without such a terminal. Each new month shows a wider set of applications and uses of the communication-based (time-sharing, if you will) computer, serving many clients. Specialized languages and check-out systems have long been a staple for time-sharing. Now we see, increasingly, modelling systems, powerful data base access systems, and data bases available to thousands. Tomorrow will see comprehensive business systems for accounting and financial control, as well as for production of the printed matter — from information access to editing, through electronic photocomposition, and to dissemination.

Data Processing Has Come of Age

How are the successes of these proprietary products and services born? Simply put, the data processing industry has finally come of age. No longer are the data processing managers the mystery technicians who asked for and received boundless amounts of money without fully understanding and appreciating the economics of the service provided. Today's managers understand that some sacrifice in the flexibility of their own specifications for data can bring much lower costs; the purchased product or service may not fit precisely, but it is a cost effective solution. Meanwhile, we developers and purveyors of such products and services understand better the scope of the needs; we understand better how to fashion our offerings for wide receptivity.

Our industry is passing through its adolescent stage and is rapidly maturing to young adulthood. In the past 10-15 years, we have derived much of our growth and our momentum by exploitation of the shortage of capable, knowledgeable professionals to implement systems. As the industry was growing as an ungraceful, uncoordinated teenager, we were able to get the job and demand the price simply because we had knowledge, as an individual or as a group of individuals. That day is rapidly coming to an end, or, indeed, that day has already ended. While individual expertise is still marketable, our future prospects shift more to the development of proprietary products and services. "Leverage through replication" may well be an important philosophy of the future data services entrepreneur; this will allow our product and services offerings to be professionally honed and economically valuable.

Based on a talk given before the Association of Data Processing Service Organizations (ADAPSO), San Diego, October, 1975.

The Only Industry Dominated by One Company

But, what of the oppressions which the industry faces? What is the nature of the threats? How imminent are they?

The major threat to our industry is marketing and financial concentration which might well stifle competition. While some industries are oligopolies — dominated by a few companies — ours is the only industry dominated by one company. Whether one calls it "dominated by" or "monopolized by" is a personal opinion; the former phrase does not have the legal connotations the latter has, of course.

The 1956 Consent Decree between IBM and the U.S. Government gave good protection to the punched card manufacturing industry and a temporary respite to the mainframe industry, but the peripheral equipment industry was so small as to be disregarded, and the software and services industry was at the time non-existent. The industry was too new and the consent decree formulation processes too limited in scope, vision, and industry participation to have produced a decree of longer lasting value and effect. As a slight digression, I might add that the new legislation guaranteeing a public airing of any intended consent decree in settlement of antitrust cases is certainly a step in the right direction. Hopefully, this public airing will do more than cushion us against the shock of ineffective antitrust legislation successfully combatted by organizations which can literally hire more lawyers than the Government can.

The Importance of Competition

Have you considered how important it is for you in data processing services to have competition in our industry for your hardware business? Today you can fashion your own IBM system using a Data Products printer, a Cal Comp plotter or disc, an Electronic Memories add-on memory, and a Memorex front-end. Tomorrow you may not have that luxury. Tomorrow you may well be faced with choosing among the system architectures IBM has ordained or buying a similar set from one of IBM's mainframe competitors (if IBM has any). The lack of competition in peripheral equipments and add-ons — indeed, the collapse of that industry — will take from you the last vestige of your freedom to design your own system.

In any other industry, this would be an unheard of situation. Imagine a General Motors or any large manufacturer which was forced to buy all of its manufacturing equipments — its punches, its stamping equipments, its drill presses — from a single supplier. If you are like most data processing organizations, up to 35% of your expense budget is in hardware. Needless to say, getting cost effective equipment is most important to you.

A Chilling Fact

But, the indirect problems of equipment availability and cost effectiveness are not the major factors. Who is to say that an unfettered IBM, totally cleared of all antitrust charges, would not be the giant to stamp out competition in software products and processing services in the next decade? Today's competition problem for the peripheral equipment manufacturer could become tomorrow's problem for the software product and services company. The short-sightedness of the 1956 Consent Decree must not be repeated.

Let me state a chilling fact: IBM's settlement with Control Data guaranteed IBM would stay out of data processing services for six years. In January, 1976, four of those six years will have elapsed!

Bowing to the Giant

We have all heard of the threat to data services of the free standing minicomputers. My own personal opinion is that they will never completely stifle the processing done by communication-based systems, although it is difficult to assess the future relative marketplace split between the two. Since minicomputers are supplied by mainframe companies, IBM again becomes the principal factor. Wherever the technology leads us, one thing is sure: Our course is better served by an industry not dominated by an unfettered, free-ranging, freely-raging giant to whom we bow and prostrate ourselves in supplication for our existence.

You have all heard, as I have, the reasons many give as to why IBM should not be assailed — reasons why the IBM status quo should be maintained. (Incidentally, by way of digression, there is probably no way the status quo can be maintained. A company can only be healthy and growing if it is aggressive. IBM's aggressiveness must take the form of an awesome market and financial power. This, in turn, leads to greater market and financial power. IBM's market share must be reduced in the next ten years or it will increase; the probability of maintaining the status quo is just about zero.)

Pro-IBM Reasons

The pro-IBM reasons given are, about, as follows:

1. IBM deserves its position because it has good management which has run the company well.
2. The technological leadership of the U.S. in computers would otherwise be lost.
3. IBM contributes greatly to the balance of payments problem.
4. Anything deleterious to IBM is deleterious to Wall Street and our financial system.

Future Rewards for Past Performance

Let us examine briefly each of these four assertions. Consider the first point — that IBM deserves its position. IBM does have good management which has done a good job of running the company. However, the management and the shareholders of IBM have been greatly rewarded financially for the job which has been done. The logic that management and shareholders deserve future rewards for past performance at the expense of the welfare of the rest of this billion-dollar industry, and at the expense of the sacrifice of our principle of competition in industry — that logic escapes me.

When professional football decided to move the goal posts ten yards back, did anyone argue that this should not be done because it would hurt those teams which had the better place kickers who could kick forty-yard field goals with high consistency? No. The argument was made and accepted that the move was best for the future of professional football. The application of antitrust laws is not recriminatory; the application of the law should not be withheld because of the "good job" someone has done. The application of antitrust legislation is designed only to foster future competition.

Technological Leader in U.S. Not IBM

Consider the second point concerning the technological leadership of the United States. That assertion is just plain nonsense. Technological leadership of the United States in computers came about through this country's technological leadership in electronics, gained during the war and the years shortly thereafter. The U.S. Government built the first electronic computers, not IBM. The first commercial electronic computer was built by Eckert Mauchly Corporation, not IBM. The first magnetic core system was built by MIT on the Whirlwind computer, not by IBM. The first commercial magnetic memory was built and supplied by International Tele-meter Corporation, not IBM. The first commercial solid state computer was built by Computer Research Corporation, which later became part of NCR, and was not built by IBM. The first magnetic drum device, the forerunner of all of our rotating magnetic equipments, was built by Engineering Research Associates, not IBM. The first commercial key-to-tape devices were not built by IBM. The first key-to-disc devices were not built by IBM. Even in the computer logic area, the concept of the "interrupt command" was first seen on a Univac computer, not an IBM computer. The file management system in programming, which now takes the form of our RPG systems, GIS, Ass-Ist, and MARK IV Systems, was not first developed by IBM.

Would the country have as much research if it were not for IBM's strength? If there were more competition in the industry, and if no one company had between 60 and 70% of the electronic computer business, that research being done by IBM would be spread over more organizations which are capable and that research would be much more effectively accomplished. (There is no such thing as economy of size in the research and development business; five different companies each doing \$10 million of research and development can do the job better than one organization doing \$50 million.)

You might well ask: "If competition to IBM is increased, might not that weaken IBM and threaten our world computer leadership?" I say no, as long as the competition is properly achieved. We can achieve a stronger NCR, Honeywell, Univac, and Burroughs, and we can achieve stronger peripheral companies, all of which can balance out any lack of growth in strength of IBM. Again, our leadership in computers stems mainly from the fundamental technical, entrepreneurial and financial strengths of the country rather than those of IBM.

No Contribution to International Trade

The third point related to the balance of payments problem, in other words, our strength in international trading from a strictly financial viewpoint. Again, I say nonsense. In the first place, almost all equipment which IBM sells overseas is built overseas. The only contribution to the balance of payments, therefore, is equipment components which are manufactured in the United States and sent overseas for assimilation into computer systems there. This is a small percentage of IBM's costs and a minuscule part of the exports of the United States as a whole. Keep in mind that IBM hires foreign nationals for its labor source abroad; so there is no contribution to international trade there.

The Bluest of all Blue Chips

The fourth point was that some would equate the financial success of IBM to the financial success of

Wall Street, the stock market, our financial institutions, and our capitalistic system. I maintain that just the opposite is true. The lack of competition in the data processing industry will do great harm to our financial, capitalistic system. During the heydays of the stock market of the late sixties, almost any promising young data processing company could go to a Wall Street investment banker and get him to underwrite a public stock offering. When the first bit of softness in the stock market appeared, almost all companies in the data processing industry were immediately denied access to these funds for their future financial growth. The specter of IBM and the lack of competition immediately closed the door to such financing. I have talked with many investment bankers and money managers. Almost all of them say they would not consider investment in a data processing firm except IBM. Today, only a half dozen or so hardware companies can get appropriate financing, and even in these cases, it is probably not sufficient to maintain their market position against IBM in the long run. Only a euphoric, optimistic stock market like that of the late sixties will give any data processing company ample financing in today's competitive situation. I don't know of anyone predicting the return of that euphoria.

When the reversal of Judge Christensen's Telex decision was announced, IBM's stock rose some ten or twenty points. In fact, that announcement triggered a general stock market rise in January. Some, therefore, equate IBM's financial well-being to that of the stock market. On a short-term basis, that is probably true. In other words, IBM, as the bluest of all Blue Chips, will be a short-term bellwether of sorts. But let me ask this: Without competition in the data processing industry, will there be any stock of companies in the data processing industry to buy or sell besides IBM? If IBM is totally cleared of antitrust claims, who is going to buy stock in the smaller computer equipment companies?

