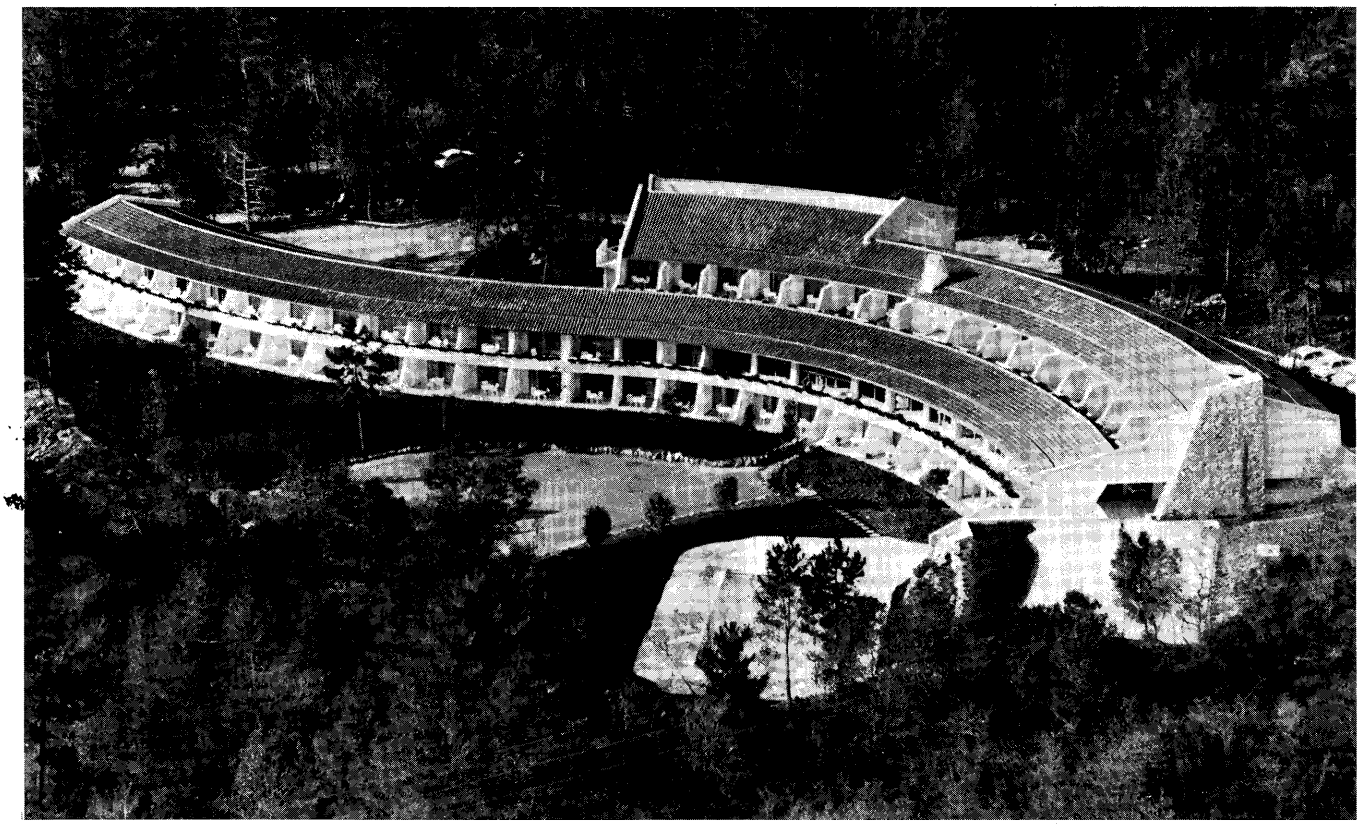
computers and people

March, 1978

Vol. 27, No. 3

formerly *Computers and Automation*



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To Come

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"RIDE THE EAST WIND: Parables of Yesterday and Today"

by Edmund C. Berkeley, Author and Anthologist

Published by Quadrangle/The New York Times Book Co., 1974, 224 pp, $6.95

The Fly, the Spider, and the Hornet

Once a Fly, a Spider, and a Hornet were trapped inside a window screen in an attic. For several hours they walked up and down, left and right, here and there, all over the screen. They could look through the screen at the summer woods, feel the summer breezes, and smell the summer smells; but they could not find any hole to pass through the screen to the woods and fields so tantalizingly close, yet so far away.

Finally they decided to hold a conference on the problem of getting through the screen. The Fly spoke first, and said, "My Colleagues, ...

The Fox of Mt. Etna and the Grapes

Once there was a Fox who lived on the lower slopes of Mt. Etna, the great volcano in Sicily. These slopes are extremely fertile; the grapes that grow there may well be the most delicious in the world; and of all the farmers there, Farmer Mario was probably the best. And this Fox longed and longed for some of Farmer Mario's grapes. But they grew very high on arbors, and all the arbors were inside a vineyard with high walls, and the Fox had a problem. Of course, the Fox of Mt. Etna had utterly no use for his famous ancestor, who leaping for grapes that he could not reach, called them sour, and went away.

The Fox decided that what he needed was Engineering Technology. So he went to a retired Engineer who lived on the slopes of Mt. Etna, because he liked the balmy climate and the view of the Mediterranean Sea and the excitement of watching his instruments that measured the degree of sleeping or waking of Mt. Etna. The Fox put his problem before the Engineer . . . .

The Fire Squirrels

Scene: Two squirrels, a young one named Quo, and an older one named Cra-Cra, are sitting by a small campfire in a field at the edge of a wood. Behind them hung on a low branch of a tree are two squirrel-size hammocks. Over each of the hammocks is a small canopy that can be lowered to keep out biting insects. It is a pleasant summer evening; the sun has just recently set, and the stars are coming out: ——

Quo: Cra-Cra, you know I don't believe the old myths any more. Tell me again how it really happened.

Cra-Cra: Just this: we received our chance because they dropped theirs. It is as simple as that.

Quo: In other words, they were the first animals to use tools, and we are the second?

Cra-Cra: Yes. There is a mode of surviving in the world . . . .

Missile Alarm from Grunelandt

Once upon a time there were two very large and strong countries called Bazunia and Vossnia. There were many great, important, and powerful leaders of Bazunia who carefully cultivated an enormous fear of Vossnia. Over and over again these important and powerful leaders of Bazunia would say to their fellow countrymen, "You can't trust the Vossnians." And in Vossnia there was a group of great, important, and powerful leaders who pointed out what dangerous military activities the Bazunians were carrying on, and how Vossnia had to be militarily strong to counteract them. The Bazunian leaders persuaded their countrymen to vote to give them enormous sums of money to construct something called the Ballistic Missile Early Warning System, and one of its stations was installed in a land called Grunelandt far to the north of Bazunia.

Now of course ballistic missiles with nuclear explosives can fly any kind of a path all around a spherical world, and they do not have to fly over northern regions. But this kind of reasoning had no influence on the leaders of Bazunia who wanted the money for building BMEWS. Nor did it have influence on their countrymen, who were always busy, trying to make money — in fact often too busy to think clearly . . . .

---

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Vol. 27, No. 3
March, 1978

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

"Computers and People," formerly "Computers and Automation," is published monthly, 12 issues per year, at 815 Washington St., Newtonville, MA 02160, by Berkeley Enterprises, Inc. Printed in U.S.A. Second Class Postage paid at Boston, MA, and additional mailing points.

Subscription rates: United States, $11.50 for one year, $22.00 for two years. Canada: add $1 a year; elsewhere, add $6 a year.

NOTE: The above rates do not include our publication "The Computer Directory and Buyers' Guide." If you elect to receive "The Computer Directory and Buyers' Guide," please add $12.00 per year to your subscription rate in U.S. and Canada, and $15.00 elsewhere.

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computers and people

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NOTICES

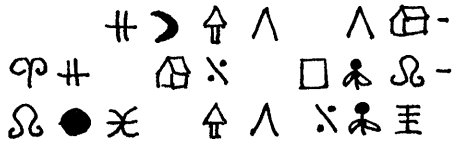
1. The *Computer Directory and Buyers' Guide* for 1977 will be entitled the *1977-78 Computer Directory and Buyers' Guide.* We hope and expect that it will be printed in March 1978. We regret the delay, recently added to by heavy snowfalls in the Boston area.

2. Our subscription entry and renewal operations have been in disorder and disarray during the latter part of 1977. We hope and expect that the conditions will be corrected and in proper order by March 1978. If you are a subscriber, and you have failed to receive any issues that you are entitled to, please let us know at once what issues you are missing, and we will send them to you as soon as possible.

Edmund C. Berkeley
Editor

Front Cover Picture

The new Sperry Univac International Executive Centre offers a pleasant environment for the presentation of seminars on computers and management. See page 24.



Key

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Editorial

The Value of Timely Information — And Heavy Snowfall

Until February 1978, I do not think that I ever fully appreciated the value of timely information. Information, knowledge, often has an exceedingly great importance. Just as oracles were useful to the ancients, so our current day oracles are useful to us.

Two recent experiences have thrust upon me the prodigious value of timely information. One was an involuntary stay in and near Chicago's O'Hare Airport which lasted 53 hours on January 19 and 20. Cause: a big snowfall in Boston. The other experience was an involuntary confinement without motor car travel in the city of Newton which began on Tuesday, February 7. At present writing (Saturday, Feb. 11), it has endured five days. Cause: a much bigger snowfall in the Boston area.

The tribal authorities of this society are making appropriate tribal noises each day about lifting "next day" the ban on travel which prevents almost all workers from going to their place of business in the morning and returning from it at night. But the physical indications that I see are that the Boston metropolitan area is a long, long way from the kind of free travel that existed up until the middle of Monday, February 6. At present writing, Otis St., where I live, which used to be wide enough for three cars, is now only wide enough for one car. Also, apparently all secondary streets in Newton are still only wide enough for one car, with about four or five feet high of solid, compacted snow banks on either side.

Item: On Jan. 20 at about 6 a.m., a big planeload of passengers due in Boston at 8 a.m. landed in Chicago because the Boston airport was closed. The airline said "call this number to make further arrangements." After I reached emergency hotel accomodations, the number was busy, busy, busy, busy more than 20 times and could not be reached. Frustration from lack of information (LOI).

Item: I returned from the hotel to O'Hare Airport. I stood in line for an hour to find out when Boston would probably open and on what planes I might go there. I discovered that I had no standby ranking; so I had lost four hours of ranking. I also found that I had no precedence and that I could make no reservation for flying out until late that night. More frustration from LOI.

Item: I thought I was staying at "the" Holiday Inn. I found out that there were over 20 Holiday Inns in the O'Hare area! and that I did not know which one was mine — because the hotel key did not have the name of the hotel on it! More frustration from LOI — so much for only 3 episodes of some dozen in O'Hare Airport.

Item: In Boston on Feb. 9 I learned of a phone number in the local police station that could be called for permission for emergency travel. But the number was busy, busy, busy, busy. More frustration from LOI.

Item: Since the number was continually busy, I drove, on Feb. 10, to the police station and stood in line (half an hour's wait). I was refused permission to pick up some medicine at Newton-Wellesley Hospital and return to my house a mile away. But the Civil Defense and Red Cross would do it instead! So I drove my car back to my house illegally, subject to a $500 fine and a year in jail. More frustration from LOI.

Item: From my own observations, it is plain and clear to me that all the single car lane passages through the snow in the Boston area must become temporary one way streets, for there are neither machines nor money enough to restore them soon to two way streets. However, there appears to be no recognition by the tribal authorities that this could quickly convert a very difficult situation into a much less difficult one. More frustration, this time not from LOI but from lack of common sense.

Information systems sometimes become heavily overloaded in crisis situations. A volume of input funnelled into an information system may become more than ten times what it usually is. This kind of crisis input should be analyzed. A large part of a heavy overload of input information could be handled by common sense decisions made beforehand.

For example, instead of giving just a busy signal, the system could describe to the person calling how he can receive various kinds of messages, then he could dial further numbers for further information.

Only a relatively small amount of sensible planning to deal with heavy and unusual overloads would reduce enormously the frustration coefficient of customers.

Edmund C. Berkeley

Edmund C. Berkeley
Editor

The Japanese Economic Challenge: Is There Equity?

E. Floyd Kvamme, Vice Pres.
National Semiconductor Corp.
2900 Semiconductor Drive
Santa Clara, CA 95051

"This situation is intolerable to trade partners of Japan because it implies that a Japanese worker has a larger right to employment than a worker in a competing American plant."

Competition

I like competition. I like the semiconductor business. We're a people business. We're a multinational business. Fundamental to business and competition is understanding the rules. My remarks in this article will be based upon two premises: first, that business within each country of the world should be conducted in accordance with the laws of that country and that trade between countries should respect those laws; secondly, that in the international trade arena the developed countries of the world should, according to expected norms, establish trade policies which by and large result in balanced trade with a balanced product mix.

Imbalance

When one considers U.S.-Japanese trade for the past decade, however, balanced trade has not existed. Figure 1 shows the imbalance in U.S.-Japanese trade during the years 1974 through 1977, with the 1977 total being estimated at an $8 billion deficit. It further goes on to show the currently forecasted imbalance in 1978 at approaching $10 billion. These data alone, however, do not show the entire picture in trade between the two countries. If we look at the imports from industrialized countries into three specific countries, the U.S., West Germany and Japan, we see that Japan imports only 20% of their total imports from industrialized countries. The United States, on the other hand, imports 53% of its imports from industrialized countries and West Germany's industrialized imports are 66% of their total. Thus, the primary imports of Japan, which are expected to roll up a positive trade balance of $17 billion this year, are in fact raw material or agricultural products. When one examines Japanese imports from the U.S., only two items among the top ten could be considered manufactured goods; U.S. imports from Japan, however, are overwhelmingly manufactured goods. There is, therefore, a trade imbalance not only in raw dollars but also from the standpoint of raw material versus finished manufactured goods. In the course of this discussion, I will utilize a number of quotations from various Japanese individuals to demonstrate their views on the matters being discussed here, and then comment on them from my point of view.

Based on a talk at the Semiconductor Equipment and Materials Institute, Palo Alto, Calif., December 1977.

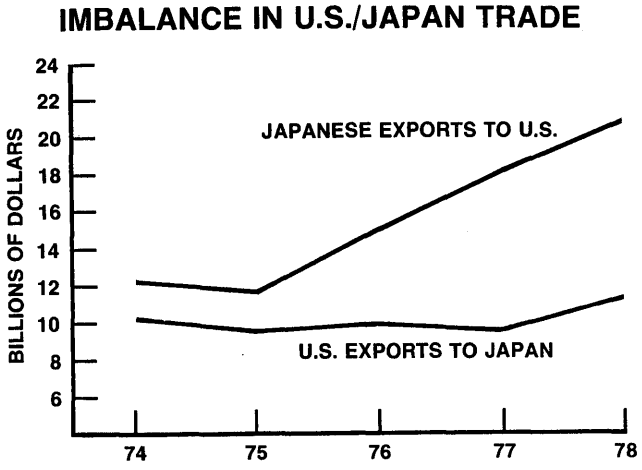

Figure 1

A Planned Economy

First, what is the root of the basic problem? The Japanese will argue that their economy is "not a planned economy." /1/ Comparing Japan with the United States would certainly lead one to refute this contention. The Japanese government has:

1) Protected the Japanese internal market from penetration by U.S. firms;
2) Provided direct financial assistance to Japanese firms;
3) Organized research and development on a joint industry and government basis;
4) Given liberal tax concessions for export trade;
5) Concentrated its attention and resources on specific programs such as the electronic data processing markets and the semiconcuctor portion of that market (VLSI Program); and
6) Has consistently and vigorously promoted the domestic and international commercial interests of Japan.

To illustrate these actions of the Japanese government I will use four specific examples. One example would be the situation that surrounded the inquiries by the International Trade Commission (ITC) when examining the American television market. The ITC received a response from the Ministry of International Trade and Industry (MITI) in Japan, which contained as part of their response to ITC questioning the following two paragraphs:

> Thus, MITI directed Japanese television manufacturers, including the present Japanese defendants, to enter into an agreement under article 5.3 of the export and import trading law with respect to minimum prices and other matters concerning domestic transactions relating to exports to the United States, and further directed the exporters to establish a new regulation to be observed by the members of the Export Association with respect to filing of export prices and other related matters pursuant to the association's functions under Article 11, Subparagraph 2 of the same law regarding the same exports.
>
> Had the Japanese television manufacturers and exporters failed to comply with MITI's direction to establish such an agreement or regulation, MITI would have invoked its powers provided for in the export trade control order under the Foreign Exchange and Foreign Trade Control law in order to unilaterally control television sales for export to the United States and carry out its established trade policies.

The control of the Japanese export situation evidenced in that response is much more dramatic than seen in this country. Implications of the response include price setting and market share determination for products sold in the United States.

Testimony of Zenith Corp.

Clearly, U.S. laws, and not MITI, should control agreements of this type. The situation surrounding this MITI involvement in trade relative to television sets from the mid-60s on through 1977 is contained in the testimony of Mr. John J. Nevin, President of Zenith Corporation, before the International Trade Commission. During those presentations, Mr. Nevin made it clear that if that same agreement had been signed by American manufacturers, there would have been criminal anti-trust prosecution against them.

A second example would be the telecommunications market within the United States and Japan. The telecommunications market is an excellent example of a case where Japan has arranged to protect its internal market from penetration by U.S. firms. Japanese telecommunications manufacturers have been very active in the U.S. market for many years. Central office equipment for control of telephone systems utilizing Japanese equipment have been installed by a number of the American telephone companies, including Southern New England Telephone, South Western Bell, Michigan/Ohio Bell, and Central Telephone Company. In addition, the Japanese have installed numerous PBX systems throughout the U.S. that utilize Japanese manufactured equipment.

Japanese Protection

In Japan, however, only Japanese-made components can be used in the equipment used by the Japanese Telephone Administration (NTT). The Japanese have effectively shielded their internal market from access by American suppliers. This is a very key point to semiconductor suppliers since the telephone industry represents a major opportunity for the application of advanced semiconductor technology. Telecommunications requirements are, in fact, much more at the cutting edge of our industry than are the requirements for most defense projects.

A third example of Japanese protection of their internal industry would include their handling of patent matters. In Japan, an opposition procedure exists within the patent office. Under this procedure, applications believed allowable by a patent examiner are published, opposition and third parties may then oppose the grant of a patent. It is common practice for Japanese companies to oppose patent applications filed by U.S. companies.

In the United States, however, the patent laws are much more liberal. As a matter of fact, the U.S. recently further liberalized their law by entering into a new patent cooperation treaty with Britain, West Germany, Switzerland and several countries in Africa. The treaty provides for a single international patent application to be filed: ideas filed under this procedure would be protected in the dozen or so countries that are participants in the treaty. Japan is notable by its absence in this type of agreement. This illustrates the openness of patent protection in the United States and the much more difficult relative situation within Japan.