Less Competition Tomorrow If Something is Not Done Today

Those of you who have attended carefully and attentively to this argument have noticed one point: None of my discussion has related to whether IBM has violated antitrust laws, and none of it has related to the question of whether IBM is a monopolist. The problem we have transcends the technical problem of whether laws, as written, have been violated. The statement of the problem is a simple one: There will be less competition tomorrow if something is not done today; and this situation is not in the public interest. Enough people understanding that problem today will produce a solution tomorrow.

The drafting of antitrust legislation and the interpretation of that legislation is a highly technical problem for lawyers. Unfortunately, it is clear even to laymen who investigate the problem that antitrust legislation is very loosely drawn and is therefore subject to a wide interpretation. There are few clear-cut cases. In fact, after observing the scene for some time, I am convinced that the most important factors in antitrust cases are the particular viewpoints of the judge together with the pulse and opinion of the general public. On that latter point, for each day that passes, the public is getting better informed on the nature of the competitive problem in the computer industry. The Computer Industry Association has, in my opinion, been an effective force in achieving this. Because of this, that organization deserves support.

Another factor is that there is currently a wave of public sentiment against big corporations. The shareholder interest of large corporations often conflicts with the public interest. In my mind, there is no excuse whatsoever for a large corporation to intrude itself into our foreign policy or into the internal politics of other nations, and when it does so, it is the loser in the eyes of the public.

I said earlier that I have put forward no argument that IBM has technically violated the antitrust laws. I will say, however, that many of the arguments which have been made that it has not violated such laws have been patently without merit. One of the reasons for the Tenth Circuit Court of Appeals reversing Judge Christensen's decision was that it accepted IBM's argument that the market was much larger than Telex asserted it was. The IBM market definition would include, as I recall, about one billion dollars of revenue of AT&T. How many people can name one product or service of AT&T which competes with IBM or vice versa? This speaks of a problem which we in the data processing industry have: The public simply doesn't understand our industry. The subtleties of the industry are lost on the general public and, in most cases, on judges, however conscientious they might be. This is changing, but the capability of non-IBM segments of the industry is weakening financially, and it is a question whether those segments of the industry can keep the fight going long enough for the general public and the judiciary to understand the industry sufficiently well to right the situation.

"Arrogance of Power"

We have heard much recently of the "arrogance of power" in many of our government agencies. It is time we considered whether bigness is not in and of itself wrong, especially if it is totally unbridled. Economists are confounded by the fact that in the recent economic downturn, prices did not go down. The connection between industry concentration and inflation should be examined. Unfortunately, to many people, anything said against large corporations appears to be anti-American.

Achieving Competition

Solutions to the "badness of bigness" problem — or at least movements in the right direction — can be effected which are non-revolutionary and fit our capitalistic system: Casting antitrust legislation to reflect more directly problems of size and market share; interpreting antitrust laws more rigorously; and a graduated income tax for corporations. If we do not effect some of these changes, the country will be the loser; in the future there may be no such thing as the small technical company emerging from inventiveness and entrepreneurship. Are not these small companies (like Xerox and Polaroid once were) the real strength of our system? Are they and the competitive system which spawned them not the real reason for our technical leadership in the world today?

Earlier, I mentioned the Computer Industry Association. In my view, that association may be the only effective force operating in the country today toward achievement of competition in the data processing industry. ADAPSO certainly has contributed importantly toward this goal as well. However, ADAPSO's interests are so broad that this particular problem frequently does not receive appropriate attention.

We have an obligation to act to obtain and maintain a competitive industry. We have an obligation as citizens to insure that this important industry remains strong. We have an obligation to ourselves to protect our means of livelihood and our professional growth. We have an obligation to our employers, owners, and shareholders to protect their future. We can discharge much of that obligation by being active participants against these threatening forces.

You may regard this argument as an attack on IBM, or you may regard it as an entreaty for competition in our industry. I hope you regard it as the latter. In any case, if I have contributed to your personal data bank on this subject or if I have contributed to the stimulation of your thinking on the subject, I have accomplished my mission. □

Forum — Continued from page 8

been from the beginning of recorded history. "Manipulation of human minds" is exactly what the communists say our entire educational system does. And vice versa.

Finally, I turn to your proposal to use computers to help us dispel the fog of Newspeak. One thing concerns me above all else; you are proposing we embark on a two-way street. The government is the largest institution in our society and has access to larger, more powerful computers than does anyone else. It seems to me that computers could be used very easily and very efficiently to create fog as well as to dispel it. So, isn't the question really who sets up the dictionary and who controls its contents?

As you can see I found your editorial most provocative, but I'm afraid I don't see that an answer to the threat of Newspeak is available by any purely mechanical means. My own feeling is that we must continue to depend upon an educated public kept alert and aware by a free press. Perhaps a better application of computers would be to use them to aid in summarizing and digesting the voluminous Newspeak being issued daily worldwide. This might free up the press so that they can do a better job of fog penetration.

SIMPLISTIC REMEDIES IN A COMPLICATED WORLD

From: Ed Burnett
New York, N.Y.

I think "Newspeak" is important. I think your reminders that we get lied to often and over and over again are important.

But you need to balance part of what you say with the available proof that a good part of advertising (mind bending?) has no effect, that in a consumerist economy the public is fairly well protected by its general common sense.

I am troubled by the tone shown in the editorial to harp in simplistic terms at the capitalist world, which god knows has its mores — but makes it look as though the other side is angelic by omission. That part of the diatribe I would omit — or soften — or couch differently.

There is no doubt that: unknowing elites wish to move the United States in non-cooperative ways; and much of what the bemused public learns is too complicated to grasp.

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The Future of Telecommunications: Competition and Computers

Part 1

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"There is a collision course of computers and communications. Where will the next five years lead us?"

Introduction

A survey of the telecommunications industry reveals a series of events, practices and policy changes that at first glance appear random and unrelated. Consider the following:

- In November of 1974 the U.S. Government filed an antitrust suit alleging that Bell System had engaged in predatory conduct in response to competition from specialized carriers. The suit seeks to divest the Long-Lines division of AT&T from the Bell System and to separate Western Electric from AT&T in addition to forcing competitive buying practices by the various Bell Operating Companies. Is such a suit in the public interest?
- The General Telephone System is also beset by an antitrust suit, this time a private suit filed by ITT. ITT alleges that General Telephone's operating companies buy the bulk of their equipment from the captive manufacturing affiliates of General Telephone, thus foreclosing ITT's access to the equipment market. ITT seeks corporate divestiture between utility and manufacturing affiliates, a plea that was granted at the district court level but denied at the appeal court. The case has now been remanded to the district court and the outcome is uncertain. Will such divestiture result in the telephone customer paying higher rates for telephone service?
- IBM has announced plans to develop a domestic satellite system, a satellite oriented toward the transmission of data and computer messages between terminal devices and computer centers. The system will by-pass the local and toll facilities of the telephone communication carriers. The FCC has approved the plan subject to IBM's willingness to interconnect the terminals manufactured by other firms to IBM's systems and computers. Should a dominant computer company be permitted to own its own data-link system via satellite relay?
- AT&T is now producing a Cathode Ray Tube terminal entitled the Model 40. The tariffs for this equipment or device have been filed before the various state public utility commissions. Here we note a regulated firm filing a tariff on a computer display device. Does this mean that competitive firms must likewise file tariffs if the CRT's are to be tied into the nation's telephone system?

This article is based on Chapter 8 of the 160 page study, "The Unbundling of AT&T: Implications and Opportunities", by Dr. Manley Irwin, formerly Chief, Western Electric Group, AT&T Task Force, Federal Communications Commission, Washington, D.C. For information about the study, write to "The Yankee Group".

- AT&T recently announced a major marketing reorganization of the corporation, beginning at the corporate headquarters and extending to the twenty-three Bell Operating Companies. The reorganization will emphasize marketing and customer services, and it is not merely another change in the table of organization. What prompted Bell's massive reorganization?
- The FCC seeks to encourage customer ownership of terminal equipment and to permit such users to interconnect their hardware into the telephone dial network. The carriers oppose such interconnection unless a protective interface is required. The FCC by contrast is assessing the merits of a certification or type acceptance program. What is the proper route for public policy?

A State of Flux

What do these events suggest? If nothing else, they indicate that the telephone industry, its investment, its organization, its policies, and its practices are in a state of flux. The events cited above serve as a background to our posing two questions. First, what is the role of competition in the telecommunications industry? Second, what is to be the relationship between telecommunications and computation? In addressing the first question, we will assess the investment, organization, policy and practices of today's common carriers. We will then observe the impact of technology, competition, and public policy on the structure and future direction of the common carrier industry.

In addressing the second question — the relationship between data processing and communications — we will note that the data processing/communication mix is experiencing a three phase development. A first consists of computation and communications operating independent of each other. A second phase consists of an interdependence of computers and communication; and the third phase consists of a "blurring" of data processing and communications — for lack of a more elegant description.

Competition and the Future of Communications — The Investment of Telecommunication Carriers

Viewed in terms of assets and plant investment, the telecommunications industry dwarfs most other industries in the U.S. economy. Investment in plant investment, wire, cable, handsets, switching equipment, telephone instruments exceeds seventy-five billion dollars, and that investment continues to grow. Bell's construction budget alone is close to ten billion dollars annually, although the recession has resulted in some expenditure cutbacks.

In an overall sense, telephone plant and equipment is classified as local loop, facilities, long-haul facilities, switching equipment and customer apparatus. Local loop includes plant between the residential home and the switching office; switching embraces a hierarchy or switching center, exchange, tandem, and toll; and long-haul facilities include wire cable, microwave, and more recently, satellites. Finally, customer apparatus covers a large range of equipment and hardware ranging from handset and key systems and PBX's. Such plant is the carriers' investment upon which telephone service is rendered to the nation.