Lifetime Employment

Lastly, the Japanese are very proud of their practice of lifetime employment for all personnel who are hired by Japanese companies. Indeed, this is a very admirable trait of their business posture. In a recent appearance before the National Press Club of Japan, however, the Vice Minister for International Finance, in a lengthy statement regarding the trade policies of Japan and his reasons for substantial control of the exchange rate of the yen, explained that "With this much black ink, the exchange rate goes up and, from a foreigner's viewpoint, this should cause the emergence of some industries that can't make ends meet by exporting, leading to such companies withdrawing from exports and gradually creating a balance in a nation's international payments. That is what the textbooks teach."

"But with Japanese practices of lifetime employment, it's not that easy to fire workers and shut down plants. Here, flexibility is limited." /2/

"Japan, Incorporated"

He goes on to explain that in the Japanese situation, production continues and export markets are sought for the product. The natural extension to these comments is that products are in fact dumped on foreign markets to absorb the effects of this lifetime employment policy. This situation is clearly intolerable to trade partners of Japan because it implies that a Japanese worker has a larger right to employment than a worker in a competing American plant.

Thus, considerable evidence exists that the Japanese economy is very much in the control of the Japanese government. Actually, the term "Japan, Incorporated" is a very appropriate way of viewing that economy.

Outlook for Computer and Semiconductor Industries

Moving now from the discussion of the basic problem, I would like to discuss the outlook for the electronics industry in general and the computer and semiconductor industries in particluar, relative to the Japanese.

It is important for all of us to recognize (as two members of the Japanese computer industry recently pointed out in the "IEEE Spectrum") that "the Japanese government considers computers strategic national products, and so has guided manufacturers into avenues of research and development designed to meet the needs of the Japanese economy in both the domestic and export markets." /3/ In the same issue of "IEEE Spectrum" persons involved with the semiconductor industry pointed out that "a key element in the growth of Japanese semiconductor technology is the close cooperation among industry, the academic world, and the government." /4/ It is common enough to discuss the role of MITI in the establishment of the VLSI program in Japan, but it must not be forgotten that numerous sources of government aid exist there. These are: (1) MITI; (2) NTT, the previously mentioned telephone administration which is heavily responsible for the current position of Japanese manufacturers in memory components; (3) the Ministry of Education, Research and Culture; and (4) the Japanese Technologies Agency. Specifically, the VLSI program is a concerted effort to establish the Japanese electronic data processing industry at the forefront of computer capability in the 1980s.

Objective: Worldwide Computer Dominance

From available reports, it is clear that the objective is worldwide EDP dominance. Support in the hundreds of millions of dollars, with most recent figures at $350-400 million for the semiconductor portion of the program, has been committed to a combine of the largest computer and semiconductor companies in Japan. NTT, with its internally protected market, is part of the combine.

It is important for us to recognize that this program is only now being launched; it has not yet succeeded. American technology is fully capable of reaching or surpassing the objectives laid down for VLSI, but we fund research and development with internally-generated profits. Our profits need to be achieved from open competition in a free and equitable international marketplace. If we support a continuation of trade imbalance, government subsidy, and acknowledged "dumping" as national policy in Japan, then we will be hard pressed to continue the level of investment required to insure that semiconductor technology so critical to a wide range of American industries (EDP, telecommunications, automotive control, not to mention defense) is available.

Free Trade, Not Quotas, Not Barriers

What then, are some of the solutions to the overall problem of balanced trade between our countries? We seek this objective. We in the semiconductor industry, and at National Semiconductor specifically, are not interested in trade quotas; we are not interested in added trade barriers; we are advocates of free trade. We believe that trade barriers of all types, whether tariff or nontariff barriers, should be eliminated. We believe that balanced trade should occur between developed countries of the world. And, we believe that international trade should be based on equitable treatment for all competitors in a given market.

More Exports or Less Imports

There are really only two alternatives that have any merit: the United States could increase its exports into Japan, or, secondly, it could limit its imports from Japan. In March of this past year, the solution proposed by Prime Minister Fukuda was that Japan would in fact take an active role in increasing the level of its imports. However, subsequent to that time, MITI has stated that the Japanese economy is not currently strong enough to absorb more imports. Thus, the commitment which was made by the Prime Minister has not been carried out.

Figure 1 certainly shows that the Japanese purchases of American goods has stagnated. A major trading company official argues that "Japanese people are uncertain about the future; they are willing to deposit their money, but not to spend it." /5/ Another trading company official argues that "the best way to narrow Japan's favorable trade balance with the United States is to have Japan step up its direct investment here [in the U.S.]." /6/ This would not necessarily be in the best interests of the U.S. economy. Testimony before the ITC showed that in the Matsushita acquisition of Motorola's television assets in 1974, in spite of its pledge to protect the jobs of the Motorola employees, 4,300 of the 6,700 people employed by Motorola had been laid off by the end of 1976.

Only Available Solution: Cut Back on Imports

Thus, it appears that the only available solution is to cut back on the level of imports from Japanese sources. U.S. industry must be the prime mover in any such action in that ultimately they are the purchasers of a large amount of the imported product. The accomplishment of a reduction in import purchases can only come through intelligent self-restraint on the part of executives throughout industry as they weigh the arguments related to the inequities which result from a distorted balance of trade over an extended period of time. I would propose that "zero based purchasing" be applied to requirements where the vendor is Japanese. We are not proposing to reduce our imports to zero; we are proposing that they must be cut to half the level that they are at today in order to provide for balanced trade in the absence of increased U.S. exports to Japan.

Swift Action

Furthermore, the U.S. government, I believe, must act swiftly in resolving this trade imbalance issue. I think a number of steps are open to the government. First, I believe that the establishment of a cabinet-level trade position (called, perhaps, the Secretary of Trade) is vital to the future interests of the United States. The Japanese have been very successful in coordinating their trade policy through the

(Please turn to page 17)

Technology Transfer in Transition

W.S. Anderson, Chairman
NCR Corporation
1700 S. Patterson Blvd.
Dayton, OH 45479

"Many Third World countries tend to look upon technology transfer as simply a new, more subtle form of colonialism."

Technology Transfer

Technology transfer is truly in a time of transition. It is a transition which has far-reaching repercussions, not only in terms of national security but for American business and especially for the industries represented at this conference.

I bring to these discussions no quick and easy answers to the difficult political and economic questions which technology transfer poses. Indeed, in this subject, we face problems of almost infinite complexity. But they are problems we cannot afford to ignore.

From West to East: From Developed to Developing

As you know, there are two major areas of technology transfer that are foremost in the news today. These are technology transfer from the West to the East, to use the geographic distinction, and technology transfer from developed nations to developing nations.

I should like to concentrate on those two areas rather than the third category of West to West technology transfer, because I believe they present the most immediate and most critical challenges — both to government and to business. Let's look first at a few of the economic reasons that have made technology transfer such an important issue.

U.S. Trade Deficit

The United States will report this year a staggering trade deficit of almost $30 billion, and the outlook for next year is even bleaker. Meanwhile, unemployment in the U.S. remains stubbornly high at almost 7 percent. In view of these developments, I think we all would agree that America needs to expand its foreign trade rather than restrict it. And in today's technological world, expansion of foreign trade inevitably means an increase in technology transfer.

Yet, the fact that the world trading system is in trouble cannot be disputed. Last year the volume of international trade grew more than 10 percent. Last year's growth will be only about half that rate, and a further reduction is anticipated for 1978.

Based on a talk before the Conference on Technology Transfer in Transition, Washington, D.C., Dec. 1977.

U.S. Exports

Not too many years ago, exports accounted for only about 5 percent of this country's Gross National Product. Foreign trade was not all that important to the United States. Today, however, exports represent almost 10 percent of all this country's goods and services, and they provide jobs for some 8 million Americans.

Despite that growth in exports, this country's competitive position in the international marketplace has seriously eroded. In 1958, for example, the United States' share of the world's manufactured exports was 28 percent. Today that share has shrunk to 20 percent. In fact, according to a recent study by the General Agreement on Tariffs and Trade, manufacturing output in the Western nations as a whole has been virtually flat since 1973. In contrast, manufacturing output in developing countries has been growing at 6 percent a year during the same period.

U.S. Decline in Research and Development

Meanwhile, the percentage of U.S. Gross National Product devoted to research and development has steadily declined to the point where, in many industries, the technology of other Western nations equals, or exceeds, our own technology.

These are disturbing developments. They suggest that we face not only the problem of achieving more intelligent control of the transfer of our technology, but also the problem of stimulating the further growth of that technology.

I have touched on a few of the economic incentives to develop a comprehensive national policy that fosters the export of products and technology. But what about the risks of such a policy?

The Department of Defense has pointed out the promotion of international trade and the protection of national security are not always reconcilable objectives, and that the United States must safeguard

its current technological edge in certain key areas which have potential military applications.

"The Rope Which Will Hang Capitalism"

I strongly endorse this position, and I'm sure all of you endorse it as well. We live in a divided and dangerous world — a world in which technology has become the cornerstone of national security. And contrary to Lenin's prediction, we do not advocate supplying the rope with which capitalism will eventually be hanged.

Our dilemma, therefore, is not disagreement with the principle of controlling the transfer of critical technology, but rather a lack of consensus as to what should be controlled, and the absence of a consistent national policy on how that control can best be achieved.

What is technology transfer? Is it primarily a transfer of the ability to develop and manufacture an industrial or military product? Or is technology transferred, in effect, when that product is sold to another country?