The U.S. telephone market is dominated by the Bell System, the American Telephone and Telegraph Corporation. AT&T and its 23 operating telephone companies account for 90% of the toll service in the U.S. and some 80% of local exchange service. Non-Bell companies include General Telephone, Mid-Continent, United Utilities, Continental Telephone and others. Public record service is provided by the Western Union Telegraph Company.

The operating telephone companies of these systems are licensed public utilities. That is, they are firms that receive an exclusive franchise to render service to the subscribing public. In return for this franchise, this legal monopoly is subject to review by state public utility commissions as well as the Federal Communications Commission, depending upon the jurisdictions of each.

Regulation

Regulation is an institutionalized substitute for the forces of the market place — forces which are deemed unworkable or inefficient. The regulatory agency thus must balance two forces — the interests of the consumer and the interests of the shareholder. For the consumer, the regulatory agency must insure that the rates and tariffs charges are not unjustifiably high; and for the shareholder, the agency must insure that the firm earns a reasonable return on its invested capital.

By definition, regulation borders on an art. It is certainly not precise, given the great areas of conflict between the interests of the shareholder and the consumer. It is no wonder that regulation is laden with controversy as commissions attempt to walk a fine line between the firm and the consumer.

Although admittedly oversimplified, regulation is an exercise in cost-plus. The revenues flowing to the firm must cover its cost. If costs increase, then revenues must increase. Costs in turn fall into two broad categories — operating costs and the costs of capital or return on rate base investment. Operating expenses include labor, maintenance, advertising, depreciation, taxes, contributions to charity, legal fees and the like. A dollar spent by the utility on operating expenses entitles the firm to receive a dollar back from the subscribing public.

The cost-plus nature of operating expenses is, of course, not without its own dilemma. Where is the incentive for a firm to cut and reduce expenses if such outlays can be passed forward to the customer? No one has been able to deal with this paradox or this problem satisfactorily. Assessing the reasonableness of such expenditures is obviously a challenging endeavor. In any case, the operating expenses are no small matter. In the Bell System such expenses are in excess of twenty-two billion dollars annually.

Return on Invested Capital

The other element of cost is a return on the invested capital of the carrier. This rate base investment is of no little magnitude. The Bell System's investment exceeds sixty-five billion dollars in plant and equipment and under FCC rules and regulations the utility is entitled to earn a reasonable profit on its net investment.

Determining the "used and useful" content of such a rate base is a challenging regulatory matter for in probing a carrier's rate base, regulation must assess whether that investment was made in a prudent manner, a decision that can border on the prerogatives of management. And in sanctioning the investment rate base value, the regulator must review the prices paid by the carrier for hardware, equipment, apparatus and supplies.

Although controversial, the appropriate rate of return demanded for an investment rate base boils down to whose formula one finds more persuasive. Generally the rule has been that the proportional mix of debt and equity determines the capital cost of the utility. Hence most commissions enable telephone carriers to cover cost of capital plus an increment for financial growth.

This cursory overview of the utility's rates, its expenses and its rate base serves as a prelude to a discussion of competition in the telephone industry. Competition stands in sharp contrast to the firms that exist in a market of re-entry and price competition. A competitive firm, for example, derives a pay-off for efficiency and cost reduction. That pay-off is profit. And profits are by no means guaranteed. Inattention or neglect can lead to runaway costs or expenses, and losses that can even threaten the survival of a corporate entity.

Environment of Risk

The investment decisions of a competitive firm occur in an environment of risk and uncertainty. Certainly profit rests upon economic performance and the price of performance is obviously more harsh than the investment decisions under regulation where presumably a reasonable profit is all but guaranteed.

Prices also differ between competition and regulation. Under competition the market sets the prices giving little discretion to the firm to alter such prices. Under regulation prices are filed as tariffs before regulatory agencies and the discipline of the market force is by definition less intense.

Finally the depreciation policies between regulated firms and competitive firms stand in sharp contrast. The regulated firm can often assign a forty year life to its equipment, particularly switching equipment, and depreciate that equipment over that period of time. Once equipment cost has been recovered, the firm is in a position to make another investment decision. Under conditions of competition,

however, its depreciation and economic life can change dramatically. A competitive product may become obsolete and thus prompt write-offs or a loss.

What we are suggesting is that as competition begins to impact the telecommunications industry, that impact can be unsettling and disquieting to firms identified with the relative security of regulation. The attitudes engendered in regulated industry stand at polar extremes to attitudes developed in competitive environments. Competition is susceptible to the rough and tumble of new entrants, new products, new pricing and new organizational strategies. Regulation tends to be static, orderly and more evenly paced. It is this contrast that explains much of the disarray in telecommunications, whether it be on cost, prices, the practices of the carrier or the investment decisions of telecommunication firms.

Communication Carriers: Organization, Policies and Practices

As noted above, most of the U.S. telephone companies are organized around the holding company. AT&T, and its twenty-three operating companies typify the holding company arrangement, replicated to a lesser extent by the independent telephone industry (General Tel., Mid-Continent, United Utilities, etc.) By definition, a holding company does not render telephone service to the public. Rather, a holding company owns an operating telephone subsidiary, which as a public utility, renders its services to the subscriber. The holding company also holds ownership in manufacturing firms that sell telephone equipment and apparatus. These firms are captive suppliers who sell to the member utilities of the holding company family.

The holding company thus occupies two markets. The first is the market for service that stands between the utility and the public. The second is the market for equipment that stands between the manufacturer and the utility. The holding company thus embraces both buyer and seller of equipment, and both buyer and seller are subject to holding company policies, control and practices.

Manufacturing Affiliates

The utilities, as members of the holding company, purchase the bulk of their equipment from their manufacturing affiliates. Bell, for example, buys most of its hardware from Western Electric, General Tel, its equipment from Lenkurt Electric or Automatic Electric, Mid-Continent, Continental, United Utilities follow suit given their restricted line of telephone manufacturing affiliates. The operating telephone companies, as part of the holding company, do not let competitive bids on equipment, nor do they announce their equipment requirements to outside vendors. The competitive supplier for all intents and purposes stands outside of the holding company ownership of buyer and seller. The manufacturer contained in the holding company enjoys a captive customer market and the operating companies purchase their equipment in house.

The telephone carriers do not sell equipment to the subscribers. As a long-standing tradition, the carriers lease their service which embraces both a telephone line and telephone equipment. Customer ownership of equipment, therefore, does not exist to the extent such equipment could not be interconnected to the nation's toll network. This long-standing practice prohibiting "foreign attachments" was not without its defense. The telephone carriers argued that ownership and control equipment, centralized

responsibility, prompted high quality, insured proper maintenance and expedited the innovation of new services and new equipment to the subscribing public. The carriers insisted that separation of ownership of equipment and lines would compromise telephone quality and result in higher rates to the telephone consumer. Whatever the merits of that argument or policy, the subscriber equipment market was essentially closed to outside vendors — a closure sanctioned by tariffs filed at the various regulatory agencies.

Total System Concept

In sum, the communications industry, its investment, its organization and its practices found its rationale in a total system concept. System meant control, control of research and development, of design, of marketing, of installation, of service, and of equipment retirement. The system embraced the utility and the subscriber. It embraced the manufacturer and the utility. Both markets were essentially insulated from outside penetration or competition. The buying and selling of equipment, apparatus, and services was essentially an intra-corporate transaction. By definition, the utility was a legal monopoly and the market benchmark to assess its efficiency or innovation was generally non-existent until competition began to intrude into the system concept and into the communications industry.

The Impact of Technology

The eruption of competition in the telecommunications industry can be traced to a relentless, changing technology. Today, for example, computers route digital messages among and between remote terminals; microprocessors possess logic and memory capability and increase the ability of intelligence at the terminal end of the market. Satellites route voice and non-voice signals among and between various countries as well as domestically; and micro-wave radio routes and relays voice, video, data, and facsimile signals throughout the country.

Each of these developments possesses a long history, but certainly the innovation of such technology was expedited by the research and development conducted during the second World War. Computers were identified with the army's attempt to calculate artillery tables; the semi-conductor industry was spurred by the developments in radar and sonar research; micro-wave radio found its first application in the battle of Africa and satellites trace their origin to the V-1 and V-2 rockets in the Second Battle of Britain.

The impact and momentum of technology has challenged the constituent components of the rate base or investment of the telephone carriers, namely terminals, loops, long-hauls and switching. In terminals, for example, micro-processors drive PBX's and integrated circuits have infiltrated into key telephone systems; in loops, cable television, fiber-optics and other devices act as potential substitute for existing hard wires. In the long-haul area, satellites as well as new generations of micro-wave relay pose as alternatives to wire and cable, and in switching again the ubiquitous computer is able to store and forward digital data for information and also to route analog signals.

Indeed, it is becoming increasingly difficult to identify the limits of what are the members of the telecommunications industry. Certainly this includes conventional suppliers of equipment and apparatus.

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The Universal Product Code - A Defense

Ray Boche

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"To legislate against a particular technology because an extremely small supplier may find it awkward to adopt, seems as silly as it would be to preclude the use of forklifts by larger manufacturers because they could not be employed economically by smaller manufacturers."

I have followed the development of the Universal Product Code with some interest, and I am not very enthusiastic about attitudes such as those expressed by Dr. Thomas V. Sobczak in his article (see the December, 1975 issue of "Computers and People") entitled "The Universal Product Code: An Introduction to What It Means for Consumers".

The purpose of the following remarks is to respond to a few of the frequently cited consumer concerns regarding the Universal Product Code. I am not prepared to analyze in any depth the cost/benefit considerations pertaining to the adoption of the UPC by manufacturers, wholesalers, or retailers, but I am concerned with the "great rip-off" theory as expounded by Dr. Sobczak. Since a great many of Dr. Sobczak's points have also appeared in the general news media (and in what I consider to be a similar emotionally charged vein), I will make reference to many of his specific comments.

Profit

He begins very accurately, I believe, by responding to the rhetorical question, "why develop UPC?" with "the supermarket industry had many good reasons, but they can be summed up in one word, 'PROFIT'." That does not surprise me at all, as I believe that private industry's motivation for adopting any new technology must be either directly or indirectly their opportunity to profit from its adoption. We can expect technological innovation to progress rather slowly in such areas as environmental protection until such time as our collective social conscience as consumers causes us to reflect our concern in our purchasing behavior, thus building the indirect link to industrial profit.

He may be correct in assuming a cause-effect chain from the lobbying of vested interests to action or inaction by particular governmental bodies. But, there is also the distinct possibility that our legislative bodies did not see in this new technology a great rip-off threat warranting their immediate concern. Similarly, it is possible that the extension of UPC adoption beyond grocery products may have resulted from a desire to benefit from other people's investment in standards development rather than just "to give in".

Accuracy and Verification

My own observations concerning the structure of the code and its built-in checking mechanism indi-

cate that reading accuracy and automatic verification have been well planned and carefully implemented. Of course, there are many opportunities to deliberately or accidentally interfere with the proper scanning of the symbol. In the same way, we can "fold, spindle, or mutilate" the Hollerith cards we encounter. I am not aware that research in artificial intelligence has progressed to the point that "the computer will go berserk" when encountering an input error. Neither has research brought us to the point of sophistication in pattern recognition that would allow us to read prices or other identifying information economically in the absence of a standard.

Price Marking

At the present time we are conditioned to finding price markings on most individual products. I understand that the absence of price markings on individual items is not a requirement of the UPC, but it is indeed an important part of the cost reduction potential for the stores adopting the UPC. I am certainly not opposed to price marking, and I am, in fact, a strong advocate of unit pricing, but I believe that I could become quite satisfied with both pieces of information on the shelf. (I don't seem to suffer when I select fresh fruits and vegetables from marked bins.)

Procedures for marking prices on shelves have not been particularly good in my view; but the fact that "we have always done it that way before" is no reason that a method cannot be improved. It seems to me that an image of the product label could be coupled with marking information to protect us from misshelving or sloppy shelf returns by our fellow customers. A glance at the shelf to verify that the item I am selecting matches the indicated price seems to me a small sacrifice for which I will feel amply compensated by the item identification that can readily appear on the lengthy register tape and is now unavailable.

Marginal Manufacturers

I completely reject the notion that marginal manufacturers would be affected to the point where they would "drop out of competition" as a result of the simple need to reformat their label printing over a period of several years. To legislate against a particular technology because an extremely small supplier may find it awkward to adopt, seems as silly as it would be to preclude the use of forklifts by

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Universal Product Coding: Who Profits and Who Loses?

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"The whole concept of Universal Product Coding is at this point one-sided, and the Wholesaler/Distributors are getting the best of all worlds."

Universal Product Coding (UPC) had its formal initiation into industry as part of the Grocery Industry Ad Hoc Committee Study to codify product identification within that industry. It has expanded to include the Distribution Code (DC) sponsored by the National Association Of Wholesaler/Distributors (NAW); The National Drug Code (NDC), and the National Health Related Items Code (HRI) in the United States.

UPC is multi-national in the sense that there exists in West Germany and Austria the BAN-L System and in France, the GENCOD System. Universal Product Coding is being reviewed in the United Kingdom, Sweden, Australia, and Japan.

The generic Universal Product Code is considered by its implementors to be a complete product identification system which uses an eleven digit, all numeric identification number. Typically the first six digits identify the manufacturer and the five remaining digits identify the manufacturer's item. The system has capacity for the 400,000 manufacturers, which some research showed, might need to be accommodated by a Universal Product Code.

Many Heads Buried in the Sand

An initial review of the concept of Universal Product Coding suggests that it is advantageous to everyone (manufacturer, wholesaler, distributor, and user). However, as one begins to think about the implementation of the code, one becomes aware of the consequences (unsaid and perhaps unforeseen) which could result from the indiscriminate use of the code.

To date, United States manufacturers have not objected to or, for that matter, commented publicly, concerning the effects of a Universal-type Product Coding on their operations and costs. This is strange, for it is the intention of the National Association of Wholesaler/Distributors (NAW) to put the distribution code into widespread use in the non-retail sectors of the distribution function. It is by design that the Universal Product Code used with consumer products and sold through grocery, drug, and mass merchandise/discount retail outlets is totally compatible with the distribution code.

Manufacturers will definitely be affected. It would seem that many heads are buried in the sand, thinking as it were, "If I ignore Universal Product Coding, it will pass me by". However, the Universal

Product Code concept, whether it is a distribution code, a drug code, or a health code, is gradually spreading into every definable industrial area.

"We're Being Forced into It"

As one reviews the concept of a Universal Product Code, there comes to mind the potential, caused by the cost of implementation of the code, that may restrain competition. It would seem logical that the cost of operations will increase for those manufacturers implementing a Universal Product Code. The code format will have to be added to their computer, to their packaging, into their advertising, catalogs, price books, etc. This increase in cost will move marginal manufacturers out of competition because they will not be able to remain competitively priced and still absorb the increased costs.

An example of this indirect force was illustrated in the August 13, 1975, issue of the periodical "Computerworld":

"The L'eggs division of Haines Hosiery will begin marking packages with the Universal Product Code this fall. Because all our major customers are going through Universal Product Coded Systems now or in the near future, we're being forced into it",

according to a Haines spokesman. Continuing with the same logic, the small distributor and retailer is becoming trapped in "Numberland", but, unlike Alice, will have no tea party. It can be safely assumed that manufacturers who are being forced into a Universal Product Coding will use their codes on the preprinted order forms typical in industry. The low man on the totem pole will have to have a dictionary to translate from the product designation he understood in the past to the newly coded product designation.

Big Business Profits, Small Business Suffers

The August, 1975, issue of "Code & Symbol, Volume I, Number 1" published by Distribution Codes, Inc. appropriately explains that

"The Unique item identification need take place only once. For once the unique product identity has been established in terms adequate to the supplier, the proper merchandise can be ordered, and it can complete the transit of our nation's channels of distribution without requiring any

other individual to describe, in detail, the physical characteristics of the product which is being received, stored, picked, or shipped."

It is typical that when big business profits, small business suffers. One has only to look into the catalog of any UPC coded distributor to see the applicability of the foregoing statement.

Loss of Product Identity

The Universal Product Codes so far defined are all numeric and have to be translated. So, another item which hasn't been widely considered is, what happens to product identity. Most products that are marketed have some form of significant identification. Will this form of identification be lost in a meaningless random jungle of numbers? Will this imply that years of patient effort by manufacturers and their advertising agencies to give identity and meaning to a product will be wasted? Again, there has been no statement from any advertising association or advertising agency concerning their position policy towards Universal Product Coding. Are people hiding?

Loss of product identity has a tremendous effect in that it complicates the task of purchasing that is normal to engineers and buyers. This complication, however, will at some future time disappear if the manufacturers also re-code their catalogs. But, initially, for a period of more than a year there will be dictionary reference and study required for translation from old code to new code. No one has apparently considered the cost of this extra effort to the manufacturer and to the end user. As a middleman, the distributor is passing merchandise from one point to another. He will generally have a saving.

Price Disorientation

Going still further, there has been no documentation of any research, on the part of the proponents of a Universal Product Code or those objecting to it, into the effect of non-significant random numbering on the buying habits of the user. Could it be that the middlemen have another innovation under development which depends heavily on the lack of product identification? Potentially, if an individual could buy the cheapest and sell it undefined he has a chance to increase his profit income substantially. Couple this to the thought of people, buyers, and engineers, working in a new non-significant system with the confusion of cross-referencing to an old coding system. It would appear that the potential exists for price disorientation. For example, it is easier to understand that a 1 inch wide tape costs less than a 2 inch wide tape in 100 yard lengths, than it is to understand that 678901 is more expensive or cheaper, as the case may be, than 105692.

At present there is in the grocery industry a hue and cry from consumer activists concerning the elimination of price marking on packages in the stores. This again would seem to indicate that somebody has found that price disorientation can be used to the advantage of the person selling the product. It would appear that a learning curve for consumers to accept the absence of price marking would show that the tendency to overbuy will be normal in the not-too-distant future.

Savings Are Not Going to be Passed Down

This line of thought concerning profits and methods to obtain profits leads one to believe that auto-

mation via a Universal Product Coding-type system with its ancillary scanners and computers, etc., will cause a reduction in a labor force in the wholesaler/distributor warehouse and also in the retail store. A question never publicly posed is, "Are savings going to be passed down to the end user to compensate for his extra effort?"

In recent testimony before the Council on Wage and Price Stability, Mr. John O. Whitney, president of Pathmark Supermarkets Division of Supermarkets General Corporation, stated;

"...any public corporation's source of capital for investments comes from one or more of three sources: borrowed funds, issuing stock, or increasing operating profits. With the rate of return currently being experienced in the retail food industry, the cost of borrowing capital far exceeds our current rate of return on that capital. With the diminished market values of stocks in the food retailing business, issuing new stock is not an economic source of capital. The only source open to us is to increase operating profits".

Mr. Whitney said this after listing the increases in his operating costs. This paragraph indicates that the savings are not going to be passed down.

Vast Profit Increases Predicted

The Universal Product Code oriented companies are predicting vast increases in their profits. An editorial in the "Retail Clerks Advocate" said:

For example, in a recent publication on Universal Coding, the Industry Association estimated that a \$40,000 per week retail store should expect to save \$27,000 before taxes by 1975. After subtracting depreciation cost of capital (on a \$120,000 investment) and other costs, average return after taxes on average investments over a ten year period appears to be over 30 per cent.