Guidance for the Department of Defense, from the Bucy Report

According to the Bucy Report, which was prepared for the guidance of the Department of Defense, products are simply the end result of technology. What really counts is the transfer of the know-how to design and manufacture those products. Based on that conclusion, the Bucy Report urged that control of technology transfer should therefore focus on proprietary technologies rather than the export of end products. Specifically cited were such areas as co-development and co-manufacturing agreements, the sale or licensing of manufacturing or technical data, the training of personnel, and the sale of turnkey manufacturing plants.

In fact, the Bucy Report points out that the sale of U.S. products, in contrast with the sale of technology per se, tends to produce long-term national benefits. The reason is that product sales generate profits, which in turn provide funds for increased research and development, thus helping to preserve technological leadership.

Unfortunately, the question of technology transfer from the West to the East is complicated by the fact that no single nation has a monopoly on research and development capabilities. If the United States doesn't supply a given technology, some other country probably will.

Western Europe and Japanese Technology

We have all seen evidence of this, as Western Europe and Japan have made strong and successful invasions into world markets previously dominated by the United States. And these aggressive international competitors have proved not only that they can match U.S. technology, but that they can successfully market the products of that technology as well.

Since we cannot expect to bottle up a given technology for any extended period of time, should we therefore exploit that technology to the limit even though it may come back to haunt us? It is a difficult question and obviously one for which there is no universal answer.

The Regulatory Maze

Currently the United States has the most stringent controls over the export of high-technology products of any Western country. Yet, lack of standard criteria and a jungle of conflicting interpretations make it extremely difficult for U.S. industry to assume a responsible position in the transfer of technology to Eastern countries.

The regulatory maze is at times ludicrous. It is not surprising, for example, that the Office of Munitions Control requires a special permit for the export of cryptographic devices. What is surprising is that the regulations for such exports do not differentiate nonmilitary cryptographic devices from those that have military implications. As a result, our industry cannot export automated bank teller machines containing data encryptors without first obtaining a munitions license. The fact that the National Security Agency has determined that this type of product is totally "benign," to use their own term, makes no difference. The drawn-out licensing procedure must nevertheless be followed.

I cite this example not as a criticism but as an indication that it is time to clearly define the rules governing West-East technology transfer, to apply those rules consistently, and to modify them when and if circumstances change.

100 Critical Technologies

There are encouraging signs that the government is beginning to move in that direction. Currently under review by the Department of Defense are more than 100 so-called critical technologies, to determine which of those technologies should be more closely controlled. Meanwhile, the Department of Commerce's Office of U.S. Export Control is studying, on a country-by-country basis, both the risks and benefits of technology transfer. The Department of State is currently preparing for the next round of negotiation of the Coordinating Committee on East-West Trade (CoCom), which, as you know, was established to control technology transfers by NATO countries and also Japan to potential adversaries. And in Congress, the House Subcommittee on International Policy and Trade is holding hearings on the present export licensing process.

Based on these and other inputs, the National Security Council is preparing recommendations for the President which hopefully will clarify this country's posture on many aspects of technology transfer.

Order out of Disorder

These efforts by both the executive and legislative branches to bring some semblance of order out of the present disorder merit the support and cooperation of private industry. But at the same time, many of us are apprehensive. We have a nagging fear that what will finally emerge from these somewhat overlapping efforts will be over-regulation of technology transfer. If that happens, there is always the possibility that in curing the disease, the doctor will have killed the patient.

If, for example, the Department of Defense interim policy of requiring the licensing of critical technology transfer to any country prevails, the United States' competitive position in key world markets will be seriously jeopardized.

Questions Without Existing Answers

In addition, such a course would raise other serious questions for which, to my knowledge, no answers presently exist. As only one example, suppose an overseas subsidiary of a U.S. company develops a so-called critical technology which it proposes to export. In such as case, would that technology be subject to U.S. licensing requirements?

One must also question whether the subsidiaries of U.S. multinationals can, over the long run, remain viable competitors with local companies if their U.S. parent is not allowed to transfer its technology to its subsidiary operations.

Certainly everyone concerned with the technology transfer process — and that includes government as well as business — needs a clearer idea of whether critical technologies developed for commercial products have contributed, or could contribute, to the military potential of a possible adversary. To date we have seen little evidence that they have. In fact, one could argue that no country can afford to build its military capability around dependence on foreign technology. If there is evidence to the contrary; I am sure that industry would be zealous in policing its own transfer processes.

Export of Obsolete Technologies?

The Department of Defense has stated that insofar as West-East transfer is concerned, the fact that a given technology is obsolete by U.S. standards is beside the point. What matters is whether it would significantly advance the receiving country's military potential. But is the issue really that simple, in view of the pace of today's technological advances?

Obviously, the determination of what constitutes critical technology is a crucial and still only partially answered question. The current listing, for example, includes technologies pertaining to memory, distributed data base systems, large-scale integrated circuits and plasma displays. In view of the widespread capabilities in these areas of technology, it is doubtful that their export by American companies would provide a competitive edge to potential adversary countries.

The Department of Defense acknowledges that it is dealing with a moving target, and says it will continuously update the list of critical technologies and/or end products whose export will require licensing in order to protect national security. This is a commendable goal but one that is more easily stated than achieved, especially in the absence of hard evidence that a given technology is or is not being utilized for military purposes. And of course that kind of hard evidence is difficult to obtain due to the fact that most military developments are shrouded in secrecy.

What Helps and What Hinders National Security?

As new guidelines for West-East technology transfer are developed, one hopes the developers will remember that this country's current technological edge in many industries is due in large measure to the fact that ours is still a relatively free and open economy. If additional controls restrict international sales to the point where return on investment becomes minimal, the nation will pay a high price for that regulation. Many industries will substantially reduce both their overseas investments and their investment in research and development, with a resultant adverse impact on future technological development. And in the long run, that could be counterproductive to national security.

Finally, I wonder if our concept of national security is broad enough. Should it not extend well beyond military capability and the control of critical technology transfer? What about our national policy as it pertains to investment and thus to the long-term strength of our economy? I have already mentioned the declining percentage of GNP currently going into research and development efforts. Concurrently, this country's industrial plant continues to age. The result is that we are lagging behind our international competitors,in several key industries, in terms of efficiency and annual productivity improvement.

The United States clearly needs to encourage greater investment in research and development and the replacement of obsolescent plant and equipment. It needs to stimulate the investment of more venture capital — the kinds of investment which in the 1960s led to the development of much of the exotic technology used in today's military systems.

I have touched on only a few aspects of the problem of technology transfer from West to East. But I think it is apparent that the issues raised by that problem cannot be resolved by simplistic slogans, or by the unilateral actions of government alone. Additional government-industry interchange is mandatory if the best interests of the United States and its people are to be served.

Technology Transfer from Developed to Developing Nations

All nations agree on at least one point: Capital and technology are the primary ingredients for economic growth and improved living standards. But, unfortunately, both capital and technology are in short supply in most of the world's developing countries. The capital needs of these countries are universally recognized. Progress in meeting those needs has been slow, but progress is being achieved. Can we say the same about their acquisition of needed technology?

I doubt it. Even as developing countries strive to acquire more technology, the technically advanced countries grow increasingly apprehensive of sharing their industrial and scientific knowledge.

The Know-How "Monopoly" of Western Nations

The reasons for this approaching impasse are not obscure. Many developing countries, for example, believe that the current process of technology transfer tends to perpetuate the know-how "monopoly" of Western industrial nations.

Poorer nations also fear they are paying too high a price to acquire technology, thereby worsening their already critical balance-of-payments problems. And finally, they feel they are at the mercy of developed countries because their lack of technical expertise precludes negotiating fair and equitable agreements involving technology transfer.

Thus, many Third World countries tend to look upon technology transfer as simply a new, more subtle form of colonialism.

In a growing number of cases this is prompting legislation which seeks to regulate technology transfer by brute force. Restrictions on licensing payments, the duration of agreements, and the supplier's proprietary rights are typical of such legislation. Frequently, governments cancel at will agreements previously entered into in good faith by both parties. And at the international level, various "codes of conduct" are being advanced as cure-alls for the developing countries' technological gap.

That's one side of the picture. But consider the almost diametrically opposed viewpoints of technology suppliers:

For the most part, these are privately owned companies which, rather than enjoying a monopoly, operate in fiercely competitive markets. They understandably worry about the boomerang effect of sharing expertise they have acquired at heavy expense. This same concern is shared by their governments, which feel that accelerated technology transfer will seriously impact employment levels and tax revenues.

In addition, technology suppliers and their governments question whether hard-pressed developing countries understand that reward for innovation is the mainspring of any free-market economy, and that any weakening of such rewards saps the economic vitality of both the supplier company and country.

The controversial facets of technology transfer are further complicated by widespread misunderstandings.

Many developing countries view technology transfer as a business in itself. But is it? Multinational corporations that develop and manufacture products abroad, thereby transferring technology, do so to compete in markets they cannot effectively cover through exports. Technology transfer is thus subordinate and largely incidental to their basic business objectives.

Also, business management does not own the technology for which developing nations are clamoring. It belongs to shareholders, who feel no compulsion to scatter that technology around the world and who expect a reasonable return on the investment they have made on its development.

How Does New Technology Take Root?

An additional question posed by technology suppliers is whether the expertise being sought by many developing countries can actually take root and produce the economic fruits that are envisioned. Does a country in an early stage of industrial development have the trained people, and the necessary technical infrastructure, to produce the most powerful computers, the fastest aircraft, the most efficient atomic power plants, and the newest miracle drugs?

Assuming such latent capability exists, does it make economic sense for them to do so? Where will the markets to provide the essential economies of scale come from?