The annual return increases as the investment amount decreases. Manufacturers of scanning hardware and computers are reducing their cost through volume production and passing it on to the distribution industry. But, thus far, it has not passed from that industry.

Needs and Rights of Users Overridden

In the grocery industry, the middlemen and supermarkets who are staunch proponents of the Universal Product Code want to eliminate price marking. Their lobby is so strong that:

- A Maryland bill requiring price marking for example, died in a State Senate Committee.
- A price marking bill passed the Illinois House in the Senate Committee only to lose on the Senate floor by seven votes.
- Virginia legislators killed a price marking bill because they didn't feel automated check-out systems had been given a fair chance.
- New York State's price marking measure got sidetracked until 1976.

Mr. Alan Haberman, President of First National Stores, suggested that if consumers were really interested on having prices on merchandise, the supermarkets would be glad to supply grease pencils so the consumers could do the marking themselves. When an

industry group such as Wholesalers and Distributors band together and impose a Universal Product Coding type system, they (the implementors) become so strong as to override the needs and rights of the user. Another question to ponder is: "What recourse does a disorganized band of users have to the impositions by the implementors of a Universal Product Coding type system?" I tend to think that the manufacturers know the answer and are not happy with what they realize.

Increase Universality, Decrease Flexibility

Finally, the Universal Product Code presently being implemented is defined, as previously mentioned, as an eleven digit, all numeric, non-significant code. A simple question: why? Computers with their tremendous speed can handle larger codes. People are able to memorize up to sixteen digits. Research has shown that significant identification has helped manufacturers move their product because buyers reorder things that they can identify. This, as it affects the manufacturer, was not considered.

Not every industry needs the same type of coding. As an example, 200,000 gas stations selling 100 types of mechanical parts certainly need a different distribution of digits, from the twelve manufacturers supplying 18,000 different types of ball bearings. This is one argument against the total universality of the code. As you increase your universe, you decrease your flexibility and must trade off some efficiencies and economies. A second point is that the Universal Product Code control agency, Distribution Codes, Inc., has recommended a bar type coding because it was suited to the grocery industry. Might not optical character recognition be better suited to retail merchants? And magnetic ink to still other industries? The whole concept of Universal Product Coding is at this point one-sided, and the Wholesaler/Distributors are getting the best of all worlds.

Now is the Time to Participate

Before manufacturers begin to implement a Universal Product Code, they should contact their own associations and others in their industry. They should develop a position on the most efficient and economical way to utilize the Universal Product Code in their own operating environment. They should approach their distributors before the distributors approach them. They should explain what they are doing and what they want to do so that the programs can be complementary for all participants. When they have a plan, it should be discussed and debated to be sure that the Universal Product Code is in reality an industry co-ordinated code. Now, today, is the time to participate. If we as manufacturers procrastinate, the end result could be submission to needless expense and further complications in our normal operations. □

Boche — Continued from page 16

larger manufacturers because they could not be employed economically by smaller manufacturers. I am not prepared to argue the cost effect relationship relating to "savings from other supermarket gimmicks," but to the extent that the supermarket is the sum of those "gimmicks", the difference in pricing by contrast to the convenient neighborhood "mom and pop store" seems fairly apparent.

Supermarket Profits

I understand that supermarket profits are about one percent of gross sales. I am pleased to hear that the grocer's expected rate of return on invest-

Forum — Continued from page 12

Try your Newspeak on the silence over energy, over the killing of environments, over the continuous nearness of man killing man — but don't make it a diatribe against the system (even though the intelligensia can read it that way).

World Utopia — one world — the end of national thinking — is quite incompatible with capitalistic democracy. An op ed editorial in the Times recently by the president of IBM asked for cooperation between countries and international companies — because only countries (only some countries) are large enough to provide countervailing power to moderate the internationals. He didn't actually add that — but his plea for cooperation said it clearly enough. I think your editorial should underplay its apparent intent shown by the tone.

SOME FOCAL QUESTIONS

From: Neil MacDonald

Assistant Editor, Computers and People

What is especially interesting to me in this report of discussion is the significant, focal questions that are raised:

1. Can a computer actually translate Newspeak? or is the 1965 verdict that machine translation cannot work still correct?
2. Who sets up the dictionary and who controls its contents?
3. Will the government or the establishment use computers to make more Newspeak?
4. How develop an example of Newspeak related to pollution abatement controls?
5. It may not be necessary to translate Newspeak in the area of advertising because consumers come into touch with reality in a few months by sampling products. But, how translate Newspeak in the political arenas, where it takes perhaps ten years to really find out the score, as with the United States war in Vietnam?
6. Why not apply computers to measure bias (see Les Mezei's fruitful suggestions) and other aspects of one's writing and thinking? □

ment in UPC equipment may approach 35 percent. Unfortunately for the consumer, these two facts are not significantly related. (Consulting any good engineering economy text should serve to clarify this distinction for readers not familiar with this type of capital investment analysis.) A great deal of effort and coordination has been expended by an industry in order to develop standards so that an important new technology may be employed for profit improvement.

Potential for Lower Prices

As a consumer, I support that potential profit improvement. I cannot expect significant reductions in prices while supermarket profits remain at only one percent. As long as increased profits stem from operating cost reductions there is the prospect that, via competitive pressures, a portion of those profits will be passed on to the consumer in the form of lower prices. Conversely inefficiencies resulting

(please turn to page 26)

Information, Power, and Complexity

Part 2

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"Bureaucratic structure goes hand in hand with the concentration of the material means of management in the hands of the master."

4. Centralization of Power

The rapid increase in the range of social choice has been and continues to be met by increasing centralization of power. Expanding computer application in decision-making is viewed by proponents as a natural response to the need for centralization of function in complex organizations. Government, for example, is charged with the responsibility for making decisions which affect many different sectors of society: industry, labor, education, health services, etc. In order for government decision-makers to plan intelligently, it is essential for them to have access to reliable information regarding all aspects of proposed policy. Since data collection and record-keeping functions are spread among many government agencies, and the volume of information required by government decision-makers is so great, it is argued that some form of centralized information processing is required.

This argument is historically familiar and resembles the litany of reasons periodically intoned before the public to justify defense expenditures. The connection between improved administrative controls and military activities is not a fortuitous one, as Max Weber explains.

The bureaucratic tendency has chiefly been influenced by needs arising from the creation of standing armies as determined by power politics and by the development of public finance connected with the military establishment. In the modern state, the increasing demands for administration rest on the increasing complexity of civilization and push towards bureaucratization. (Weber; in: Gerth and Mills, 1946, p.212)

Computer technology forms part of the technical apparatus appropriated by the modern state to consolidate its regulatory powers. Centralized management is facilitated by the achievements of technology in transportation, communication, and now information-processing. "The bureaucratic structure goes hand in hand with the concentration of the material means of management in the hands of the master." (Weber)

The creation of information-processing systems with databanks for use by administrators and policy planners seems at first glance to have much to recommend it. There is some evidence to suggest that

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there would be considerable reductions in operating costs of many government agencies. What is more, one might anticipate more informed policy decisions and improved social services simply on the basis of the availability of more extensive and reliable information. The proponents of databanks are also aware of the dangers of possible abuse: access by unauthorized persons, either in business or criminal organizations, and manipulation by corrupt government officials for private ends. However, it is felt that the possible abuses constitute a tolerable risk which can be minimized by taking security measures to control and monitor access.

As we have indicated repeatedly, the persuasive character of information systems in government and industry derives from their ability to mitigate the effects of disorganized complexity. The modern state exists on the edge of chaos; disorder is endemic to the mass society. This is the anarchy of which Wiener (1961, p.148) spoke.

There [are] those who see nothing good in the anarchy of modern society, and in whom an optimistic feeling that there must be some way out has led to overvaluation of the possible homeostatic elements in the community. Much as we may sympathize with these individuals and appreciate the emotional dilemma in which they find themselves, we cannot attribute too much value to this type of wishful thinking. It is the mode of thought of the mice when faced with the problem of belling the cat. Undoubtedly it would be very pleasant for us mice if the predatory cats of this world were to be belled, but — who is going to do it? Who is to assure us that ruthless power will not find its way back into the hands of those most avid for it?

For the most part, the debate over databanks and computer utilities has centered about tactical considerations of the sort summarized above. The strategic impact has largely been ignored. Since the issue has such broad implications this response is not surprising. However, one is entitled to question the seductive character of the framework for tactical analysis. Does the problem in fact reduce to weighing on one hand the benefits of improved bureaucratic organization and consequent improvements in decision-making and social services, against, on the other hand, the dangers of invasion of privacy and abuse of public trust? Can we be so certain that the goals we want to achieve as a society will best be served by accomplishing these limited objectives? There is really no way to

answer this question honestly by anticipating the future. The present state of futurist projection is little better than the prophesying by diviners and oracles of old. The more prudent course calls for understanding the historical forces which have shaped our present values and attitudes, so that we may gain deeper insight into the biases underlying desired futures and perhaps influence the emergence of a desirable future.

Weizenbaum (1969) discusses some of the consequences of population growth as evidenced by what he terms the "homogenization of life styles." It is a paradox of disorganized complexity that great diversity should amount to so much sameness. For all the different models of automobiles, gadgets of every description, and liberated mores, our "life styles" are as standardized and interchangeable as the parts produced in our factories. The computer is seen as a necessary but not sufficient instrument for dealing with this condition. Although not explicitly stated, the process of homogenization is seen to be encouraged by the increasing centralization of control made possible through the use of computers. Weizenbaum's concern over the emergence of two separate cultures distinguished according to their ability to utilize computing facilities supports this view. However, it appears from the discussion that the danger of power concentration derives quite simply from inappropriate applications of computer technology. No account is taken of historical trends. Although we may ignore history, history is unlikely to ignore us.

There is a pronounced trend in the history of the modern period toward the centralization of power. Coping with the current problem requires an understanding of the underlying historical trend. Bertrand de Jouvenel (1962) describes the transformation of power in Western history.