And can the sought-after technology actually make a meaningful contribution? The machinery and know-how to create a massive highway system is of little use in a country with virtually no motor vehicles.

Interdependence

Unfortunately, in many developing countries there is only a fuzzy definition of national objectives and widely differing opinions regarding the types of technology most urgently required. A major objective of almost every country, for example, is economic self-sufficiency. But what country is self-sufficient? Even the United States, which is generally regarded as the world's richest and most technologically advanced country, is heavily dependent on other nations.

Perhaps the most difficult aspect of the problem is that many fields of technology today are changing at a fantastic pace. A generation ago the blueprints, tools, and know-how for the production of a small business machine could be readily transferred to almost any country. That technology was then usable for 10 to 15 years. This is no longer true. Today, the technology of the business equipment industry is moving so rapidly that by the time a small computer system could be put into production in some countries it would already be obsolete.

New Levels of Understanding

Can the gap between the world's potential technology suppliers ever be narrowed? I believe it must be, not only for obvious humanitarian reasons but because the economic and political future of much of the world hangs in the balance. If this is to be accomplished, new levels of understanding will be required on the part of both suppliers and potential users. As a first step, developed countries must face up to the need for developing nations to improve their living standards, through more productive employment and other benefits of industrialization.

Developed countries, which have so successfully marketed their products and services worldwide, also face a new kind of selling challenge. It is to convince the developing countries that there are valid reasons for a supplier to maintain reasonable control over the transfer of his technology and for receiving fair compensation for its use. In addition, countries and companies with exportable know-how must recognize that it cannot long be hoarded. A technological advance provides the innovator with only a temporary competitive edge. Thus, if a developing country cannot get the technology it wants from one source, it can eventually get it from another.

The "Forcing" of Technology Transfer

It is a paradox that most technologically advanced countries, including the United States, lack overall national policies on technology transfer to developing countries. Yet no reasonable government or company questions the necessity for developing nations to achieve economic progress, or the vital role of technology in that evolutionary process.

And what about the developing countries? Too often they assume that their intense desire and obvious need for technology justify "forcing" its transfer. But in almost every case such measures are self-defeating. Mounting local government intervention in the transfer process only makes delivery

(please turn to page 18)

The Police Information Network of New York State

R. Natnanson
Racal-Milgo, Inc.
8600 N.W. 41st St.
Miami, FL 33166

"The significance of this inquiry system is that response time, the length of time it takes the computer to process the user's inquiry, is less than 5 seconds ... and usually only 1 or 2 seconds."

Chronology

The need for rapid teletype communications and retrieval of stored information became a necessity for the New York State Police in 1964. At that time, a study of the manually operated message switching system indicated that operational delays and mechanical inadequacies existed which could only be remedied through the use of a computer-oriented system. A request for such a computer system was made to the New York State Division of the Budget. After approval was granted, specifications for a computer system were published in June, 1965.

In September of 1965 an award was made to the UNIVAC Corporation and early the next year a UNIVAC 418-11 Computer System was installed. The use of this system was a breakthrough in New York State's data processing history, because it was the first successful operational real-time system installed in a New York State agency.

In February, 1968 an extensive survey was begun by the Division of State Police in cooperation with the Division of the Budget concerning the the functioning of the computer system. As a result of the Budget Management Unit study, it became evident that the success of the New York State Police Computerized Communications System had resulted in overloading it beyond its effective capabilities and required functions.

In the best interest of the State and of Law Enforcement in the State, specifications were released, with Division of Budget approval, for a flexible third generation computer in January, 1970. Computer manufacturers were asked to present proposals for a system scheduled for installation by April, 1971. In May, 1970, the RCA Corporation was selected as the successful vendor and early the following year an RCA Spectra 70/60 third generation computer system was installed in the New York State Police Headquarters in Albany.

System Description

The New York Statewide Police Information Network (NYSPIN) provides the State of New York with a functional statewide law enforcement communications network comprised of many sub-systems. This permits the New York State Police to fulfill its obligations under Section 217 of the Executive Law.

NYSPIN serves over 396 on-line terminals (with an estimated addition of 200 more terminals by Fall of 1978) in addition to four existing county systems having 187 terminals.

These include:

1) State and Municipal agencies throughout the State.
2) Criminal Justice agencies
3) Federal Bureau of Investigation (FBI)
4) National Auto Theft Bureau (NATB)
5) Federal Bureau of Narcotics
6) Federal Bureau of Customs

In addition to the terminals mentioned above, NYSPIN is computer-to-computer interfaced with the:

1) National Crime Information Center (NCIC) in Washington, D.C.
2) National Law Enforcement Telecommunications System (NLETS) in Phoenix, Arizona
3) Department of Motor Vehicles (DMV) in Albany, N.Y.
4) Division of Criminal Justice Services (DCJS) in Albany, N.Y.
5) New York City Police Department
6) Erie County Central Police Services

The NYSPIN Computer Center is equipped with the following series 70/6 hardware:

2 X 70/6 CPU
2 X 4 Selector Channels
5 X 262k Memory (Switchable)
2 X 8097-020 Console
1 X 70/234 Card Punch
1 X 70/237 Card Reader
1 X 70/242-30 Printer
1 X 70/243-31 Printer
1 X 70/310-23S/1 Switch
1 X 70/310-27S/1 Switch
1 X 70/432-2 Dual 30KB Tape
2 X 8442-002 Dual 60KB Tape
1 X 70/473-208 Tape Controller

Based on a report, "New York Statewide Police Information Network," prepared by the New York State Police, 1977.

8	X	DASS 8440 (800 Mega Bytes)
4	X	5521 M/C Switch
5	X	70/668 CCM
66	X	70/720-21 Buffers
22	X	70/721 Buffers

NYSPIN Sub-Systems

NYSPIN combines capability, versatility and flexibility, virtues which are not usually found in a message-switching system of this complexity and size. For example, it gives users guaranteed message delivery. Upon acceptance of a correctly coded message, the system shoulders complete responsibility for the proper transmission of the message. Every message is assigned a number that will allow retransmission in cases of garbled output or suspected message loss.

From a functional viewpoint, the NYSPIN system may be considered as consisting of two sub-systems; the Message-Switching and the Inquiry systems. This distinction is made because the Inquiry System normally handles only certain designated types of messages and has response times different from the Message-Switching System.

The sub-systems provide NYSPIN users with the capability of directing intrastate messages, utilizing its data base, initiating broadcast messages and communicating with other linked computer systems. A station can send direct, point-to-point messages to any other terminal in the system and can also access the NYSPIN, NCIC, DCJS nad DMV systems. A user may inquire of the system for a record and within seconds receive a response. In addition, updating the data base files is performed directly from the terminal.

The NYSPIN System

From the central computer in Albany, messages are received, switched, and files accessed and updated. Messages destined for out-of-state are switched to the NLETS computer center in Arizona. Inquiries are made to the files of DCJS, DMV and NCIC as well as NYSPIN. In addition to a complete system monitor at the central computer center, control points throughout the state monitor a given area to combat communications problems.

Message Switching System

The computerized Message-Switching System provides for continuous monitoring of the terminals in the system. This provides a means for determining if a terminal may send or receive a message.

The system is used by any of the over 280 subscribing agencies to transmit and receive normal point-to-point messages. Terminal users have the additional capability of transmitting to a large number of terminals simultaneously through the use of group codes. When a message is transmitted by a terminal, this system receives the message, examines it, and stores it until the proper function associated with the message can be performed. This entire process is accomplished in a matter of microseconds.

When generating a message, terminal operators follow certain format requirements. Specifically, the text of a message is preceded by the NYSPIN header. The header is minimal in size and consists of set character fields which distinguish addresses and functions to be performed. The Message-Switching program examines the message header, validates it, and determines the correct routing for the message.

Inquiry System: 2 Seconds

The Inquiry System controls terminal inquiries made by the NYSPIN user into the computer data base. The significance of this system is that response time, the length of time it takes the computer to process the users inquiry, is less than five seconds. In fact, users inquiries generally are processed in 1 to 2 seconds!

For example, a police agency may inquire into the computer concerning a suspected stolen vehicle. Once received, the computer checks the vehicle in question through its stolen car file or its license plate file. These files presently contain over 200,000 wanted vehicles and lost or stolen registration plates. In less than five seconds the computer checks this entire file and sends a reply to the original inquirer.

The backbone of the Inquiry System is the NYSPIN Data Base. This is the computer's files. In addition to querying these files, users, through interfacing with other computer systems, are able to access the files of other state and national agencies. Additionally, the inquiries are assigned priorities according to the type of inquiry. This insures that more serious inquiries are processed first. For example, an inquiry concerning a wanted person would be processed before an inquiry concerning suspected stolen securities.

Data Base File Sets

The following types of information are stored as file sets within the NYSPIN data base. A user may access any of these file sets through the Inquiry System:

1. Vehicle File:
   a. Unrecovered stolen vehicles, vin-plates, aircraft, snowmobiles and dune buggies.
   b. Unrecovered stolen major automobile components.
2. License File:
   a. Unrecovered stolen or missing license plates.
   b. License plate numbers of vehicles wanted in conjunction with felonies or licensed through the use of fraudulent papers.
3. Gun File:
   a. Lost or stolen serially-numbered weapons.
   b. Weapons recovered for which no lost or stolen report is on file.
4. Article File:
   a. Individual serially-numbered stolen property items.
5. Securities File:
   a. Stolen, embezzled, counterfeited or missing serially-numbered identifiable securities. Also included are warehouse receipts, travelers checks and money orders.
6. Boat File:
   a. Unrecovered stolen boats providing the vessel is registered or documented and there is a permanent identifying serial number affixed.