The history of the West, from the time of Europe's fragmentation into sovereign states, shows us an almost uninterrupted advance in the growth of governmental Power. The only way of failing to see it is to fix exclusive attention on the forms which Power takes: a picture of pure fantasy is then formed, in which monarchs appear as masters to whose exactions there are no bounds, to be succeeded by representative governments whose resources are proportionate to their authority, until in the end democracy succeeds and receives from a consenting people only what it chooses to give to a Power which is its servant.

These are imponderables. But there are also ponderables — the dimensions of armies, the weight of taxation, the number of officials. The measurable scale of these implements provides an exact index of the growth of Power. Begin at the reign of Philip Augustus [king of France from 1180 to 1223]. Without taxation to maintain him, the king lives, like other landlords, off his own estate. Without an army at his command, he keeps a meager bodyguard who feed at his own table. Without officials, he depends for the discharge of public business on ecclesiastics whom he employs and on servants whom he appoints. Even his public treasury, as well as his private fortune, has an ecclesiastical home and is left in the hands of the monks who act as his bankers. Though I am his subject, my path never crosses that of this head squire; he demands no tax from me, claims from me no military service, and passes no law which can possibly affect my life.

By the end of the reign of Louis XIV, what a change is here for my countrymen! After a struggle lasting for centuries, the people have been brought to fill the royal coffers at regular intervals. The monarch maintains out of his revenues a standing army of two hundred thousand men. His intendants make him obeyed in every province, and his police harry the malcontents. He gives out laws and sets his dragoons at those who do not worship God in what he considers the right way; an enormous army of officials animates and directs the nation. Power has imposed its will. It is now no longer one small dot in society but a great stain at the center of it, a network of lines which run right through it.

An infliction, you say? Is not the revolution which overthrows the king going to pull down his structure, attack his apparatus of command, which it will partly at any rate destroy, and reduce the taxation paid by the people? By no means; instead it will introduce the conscription which the monarchy long desired but never had the strength to realize. True it is that Calonne's budgets will never be seen again; but the reason simply is that they will be doubled under Napoleon and trebled under the Restoration. The intendant will have gone, but the prefect will have taken his place. And so the distension grows. From one regime to another, always more soldiers, more taxes, more laws, more officials. (Jouvenel, 1962, pp. 127-128) /12/

McDermott (1969) confirms the trend toward centralization of power in the contemporary world; but his discussion of the rise and spread of the democratic ethos in Europe and North America appears at first glance to contradict it. However, all the contributing factors (printing press, development of transportation and communication, growth in organized means of popular social expression, etc.) which McDermott views as having narrowed the gap between ruler and ruled, served also to create a mass society in which the sovereign power of a king was replaced by the far more commanding sovereignty of the peoples' representatives. According to Jouvenel, it is in the nature of power to expand.

[It] is through the interplay of [an egoistical urge combined with the will to serve society] that the tendency of Power is towards occupying an ever larger place in society; the various conjunctures of events beckon it on at the same time that its appetite is driving it to fresh pastures. Thus there ensues a growth of Power to which there is no limit, a growth which is fostered by more and more altruistic externals, though the motive-spring is still as always the wish to dominate. (Jouvenel, 1962, p. 119)

We have already examined several instances of this tendency. The introduction of computers in large corporations has led to the centralization of decision-making (see Chapter 4). Whisler (1967) discovered in his study of effects of computers on management, that the middle ranks in the corporate hierarchy are either eliminated or have their scope of action severely reduced. The gap between top and bottom widens. Similar developments are observed in the area of governmental decision-making. There is considerable evidence to support McDermott's contention that there is a growing rift between the ruling class and the lower orders of society.

5. The Myth of Complexity

The claim of social necessity for technological development obscures the motive of those in power to consolidate and enlarge their power. Jouvenel explains how the public interest is used to justify and accomplish extensions of power.

To raise contributions. Power must invoke the public interest. It was in this way that the Hundred Years' War, by multiplying the occasions on which the monarchy was forced to request the cooperation of the people, accustomed them in the end, after a long succession of occasional levies, to a permanent tax, an outcome which outlived the reason for it.

It was in this way, too, that the Revolutionary Wars provided the justification for conscription, even though the files of 1789 disclosed a unanimous hostility to its feeble beginnings under the monarchy. Conscription achieved fixation. And so it is that times of danger, when Power takes action for the general safety, are worth much to it in accretions to its armoury; and these, when the crisis has passed, it keeps. (Jouvenel, 1962, p. 129)

The argument for further development of computer technology in administration and policy-planning may be paraphrased as follows. Society is becoming ever more complex, and thus it is necessary to make use of the computer in order to deal with the potential chaos of this complexity. Armer (1966) paints a glowing picture of the opportunities in both industry and government for effectively utilizing the speed and accuracy of the computer. Of course there are problems, but they are not insurmountable. These problems are the negative consequences of technological development, which must be faced, according to Mesthene (1968), by encouraging institutional innovation. Westin (1967a) regards the development of information systems as inevitable and desirable. This new technology is not without certain negative features (invasion of privacy, abuse of public trust, etc.), but new legislation and regulatory mechanisms can be designed to handle them. Michael (1968) focuses on the use of computers in social planning. He has some of the same fears as Weizenbaum regarding participation in decision-making, and offers up continual education as a partial solution. Fano (1972) goes much further in suggesting that a "procognitive system" such as envisioned by Lickliger (1965) is essential for the preservation of our society (see Chapter 6). That is to say, unless information is made universally accessible, we will not be able to deal with the challenge of complexity.

There is a missing component in all of these arguments, namely the fact that increasing complexity is a concomitant of, the centralization of power and not a "natural" feature of social evolution. A vicious cycle is created by the technocratic response to conditions of increased complexity. Each extension of power leads to ever greater social complexity by undermining the integrity and cohesiveness of local communities. We are paying a heavy price for our mobility. As the constraining influences of family and community weaken, there appears to be greater lawlessness and thus the "need" for centralized bureaucratic control in the form of administrators, policy planners, and police becomes evident. The claim that this is a necessary or inevitable development rests on an elitist view of social organization; it is an argument in support of special privilege. The myth of complexity consists in the conviction that we must abandon any hope of

altering the conditions on which the apparent need for further consolidation of power is based.

As indicated earlier on, the notion of complexity is not an intrinsic system property. It can only be defined for a particular aspect of a system. From an individual standpoint, the breakdown of the extended family which resulted from industrialization exemplifies the often tragic over-simplification of human relations brought about by technology. The rich kinship structures of the past have either been drastically weakened or completely destroyed. In some parts of the world, even the nuclear family is virtually extinct. Do the myriad superficial associations normally formed in the contemporary world which substitute for the deep bonds of a vanishing family life constitute a net increase in complexity? This is certainly a moot point.

There can be little doubt that centralized decision-making undermines the integrity and cohesiveness of local communities. Social institutions cannot exercise effective moral suasion unless they play a vital role in community affairs. Like most other abilities, the exercise of responsibility atrophies from disuse. If we are unwilling to take responsibility for making decisions which affect us, eventually we will lose the option altogether. Since the industrial revolution, we have moved from standardized interchangeable parts in manufacturing to standardized, interchangeable people in society. But life is not lived in the aggregate. It has taken thousands of millennia for life to emerge from the primeval ooze, for individuals to become differentiated from the aggregate. Modern civilization seems determined to crawl back into that primeval state, Asimov's (1973) direct mail advertising to the contrary, notwithstanding. The computer is just another tool in the long history of the democratization of violence. The French revolution made conscription a permanent feature of our collective experience, thus democratizing the physical violence of warfare. Now, we are engaged in the more subtle process of democratizing psychic violence through the use of computers by centralized bureaucracies.

The temptation to use a tool because it is available and there is something at hand which calls for its use is a formidable one to resist. But when the stakes are high enough, resistance to temptation becomes a virtue. One may agree that centralized policy-planning and social services require centralized databanks and information systems, and that information technology is adequate to the task of guaranteeing against the obvious abuses; and yet one may take issue with the creation of such systems. The obvious forms of abuse are not the most worrisome ones. The frightening prospect here is the abrogation of community responsibility and its consequences, namely, the exercise of overwhelming power by legitimately constituted governments. We have already compromised our responsibility for making informed judgments on many matters of local and national policy by deferring to so-called "experts." The next step if taken, would constitute a dangerous extension of Hobbesian social contract. The stability afforded by a paternalistic Leviathan may be desirable so long as potentially destructive acts are rectifiable through community action. It is certainly not clear, however, that it is possible to extend the powers of Leviathan indefinitely without sacrificing the principle of rectifiability.

Surely some revelation is at hand;
Surely the Second Coming is at hand.
The Second Coming! Hardly are these words out
When a vast image out of "Spiritus Mundi"

(please turn to page 25)

Computing and Data Processing Newsletter

COMPUTER HELPS AIRLINE OPERATE THROUGHOUT HAWAIIAN ISLANDS AND ATTAIN RECORD RELIABILITY BY NIGHT MAINTENANCE OPERATIONS

Linda Chun
Aloha Airlines
P.O. Box 30028
Honolulu, Hawaii 96820

One of the world's most unusual airlines is using a computer to help keep its small fleet of planes flying throughout the Hawaiian Islands.

We fly our seven jets on 96 daily flights along 19 different routes. We serve six airports on five islands of Hawaii. The longest flight stretches only 318 miles, and the shortest, just 47 miles, taking 16 minutes.