Interfacing Data Base

The NYSPIN user not only has access to the NYSPIN Data Base, but as previously noted, he also has access to other computer data bases through interfacing with other computer systems.

Each computer system has distinct interplay requirements, buffer capacities, hardware interface constraints, inquiry processing time frames and format considerations. For example, a police agency checking a stolen firearm would automatically have its teletype inquiry routed to the NCIC data base in Washington. This, in effect, makes the NYSPIN system national in scope. The following systems are interfaced with NYSPIN:

National Crime Information Center (NCIC): This is an inquiry/response system containing national files on stolen firearms and property, stolen vehicles, wanted persons, missing persons and criminal history.

Department of Motor Vehicles (DMV): This inquiry/response system consists of extensive files on all vehicle registrations and driver licenses for the state of New York.

Division of Criminal Justice Services (DCJS): This is an inquiry/response system containing files on criminal history.

National Law Enforcement Telecommunications System (NLETS): This is a message switching and inquiry/response system allowing DMV checks and message dissemination on a national basis.

Mobile Digital Application

NYSPIN became the first state law enforcement agency in the nation to provide a digital communications link between a mobile terminal and a base station data file. The mobile terminal in use, mounted in the front seat of a troop car, consists of a typewriter-like keyboard with a visual display screen, similar to a TV screen, and a printout unit.

These versatile, easy to use mobile terminals with rapid, error free message transmission, provide the patrolling officer the capabilities to send or receive messages, and to access the files of NYSPIN, DCJS, DMV, NLETS and NCIC. With the information of these files at their fingertips, officers are able to act rapidly and with greater safety. Transmissions can be made car to car or to any terminal on the NYSPIN system. As each message is sent from the mobile terminal, the unit's status is recorded. In case of an emergency, a large red button on the keyboard can be depressed which will automatically transmit an emergency request for assistance. With this mobile terminal, a Trooper need not use his radio to check on the status of a stolen vehicle or suspected felon. He need only only type the vehicle plate number or the persons name. The message enters the appropriaterdata base and a "hit" would both illuminate on the screen and be printed out. This entire procedure is accomplished in less than ten seconds.

In conclusion, the NYSPIN system has transcended the physical boundaries of law enforcement jurisdictions and allows agencies to communicate and share data in a common effort to improve the effectiveness of law enforcement in New York State. It has been established that readily available information, used as an extension of the law enforcement officer's individual resources, is a highly effective aid in combating mobile criminal elements. It is toward this end that the NYSPIN System is dedicated.

Additionally, criminal justice agencies have the capability through NYSPIN to retrieve the information necessary for their effective and efficient operation.

From the New York "Daily News," Feb. 5, 1977:

COP COMPUTER NETWORK HELPS PUNCH OUT BAD GUYS
by Ted Belknap

Albany — The woman stopped the luxury car on the shoulder of the Thruway in response to the siren. She had been speeding. A state trooper, following procedure, called in the number on the woman's driver's license and registration.

At the trooper's home barracks at Schuyler, a fellow lawman typed the numbers into a computer terminal. In seconds, the memory banks of the computer answer that the woman is wanted by a sheriff's department in New Jersey for drug-implement possession and armed robbery. In addition, the car she was driving had been reported stolen.

One of 225,000 Transmissions

The trooper's inquiry was one of 225,000 transmissions handled daily by the New York Statewide Police Information Network (NYSPIN), a large and sophisticated computer system housed in Building 22 of the State Office Campus here.

The response of the computer system was a "hit," an answer led to an arrest. The system's hit ratio is about 5%.

340 Terminals in State

There are 340 terminals of the computer system at state police barracks and local police stations throughout the state. Some of the terminals have been installed in troop cars. Local police pay a rental fee for use of the terminals.

The terminals feed into NYSPIN equipment housed under tight security on the ground floor of Building 22. About 50 state police employees work in the climate-controlled rooms full of blinking machines and television screens.

Connected with other Storage Banks

NYSPIN not only files information gathered by the police in this state, but is connected with the storage banks in Washington, D.C. and Arizona to obtain national crime information. It also connects with the computers of the Department of Motor Vehicles crosstown in Albany, and with departments in all other states and Puerto Rico.

Apart from motor vehicle and driver records, NYSPIN can file and retrieve information on wanted and miss-

ing persons, fraudulent documents, pistol permits and registration numbers of boats and appliances.

Director Denies Danger from "Big Brother"

Is NYSPIN really Big Brother?

No, says Fred Frank, director of data processing. "The system doesn't deal with arrest records, and once a case is cleared, such as a stolen car, the information is expunged," Frank said. "I see no area in which someone's civil rights could be infringed."

Two information factors are needed to identify a person, but those two factors can be any combination of the information on a driver's license. If only a name is fed to the system, the system will respond with every identical name it has on record with accompanying information, grouped, for example, by age or color of hair or geographic zone. A name might be the only one filed, or, in the case of John D. Smith, there will be enough to fill up the screen with addresses for quite some time.

Incomplete License Numbers

Incomplete license-plate numbers are sometimes reported during hit-and-run cases. They can be submitted to the system and groupings will be fed back. If all but the last digit of the plate number are known, the grouping, for example, could include all red cars with those digits.

Here are some recent NYSPIN "hits":

Two troopers from the Leeds barracks in Greene County checked a disabled car occupied by six people. A computer check showed that two of the persons were wanted for armed robbery in Florida.

Rangers at Norrie State Park arrested a man armed with a loaded shotgun. He was taken to the state police barracks at Rhinebeck, where an inquiry was made. NYSPIN replied that the man was wanted in New Jersey for rape, two accounts of armed robbery and larceny.

A state police patrol out of Chazy in the Adirondacks stopped a driver at 3 a.m. for various traffic violations. According to a computer check, the man was wanted in New York City for murder.

Speed is a Protection

Police report the system not only helps them in making arrest, but protects them with its speed. By calling in a plate number, a police officer can obtain information in seconds about the car's owner before leaving his prowl car. Criminals are more nervous, and more dangerous, in a lengthy road check.

A secondary benefit is that the innocent motorist is not unduly tied up.

The top users of the system are the state police and the New York City Police Department, although other agencies are slowly catching up. □

Kvamme — *Continued from page 9*

MITI organization. I am not proposing that a cabinet-level position would be as successful in this country or in fact have the same powers as MITI does. But it would at least place in a single government agency the responsibilities that are now spread throughout three or four cabinet positions. The Secretary of Trade would be held responsible for ensuring that the United States proceed vigorously in the direction of balanced trade with each of its trading partners, particulary balanced trade with developed nations.

Anti-Trust Provisions

Secondarily, I believe that reviews of the anti-trust provisions of U.S. law, the investment-tax incentives for critical industries, and the entire question of support of basic technology would require modification by legislative action. We have not encouraged historically government involvement in the semiconductor industry. I am not proposing that government involvement is the only solution to our problem. However, unless we have government involvement or support which is at least partially competitive with the support that Japanese companies receive from their government, we will have a very great deal of difficulty maintaining the position that we have established in the past two decades in the semiconductor industry and beyond that in the computer and data processing industries. It is estimated that the balance of trade for technology items from the U.S. is favorable at this point in time. That very favorable balance of trade will be eroded much as the balance of trade for consumer goods was eroded, unless we carefully and forcefully impress upon our own industry and government the inequity of the competitive stance being faced by the computer and semiconductor industries, and thus the semiconductor equipment manufacturing industry of the United States.

The job faced by government in negotiating this matter will not be easy. We should not continue expecting that our position in negotiating a balanced situation will be easy.

Different Rules for Different Teams

To quote again the Japanese Vice Minister of International Finance from his appearance before the National Press Club, "Japan is not likely to adjust its economy to fit the American/European pattern." The context of these remarks indicates that they expect to continue to be active in the international trade arena but that they are not planning on changing their procedures.

We cannot survive in a world where the rules are different, favorable for Japan and unfavorable for the U.S., for the opposing teams in the same game.

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Anderson — *Continued from page 13*

of the technology more difficult and thus more expensive. And local regulations that cause suppliers to lose control over their own technology, or seek to force its transfer at bargain-basement prices, only serve to diminish or shut off entirely the flow of know-how.

Technology transfer can be compared with a marriage. The partners in any marriage agree to live together for better or worse. The marriage cannot long survive if either partner rushes off to the divorce court the first time there is disagreement.

Nor can the marriage thrive if one partner is constantly and arbitrarily changing the rules. Yet this is happening with increasing frequency in many developing countries. The technology supplier is simply informed that if a change in rules is not followed, he will be expropriated or otherwide penalized.

Any Government Can Write the Rules It Chooses, and Change Them Anytime

Despite the vaunted power of multinational companies, such disputes are a conflict between unequals. Any government, no matter how small the country, can write any rules it chooses and the most influential company is helpless to prevent the change. And under those circumstances the "marriage" quickly becomes a fiction.

It should therefore surprise no one that technology suppliers tend to look before they leap. Expertise is their most valuable asset. It they are going to share that expertise, they understandably seek out only those marriages in which there is balance in the give-and-take relationship, and a good chance for a lasting relationship.

Needed: Discussion and More Discussion

An essential step to narrow the current technological gap among nations is to establish more direct, more continuous dialogue between the developed and the developing countries. Little will be accomplished by white papers or codes of conduct which reflect only the views of one government or group of governments. Any business relationship — and technology transfer is essentially a business relationship — must be mutually beneficial and mutually nurtured.

Unless such relationships are permitted to develop, those countries with the bulk of the world's technology will have little or no incentive to transfer their technology, and thereby help to correct the present imbalance among nations. And those countries with too little technology will be thwarted from gaining the economic development they seek and require.

The Most Important Issue: A More Satisfactory Technological Balance

Former Secretary of State Kissinger said recently that "No issue is more important to the future vision of international order than the ways in which the world will manage the output and distribution of goods and services." To carry that thought an additional step: No issue is more important to managing the world's output and distribution of goods and services than achieving a more satisfactory technological balance among nations. It is an elusive goal but one we need to strive for. □

Newsletter — *Continued from page 26*

that The Northern Trust is in violation of the Bank Holding Company Act due to an illegal tie-in requirement between cashier checks and payroll data processing. Northern has its customer payroll data processing done by Automatic Data Processing-Midwest, Inc., a subsidiary of Automatic Data Processing, Inc., of Clifton, New Jersey.

STAT:TAB contends that the tie-in requirement has caused it to lose clients and prohibits its ability to gain new customers for its payroll services. Late last year, The Northern Trust entered into an agreement with ADP for ADP to take over the processing of Northern's payroll customers and jointly market these data processing services in the Chicago area. Northern, it is alleged, receives a percentage of the revenue generated by this agreement. Further, the suit claims that The Northern Trust has refused to sell cashier's checks to customers for payroll purposes unless their payroll is processed by ADP.

In October of 1976, STAT:TAB filed an antitrust action against ADP in the United States District Court in Chicago. The suit for $25 million in damages and subject to trebling is still pending. In that suit, ADP is charged whth attempting to obtain a monopoly in Chicago and eight other metropolitan areas, by various acts, including the purchasing of payroll data processing business from banks, including The Northern Trust. □

Spelling and Reading English Phonetically:

Gradual Change Accomplished by Computer, and the "Soundspel" System

Edward Rondthaler
Chairman of the Board
Photo-Lettering, Inc.
216 East 45 Street
New York, NY 10017

"Thanks to recent typographical and computer developments we can simplify our reading matter first — in successive stages over a number of years."

A Society that Depends on Widespread Literacy

In America, those of us who can read and write English have built a society that depends on widespread literacy. We offer broad educational opportunities to all — to all, that is, who can read and write. Those who cannot are left out. We've provided no role for illiterates, and have done nothing to make reading and writing simple.

What Is Basically Wrong?

What's basically wrong is this: English words are made up of 43 different sounds, but we have only 26 letters. If we had used certain letters in regular pairs to represent the additional 17 sounds, reading and writing would be easy. But we haphazardly spell our sounds in several hundred different ways. A great deal of the spelling scheme is very irregular. Remembering the different spellings and struggling to learn which one goes with which sound in which word makes spelling much more difficult than it needs to be.

20 Million Functional Illiterates

In spite of this, most American adults can read and write — but 20 million cannot. Their frustrations show up in greater-than-average inclination to throw sand into society's gears. They're not the docile illiterates of yesterday. Unable to master our prerequisite to education, deprived of a significant role in society, many first become dropouts, then juvenile delinquents and ultimately full-fledged criminals. The alternative fate awaiting them is often continued unemployment and poverty.

Furthermore many literate American adults cannot find out the right spelling of words like "irresistable, irresistible," "instalment, installment," "harassing, harrassing" without wasting time and effort looking them up in a dictionary. Yet the meaning and pronunciation are perfectly clear; and in a better world than today's world both spellings would be fully acceptable.

Commenting on a report that more than half of U.S. prison inmates lack functional literacy, Chief Justice Warren E. Berger called the number staggering and added: "The figures on literacy alone are are enough to make one wish that every sentence imposed could include a provision that would grant release when the prisoner had learned to read and write."

The Fetters of the Past

How can we escape from these stupid fetters from a bygone age?

We can go straight to the root of the problem; we can develop a painless way to make our spelling reliably phonetic, as it is in other Western languages. With 20% of our schoolchildren — the rising generation — facing life with serious reading and writing deficiencies, it's time for a frontal attack on what is, without doubt, a major barrier to education for all: erratic English spelling.

The Opportunity from the Computer

Simplifying our spelling has been a scholarly pastime for centuries — a sort of parlor game not taken too seriously (except by a few men like George Bernard Shaw and Bertie McCormick). The reason is the absurdity of our traditional spelling is less absurd than hoping that hundreds of millions who read and write English will go back to school and learn to spell all over again.

But, thanks to recent typographical and computer developments, we can simplify our reading matter first — before we change our spelling habits.

Impossible? Consider this:

Typesetting methods are currently undergoing their greatest change in 500 years. This revolution is shaking the printing industry from top to bottom. Typesetting is turning itself inside out as it changes from a three-dimensional mechanical process to a two-dimensional photocomputerized process. Most of the printing you read today is a product of this revolution. No layman looking at the printed page can notice a difference, but what goes on behind the scenes is another matter.

Today's new typesetter taps out the letters for words on a computer-compatible keyboard linked by magnetic or punched tape to a computerized phototypesetting machine. As the computer receives the

words from this tape, it combines them with coded signals that control the typesetting mechanism.

Automatic Change from Traditional Spelling to Simplified Spelling ...

Now, if the computer had a little more capacity it could easily be programmed to accept traditionally spelled words from the tape, simplify the spelling and combine the newly spelled words with the typesetting signals. Thus a keyboard operator would continue to spell traditionally, but the final product would be simplified — automatically.

There's nothing novel about this concept except its application: For years computers have unscrambled coded messages of far greater complexity. What is new is that the typesetting revolution makes it possible for computers to take over the hitherto impossible job of simplifying the spelling of English, and to do so as a routine — automatically, accurately, uncomplainingly.

So, without any adult being urged to change his writing habits, without any reschooling of authors, editors, copywriters, reporters or typesetters, we have arrived at the point where printed English can be simplified with just a direction to computer program.

... In Stages Over Many Years

We could, of course, make this change in one big leap. But computerized typesetting lends itself equally as well to a far more comfortable gradual shift of perhaps 50 small steps. Step 1 would probably be to spell with an "e" all words that have the clear "short-e" vowel sound: any, hed, frend, sed, redy, heven, brekfast, and so on.

Throughout this article this first step is being demonstrated — and you can judge for yourself how painless it is. If you are a literate person, you would never need to change your own spelling unless you wished to. Of course, you might choose to conform to some of the simplifications that show up in print, but you would not have to. Computers will do the hard work — they will spearhead the change You will follow along if and only if you want to.

Step 2?

Step 2 might use "f" to replace "ph," or "k" for "ch" in words like kemistry and skool.

There would be 50 or more steps taken gradually over as long a time as required. Unlike adopting the metric system, spelling reform could be slowed down or speeded up at any time over many years — and still leave us with a better spelling system than ever before. This is actually what has happened with past better spellings like "thru" and "nite".

The Fiftyeth Step

If we jump ahead to the fiftyeth step, az printed heer, it mae seem a bit aukward and perhaps a litl dificult to reed, but it must be remembered that this step wil not cum until yeerz after th furst step haz bin tacken, and bi that tiem our reeding habits wil hav had ampl oportuenity to ajust to a lojical patern ov speling — simplified sound-speling.

44,000 Most Used Words in a Transliteration Table

The means for carrying out experiments with this 26-letter system called "Soundspel" are at hand. A computer at New Jersey's Ocean County College in Tom's River is now programmed with 44,000 of the most-used English words paired in traditional and simplified spellings for automatic transliteration.

The Need for Reform

Serious attention to reform is growing as more and more people realize its social implications at home, and its importance to the spread of English abroad as an international "second language." Thus an urgent need arises for those willing to accept even a small measure of reform to speak up for it, to talk about it, to build public awareness in the same way that environmentalists hammered home the air and water-pollution story. Perhaps only when voters demand it will Congress require manufacturers to build typesetting machines that produce various steps in rational spelling — just as auto makers are required to build pollution-free exhausts.

Many Phonetic Languages Already

Perhaps we cannot make reading and writing quite as simple as finger painting, but we can come closer now; much closer. We can do it by spelling English rationally, regularly, phonetically — like Italian, Spanish, Dutch, German, Finnish, Russian, Hungarian, Turkish, Swedish and other languages where spelling is so logical and easy to learn that it's not taught after the first few months of first grade. We owe it to future generations to bring the visual part of reading and writing as easy and simple as possible; to turn the rudder of our wayward orthography a few degrees so that spelling can be inched back on course until, along with other western languages, our written forms are in synchronism with our spoken words.

Before hastily saying no to spelling reform we should examine the new tool that can make the change palatable to adults and a boon to children. This tool is waiting in the wings — waiting to be discovered by the right people.

Computerized transliteration lends itself equally well to an instant change, or to a gradual "step-by-step" shift. There exists today among spelling reformers general agreement that, as a first step, the clear short vowel sound "e" should be written "e" in such words as "frendly, meny, hed, sed, heven," and so on. That is where reform can begin.

Experience with this first step will determine which of several choices should be next. Perhaps an obvious change like "k" for "ch" in words like "kemistry, and skool"; or "ee" for the long vowel in "cleen, leed, seet," etc. Other obvious improvements would carry us through a dozen or more early steps. Then the choice of improvements may get a bit difficult, and call for a balancing of alternatives.