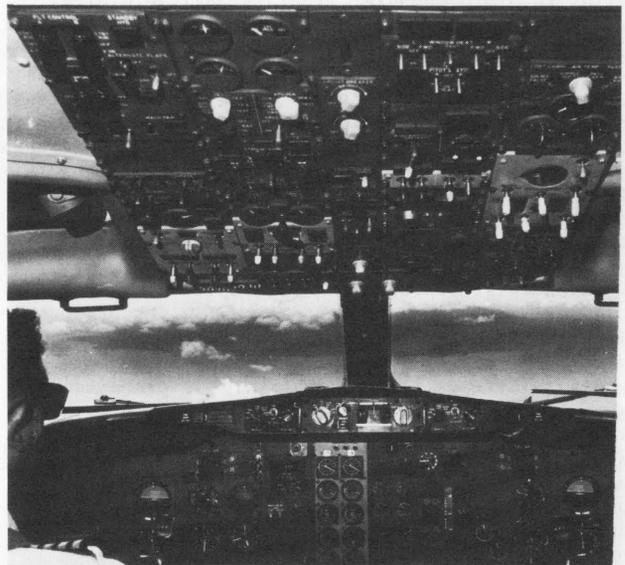
This places a heavy demand on our maintenance operations. We average 2.7 landings and takeoffs an hour, about twice the rate of other U.S. airlines. This necessitates the frequent overhaul and/or replacement of many airplane components.

We rely on our computer to maintain our parts inventory and to help us perform maintenance procedures as efficiently as possible.

The computer keeps track of available replacement parts and signals when components should be reordered. Instead of taking planes out of service for regular maintenance operations, as most airlines do, we perform maintenance at night. The planes fly between 6 A.M. and 9 P.M. each day, and then return to their Honolulu hangars. In that way, we keep them in service continuously. In daytime, there's almost always an Aloha jet in the air.

Our maintenance procedures have become so efficient that the airline has attained a 99.5 per cent reliability factor in flying scheduled flights without problems. This is the highest maintenance record in the world for the Boeing 737 planes that we fly, and has won our airline a Pride in Excellence award from Boeing. We also perform contract maintenance services for other airlines, including big international carriers that fly to Honolulu.

We're still a young company, looking forward to our 30th anniversary in 1976. As we continue to grow, we expect to expand our computer applications. For instance, we're planning to build a mathematical



Framed by instrument panels in the cockpit of an Aloha Airlines jet, the Hawaiian island of Maui looms into view.

model of our routes, so the computer can determine if we could operate more efficiently, and tell us whether to change our schedules, possibly add more 737's, or move to bigger planes.

FORECASTING CROPS USING PHOTOGRAPHIC REPORTS FROM SPACE SATELLITES

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This is a report on the development of advanced techniques for faster, more accurate forecasts of global food production through satellite photographs.

This company is assisting the National Aeronautics and Space Administration, the Department of Agriculture and the National Oceanic and Atmospheric Administration in a project known as the Large Area Crop Inventory Experiment.

The experiment involves computer analysis of satellite pictures of the wheat-growing zones of North America in an attempt to develop better means of predicting crop yields. If successful, the experi-

ment will be extended to other crops and other regions of the globe.

Information for the project originates from data recorded in bands of visible light and infra-red light by multispectral scanners aboard the earth-orbiting satellites, Landsat I and II. At Goddard Space Flight Center, this data is initially processed and produces color and black-and-white photographs for use in research studies by a wide range of organizations.

Data on the millions of pictures received is stored so that researchers can call for pictures by such criteria as frame number, date and types of atmospheric conditions.

Six hundred wheat-growing areas are under study in the experiment. One task is to precisely locate these areas in the satellite data so that changes in crops can be compared over a period of time.

The satellite pictures cover regions 100 nautical miles square. Computer programs analyze digital tapes of the satellite data, pinpoint the specific area under study, and extract the data for areas six-by-five nautical miles. The automated digital image registration system compares geographic features such as rivers, roads, and field boundaries in order to locate each study area, rather than matching areas by their lightness and darkness. The traditional light-dark approach doesn't work with crops, for they change color drastically from spring to fall.

When this preprocessing is completed, the extracted data is shipped on computer-compatible tape to Johnson Space Center for interpretation. Here computer programs will make it unnecessary to interpret the satellite data manually, and thus dramatically speed up the process. Computer programs that utilize statistical combinations of the spectral bands will automatically identify each crop and its stage of maturity. The programs operate on a special-purpose computer to overcome the problem of heavy computational loads associated with interpretive processing.

Finally, the processed satellite data is combined with information from other agencies to develop a comprehensive model for yields that will produce estimates of wheat production and other crops. NOAA contributes meteorological data from its satellites and ground stations. The Department of Agriculture supplies information on historical records of wheat yields and agricultural patterns.

SYSTEM WILL SPAN EKOFISK OIL FIELDS IN THE NORTH SEA

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After more than two years of planning, design and fabrication, acceptance tests are in progress on more than \$1-million worth of equipment that will become the computer control and telemetry system for the huge Ekofisk oil fields in the North Sea.

The system was designed by Phillips Petroleum Company's engineering department and Applied Automation, Inc., a wholly owned Phillips subsidiary that specializes in automated process control and measurement systems for the petroleum and petrochemical industries.

It will be the biggest, most complex electronic data-processing and production control, measuring and monitoring system of any offshore development, according to Applied Automation.

The heart of the system will be in a four-story building on top of the huge concrete storage tank in the Ekofisk field. Components will be scattered over 650 miles, encompassing southern Norway, Tees-side in England, and Emden in West Germany and all the offshore Ekofisk fields. Field equipment will be located on pump and compressor platforms, on two underwater pipelines and on drilling and production platforms spread over a 48,000-square-mile area in the middle of the North Sea.

There will be two virtually independent systems, with one dedicated to production operations and the other to pipeline monitoring and control.

The transmission system will be based on a "line-of-sight" micro-wave radio system augmented by tropospheric scatter and satellite systems to span the large over-water distance, and on leased lines between Stavanger and Oslo.

The system is part of the \$3-billion investment of a development group headed by Phillips Petroleum Company Norway to tap the oil and gas fields under the North Sea. Phillips partners in this group are American Petrofina Exploration Company of Norway, Norsk Agip A/S, Norsk Hydro A/S, Elf Norge A/S, Total Marine Norge A/S, Aquitaine Norge A/S, Eurafrep Norge A/S, Coparex Norge A/S, and Cofranord A/S. The project, when completed, will have the capacity to deliver one million barrels per day of oil and natural gas liquids via a 34-inch pipeline to England and about two thousand million cubic feet per day of natural gas to West Germany through a 36-inch pipeline.

The computer control/telemetry system will provide operation and surveillance of production flows from all production platforms, and selected control functions and surveillance of the intermediate oil pumping platforms and oil line and the intermediate gas compressor platforms and gas line.

The system will provide flow information for the operator in the central control facilities and perform data acquisition for material balance calculations for the entire system. It will also acquire data for the following functions: calculation of royalty payments, verification of custody transfers, calculations associated with well selection, reservoir study programs, and determination of production optimization.

It will have an emergency shutdown system located at Ekofisk Center, atop the million-barrel storage tank. The system will be capable of automatic total or selective shutdown. Scheduled shutdown can also be carried out manually. Every shutdown push-button will be scanned by computer once per second.

To prevent problems with nuisance shutdowns and voltage fluctuations, every station of the system will have stable back-up power.

A Phillips spokesman said, design criteria included the following:

- Ultimate reliability consistent with the state of the art.
- Operational and expansion flexibility.

- Compliance with regulations and restraints imposed by regulatory bodies.
- Ease of maintenance.
- Cost.

Although the hardware is from numerous sources, all of the software is either standard or custom from Applied Automation. Standard software includes Applied Automation's real-time operating systems, process input/output routines, logging routines, utility programs, telemetry service routines and cathode ray tube service routines. Examples of custom software are measurement computer-connected programs, "pig and scraper" accounting programs and emergency shutdown programs.

The system will utilize five computers, with three digital computers at Ekofisk Center serving as master stations. The largest computer will be an IBM 370/155 in Oslo on which Phillips Petroleum Company Norway leases time.

Information from Oslo, based on input from the Ekofisk field and pipelines, will be relayed through Stavanger to effect production schedules.

During the design of the communications system, several transmission alternatives were considered, including high-frequency single-sideband radio, submarine cables and satellite transmission. The high-frequency system was found to have insufficient time availability (90-95 per cent); it would support only one or two channels and had a high data error rate. Submarine cable was rejected because of its vulnerability to damage from ships' anchors and trawlers.

The tropospheric scatter radio equipment is being manufactured in the United Kingdom by Marconi Communications Systems Limited.

STIMULATING MINORITY STUDENTS TO BECOME INTERESTED IN COMPUTERS AND ENGINEERING CAREERS

Diane R. Wilson
 Department of Information Services
 Notre Dame, In. 46556

By teaching junior high school students how to play games and tricks with the computer, the University of Notre Dame's College of Engineering hopes to stimulate many minority students to consider and prepare for careers in engineering.

The project is part of a new effort launched by Notre Dame and thirteen other Midwestern engineering institutions to make pupils aware of the potential of an engineering career while they are young enough to prepare for college entrance.

Supported primarily by a \$750,000 grant from the Alfred P. Sloan Foundation, the program is known officially as the CIC+MPME, or Committee on Institutional Cooperation plus Midwestern Program on Minority Education. Each of fourteen universities forming the consortium will have the opportunity to develop its own project to encourage young minority students to prepare for engineering careers.

The decision was made to work at the lower levels of the high school grades, because this is where many youngsters lose their motivation for scholarly and college work. Because such programs are needed throughout the country, not just in the Midwest, two criteria for evaluation were transferability, that is, ease in setting up similar projects at many schools, and cost effectiveness.

In developing the program, the consortium was concerned that engineering, traditionally a profession providing upward mobility to newcomers to America and to ethnic minorities in general, has not attracted many Blacks, Hispano-Americans and American Indians.

Plans for the new program are based on several assumptions:

- Inner-city children are not exposed to engineers and engineering in their everyday experience.
- Preparation for engineering school needs to take place in secondary schools.
- Many inner-city children avoid mathematics, physics and chemistry in high school because of the presumed difficulty of these subjects.
- Parents, teachers, counselors, and administrators at inner-city schools often are not well informed about opportunities in engineering and may not recognize students with engineering talent.

Under Notre Dame's project, terminals which feed into the University computer will be placed in several South Bend junior high schools where there is a majority enrollment of minority students. Engineering faculty and students of Notre Dame will help teachers and students to understand how a computer works, suggest projects to stimulate interest in problem-solving, and sponsor programming contests among the schools. "Computers can be a lot of fun," Dr. David L. Cohn said. "You can play all kinds of games and tricks. But," he emphasized, "you can do almost nothing unless you think about it."

In addition to Notre Dame, the consortium includes Purdue University, Northwestern University, University of Illinois at both Urbana-Champaign and Chicago Circle, University of Iowa, University of Michigan, Michigan State University, University of Minnesota, Ohio State University, University of Wisconsin, at both Madison and Milwaukee, Illinois Institute of Technology and Indiana-Purdue at Indianapolis. □

Mowshowitz — Continued from page 22

Troubles my sight: somewhere in the sands of the desert
 A shape with lion body and the head of a man,
 A gaze blank and pitiless as the sun,
 Is moving its slow thighs, while all about it
 Reel shadows of the indignant desert birds.
 The darkness drops again; but now I know
 That twenty centuries of stony sleep
 Were vexed to nightmare by a rocking cradle.
 And what rough beast, its hour come round at last,
 Slouches towards Bethlehem to be born?
 (W.B. Yeats, 1924)

References

- /1/ Reprinted by permission, "American Scientist" Journal of Sigma Xi, The Scientific Research Society of North America.
- /2/ In Chapter 4, we discussed Simon's conception of hierarchy in connection with social organizations, particularly corporations.
- /3/ See Mowshowitz (1968b).
- /4/ Reprinted by permission of the Society for General Systems Research.

(please turn to page 26)

but it now embraces the electronic industry, the semi-conductor industry, the computer peripheral industry and, indeed, the computer industry itself. In a sense, the potential for competitive entry into the telecommunications industry has never appeared more promising or more real.

The Impact of Competition

Technology has sired competition in telecommunications. A first such experience occurred in the leasing of equipment by the subscriber; and a second impacted the buying practices of the operating companies. In the 1960's, subscribers began to circumvent the so-called foreign attachment rules and tariffs promulgated by the telephone company. This first began with the attachment of equipment through acoustic couplers, to the telephone network. In 1968, however, the ability for customers to own equipment received formal status. The FCC in its Carterphone decision permitted customer ownership and attachment to the telephone network, a decision that sent ripple effects through the entire telephone industry.

The effects were largely identified with the element of new competition introduced into the terminal market. The user no longer had the option of only leasing equipment and hardware from the telephone utility. Rather, the user possessed an additional choice of owning of equipment and tying it into the dial-up network. The result was that independent manufacturers began to take advantage of these market opportunities in providing telephone handsets, switchboards and key telephone systems. In less than two years the interconnect market was inundated by Japanese equipment.

It is appropriate to ask why entry took place in this segment of the market. The answer is that either the outside manufacturers could supply equipment that was lower in price than that made available by the telephone company, or that the new equipment possessed superior features than that provided by the telephone utility. Whatever the answer, users began to switch and buy and own equipment, rather than lease it from the telephone company. In so doing, they threatened the investment rate base of the regulated communication carrier.

Eruptions of Competition in Interconnection

The eruption of competition in the interconnect market also impacted the relationship between the captive supplier and the regulated utility. Now operating companies felt themselves under pressure to retain their customers and to salvage their investment rate base. As a reflex action they turned naturally to their own captive suppliers. But if the captive suppliers' products did not manifest the right price or were too expensive, or did not possess the right features, the operating company could not introduce equipment that would retain the loyalty of its customers. If that product was found wanting, in price, features or cost, the operating telephone company felt an urgency to turn to outside suppliers manufacturing equipment that would enable the utility to satisfy the needs and requirements of its business customers.

However, a third party intervening within the confines of the holding company was a serious matter. For one thing, the intrusion threatened the basic structure of the holding company organization and control. Regarding the competitive supplier as a

threat, the holding company responded with a series of policy strategies geared to counteract market intervention.

One such recent policy was to centralize the procurement of hardware and equipment at corporate headquarters, thus discouraging outside suppliers from contacting each operating telephone company individually at its own geographical location; other policies focussed on tariff cutting, reorganization, and a new emphasis on marketing.

In sum, market competition carried with it two implications to the telephone industry. One was the interjection of rivalry in the subscriber market. The second was the introduction of market entry into the operating telephone company market in its choice of equipment.

Competition in turn spurred a response on a broad front — new services, new tariffs, new pricing, new organization and an emphasis on marketing. At the same time, AT&T called upon the FCC and the state regulatory agencies to declare a "moratorium" on competition on grounds that market rivalry compromised the common carrier principle and was contrary to the best interests of the business and the residential customer.

(To be continued in next issue)

Mowshowitz — Continued from page 25

- /5/ This approach is similar to the procedure followed by the parlor game "Twenty Questions," where one must identify an object by a series of questions.
- /6/ The technical details are beyond the scope of the present discussion; see Mowshowitz (1968a).
- /7/ For a comprehensive treatment of the subject, see Ash (1965) or Gallager (1968).
- /8/ More precisely, an ensemble is a set of messages with an associated probability distribution.
- /9/ From "Problems of an Industrial Society" by W. A. Faunce. Copyright 1968 by McGraw-Hill Book Company. Used with permission of McGraw-Hill Book Company.
- /10/ This is essential to the growth of "convivial tools." See Illich (1973).
- /11/ Reprinted with permission of Macmillan Publishing Co., Inc. From "The Collected Poems of W. B. Yeats" by W. B. Yeats. Copyright 1924 by Macmillan Publishing Co., Inc., renewed 1952 by Bertha Georgie Yeats.
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Boche — Continued from page 19

from failure to take advantage of technological innovations can only lead to relatively higher costs (read higher prices) in the long run. This is a clear case in which the application of computer technology can only benefit people! □

GAMES AND PUZZLES for Nimble Minds – and Computers

Neil Macdonald
Assistant Editor

It is fun to use one's mind, and it is fun to use the artificial mind of a computer. We publish here a variety of puzzles and problems, related in one way or another to computer game playing and computer puzzle solving, or

to the programming of a computer to understand and use free and unconstrained natural language.

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

NAYMANDIJ

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

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

NAYMANDIJ 762

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

MAXIMDIJ

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

MAXIMDIJ 762

• ÷ ∴ + * ○ • ÷ ∴ + X ○ *
 ∴ + ■ ○ ☾ ○ + • ÷ ∴ + -
 * ○ * • ÷ ∴ + * ○ * *

NUMBLES

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

NUMBLE 762

I T I S		L A T E T O
x T O O		+ W A T E R
E I L P S	=	L T A E R T
E I L Y S		
I I S A S		
= I C E Y R L S		P W = Y C

66059 13025 8271

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

SOLUTIONS

NAYMANDIJ 761: Column 16: 5, 7

MAXIMDIJ 761: There is a salve for every sore.

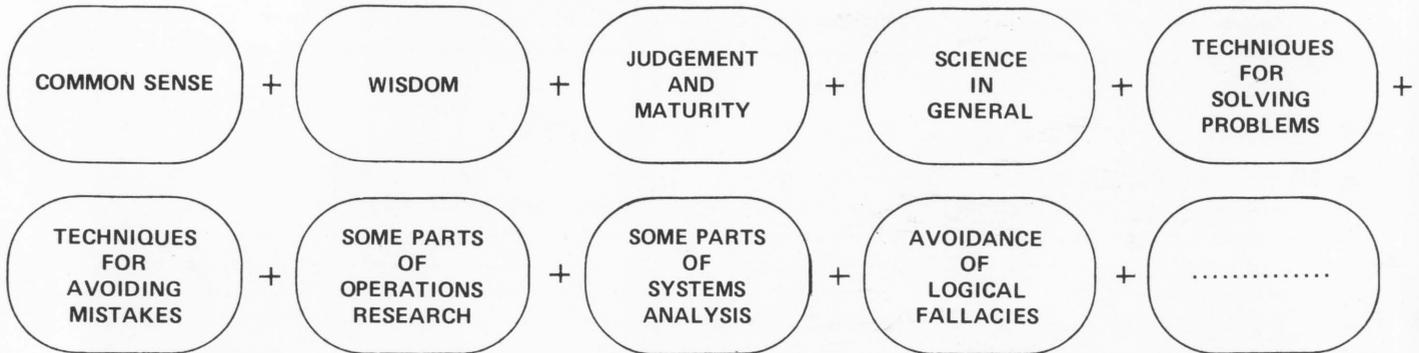
NUMBLE 761: Much honey, many moths.

Our thanks to the following individuals for sending us solutions: Leon Davidson, White Plains, N.Y.: Maximdij 7512 – Pat Tischhauser, Columbia, Md.: Naymandij 7512; Numble 7512 – Leonard Sixt, Somerville, N.J.: Maximdij 7512; Numble 7512 – Edwin W. Hayes, Upper Marlboro, Md.: Maximdij 7512; Numble 7512 – T. P. Finn, Indianapolis, In.: Maximdij 7512; Numble 7512 – Abraham Schwartz, Jamaica, N.Y.: Numble 7512 – L. R. Chauvenet, Silver Spring, Md.: Naymandij 7512; Maximdij 7512; Numble 7512.

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

8

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LOGIC is important —

But this field is more important than logic, because common sense plus wisdom plus science in general is much broader than logic.

WISDOM is important —

This field can be reasonably called "the engineering of wisdom".

COMMON SENSE is important —

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

SCIENCE is important —

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

MISTAKES are costly and to be AVOIDED —

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

MONEY is important —

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Ignorance

To Come

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Distraction
Gullibility
Failure to Observe
Failure to Inspect

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The Concept of:

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Rationalizing
Feedback
Model
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Evolution
Niche
Understanding
Idea
Abstraction

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