Meny Right Ways of Spelling

What about personal or business letters and handwritten notes that never get into print? When

CHART 1

Sample of the Way English Would Appear for Several Stages of Soundspel

Have you ever considered the meny benefits of a simplified phonetic spelling that sounds just like it's written? A spelling that children, adults and foreign students can learn quickly, without laborious memorizing. Most countries have such a spelling. We could have it too. The first writers rigidly matched letters to sounds, but those who came after them polluted the system, botched up its simplicity and, for no good reason at all, left us with several hundred different ways to spell our 43 simple sounds! Let's go back to phonetic spelling and give our children a real hedstart. Let's give them tools to read and write enything they can hear or say. And now, at last, it can be done without adult re-schooling because computer magic will do the tough part for us—automatically. Interested? Read on...

The spelling in the paragraph above is very slightly simplified. It represents the first step in a series of step-by-step simplifications.

The paragraph below is semi-simplified. It represents about the mid-point or 20th step in a series of simplifications.

Hav you ever considered the meny benefits ov a simplified fonetic speling that sounds just like it's riten? A speling that children, adults and forin students can learn quickly, without laborius memorizing. Most cuntryz hav such a speling. We could hav it too. The first rieters rijidly matched leters to sounds, but those hoo came after them polooted the sistem, botched up its simplisity and, for no good reeson at all, left us with several hundred diferent ways to spel our 43 simpl sounds! Let's go back to fonetic speling and giv our children a reel hedstart. Let's giv them tools to reed and riet enything they can heer or say. And now, at last, it can be dun without adult re-skooling because computer majic wil do the tuf part for us—automaticaly. Interested? Reed on...

The paragraph below is fully simplified, completely phonetic.

Hav u ever considerd th meny benefits ov a simplified fonetic speling that soundz just liek it's riten? A speling that children, adults and forin stoodents can lurn qikly, without laborius memoriezing. Moest cuntryz hav such a speling. We cuud hav it too. Th furst rieterz rijidly macht leterz to soundz, but thoez hoo caem after them polooted th sistem, bocht up its simplisity and, for no guud reezon at aul, left us with several hundred diferent waez to spel our 43 simpl soundz! Let's go bak to fonetic speling and giv our children a reel hedstart. Let's giv them toolz to reed and riet enything thae can heer or sae. And now, at last, it can be dun without adult re-skooling becauz compueter majic wil do th tuf part for us—automaticaly. How? Reed on...

CHART 2

The Proposed "Soundspel" Key Used in the Transliteration of 44,000 English Words

a at ago[1]	**ae** age	**aa** father	**ar** hard maroon[2]	**air** fair	**au, aw** auto saw	
b bit	**ch** church	**d** dot	**e** edit systematic[1] begin[3]	**ee**[4] meet	**er**[5] baker	**eer** cheer
f fit	**g** got	**h** hat	**i** it easily[1]	**ie**[4] ice	**ia**[3] **io** **iu** editorial champion auditorium	
j judge	**k, c** kit cat	**l** let	**m** men	**n** net	**ng** blanket[6] sing	
o hot atom[1]	**oe**[4] open	**oi** oil	**oo** ooze	**or** order (office)[7] memorandum[2]	**ou, ow** out how	
p pet	**q** quit	**r** red	**rr**[8] arrow merry sorrow hurry	**s** sets	**sh** shut	
t tint	**th**[10] this thin	**u** up	**ue** unit accumulate[9]	**ur**[5] urgent	**uu** put	
v valve	**w** wet	**wh** whet	**x**[10] exam expert	**y**[11] yet victory[3]	**z** zones	**zh** azure

[1] Short vowels (a e i o) in unstressed syllables are often given a neutral pronunciation close to the sound "uh" (ago, system, easily, atom). Phonetists call this diluted sound "schwa".

[2] When 'ar' and 'or' are followed by a stressed vowel (maroon, memorandum) the a and o are pronounced as an unstressed "uh", and the 'r' begins a new syllable. See note [1].

[3] The vowel-sound "½-ee" (half-ee) is heard in the first e of 'between'. It is never stressed, has about half the duration of ee, and some of the tonal qualities of short i. At or near the beginning of a word it is written 'e' (event, debate, reality); further on in the word it is written 'y' (pityful, sillyness, victory); and it is written 'i' in the unstressed vowel combinations ia io iu (editorial, champion, auditorium).

[4] To keep certain words looking familiar, final e may be dropped from a soundspel word ending in ee (weø), ie (alibiø), oe (goø).

[5] The pronunciation of 'ur' and 'er' is identical. 'ur' is always used in stressed syllables (urgent), 'er' in unstressed (baker). In casual speech, final and semi-final 'ar' and 'or' are often pronounced like 'er' (collar, doctoral).

[6] 'n' is pronounced 'ng' when followed by k, q, or x (blanket, banquet, jinx).

[7] When 'o' is followed by ff, ss, ng, th (office, cross, long, cloth) it is always stressed and usually pronounced like the 'o' in 'or' (or like the 'aw' in 'saw').

[8] When a e o u are followed by 'rr' the vowels are stressed and keep their normal short-vowel pronunciation.

[9] In unstressed syllables 'ue' becomes a very short diphthong pronounced ½yu (like the second 'u' in accumulate).

[10] Both 'th' and 'x' have voiced and unvoiced pronunciations: Voiced th (as in this); unvoiced th (as in thin). The voiced x (a "gz" sound as in exam) is always followed by a vowel; the unvoiced x (a "ks" sound as in box, expert) is never followed by a vowel.

[11] At the beginning of a syllable 'y' is always a consonant (yet, beyond). At the end of a syllable it is always an unstressed vowel (holy, victory, pityful). See note [3].

Soundspel has two self-evident abbreviations: u = you, th = the; three traditional spellings: to = to, do = do, -ful = -ful; and, in keeping with other languages, a lowercase pronoun: i = I.

computers lead the way, the rest of us can follow at our own pace — if we want to. Many of us will pick up the new spelling from the printed page. Others will continue to write traditionally. No matter. We need no drive for converts. No one should ever be urged to update his spelling. Those who from childhood have spelled traditionally will always be able to read both ways and to write traditionally — until our quaint orthography dies a natural death. That is how it has been in Holland, Germany, Norway, Denmark, Russia, France, Turkey, Korea, and other countries where improvements in spelling have taken place.

Readers Cannot Be Forced But Can Change Slowly

So much for spelling and writing. How about reading? Readers cannot be computerized.

Here we come face-to-face with long established habits, and we may meet big resistance. We won't know how much until we try. To minimize reading resistance we should do everything possible to make reformed reading easy. The changeover should be so gradual, so inconspicuous, so natural, so logical and sensible, so comfortable for the reader, and introduced so subtly that he is hardly aware of being enticed away from his childhood spelling (see Chart 1). This is precisely where computers rise to the occasion. They can slowly but surely feed new spellings into the mainstream of printed matter, feeding them in so gently that we should have little reason to be upset. We would be given every chance to adjust comfortably. It would even be possible to monitor public acceptance through a series of polls, enabling us to introduce each new step from coast to coast or world-wide with shrewd timing.

Perhaps Rapid Acceptance

There is, of course, a good chance that acceptance could come much faster than we anticipate. Graphic change is now quite commonplace. You can test this for yourself by comparing typical posters, magazines, and advertising today with a similar sampling from a decade or two ago. You'll be impressed at how quickly we've adjusted to new visual presentations without even knowing it. Or look back at the late '20s when printers introduced a rash of typefaces with newly designed g's and a's based on a single circle. The new shapes of these two lowercase letters changes about 40 percent of our "word-pictures" as traditionally printed and read by successive generations. Yet the change brought no public protest at all. It is worth noting that typesetters of the '20s willingly accepted the newly shaped letters because, so far as they were concerned, the shift was purely mechanical. The same acceptance can come with computerized transliteration. These examples of graphic change are, of course, less formidable than those of spelling reform. Nevertheless, the public may take spelling reform in stride.

What then, will the first transliterating computer be able to do, and when will it be doing it?

The 44,000 Most-Used Words

An experimental typographic transliterating computer is now programmed with the 44,000 most-used words in written, contemporary English. This collection of words comes largely from a study completed in 1961 by Dr. W.N. Francis of Brown University's Department of Linguistics. It covers a million-word sampling of running text selected from a wide variety of subjects: news, editorials, the arts, hobbies, skills, religion, science, biography, memoirs, general fiction, science fiction, humor, romance, mysteries, mathematics, humanities, natural sciences, annual reports, government documents, etc. Proper names and unusual technical terms have, for the present, been deleted from this list, but for each deletion a word has been added from the Merriam-Webster list of 35,000 most-used words or from the McGraw-Hill list of 20,000. The total list is substantially a composite of all three lists. These 44,000 words have been transliterated into Soundspel (see Chart 2), placed on magnetic tape (with traditional and simplified spellings in parallel) and programmed so that traditionally spelled input tape will generate a matching output tape in simplified spelling. The output tape is compatible with photo-typesetting machines. Complete typeset pages may now be produced without individual transliterating or manual rekeyboarding.

The Structure of Soundspel: Where It Comes From

The Soundspel phonetic system used for the transliterating program is a merger of Ripman-Archer "New Spelling," Godfrey Dewey's "World English Spelling," and certain modifications suggested by the Typographic Council for Spelling Reform. The pronunciation standard is the broadcasting industry's "NBC Handbook of Pronunciation," the "Random House Dictionary of the English Language," or "Webster's New International Dictionary," whichever sanctions the least deviation from traditional spelling.

The Push to Make the Change Happen

When our social agencies begin to see how transliterating computers can be used to spearhead spelling change — so "we the people" can just fall in behind — they may speak up for reform. Their voice is big. It is big enough to get the job done. Their giant push could start the ball rolling.

Another big push might come from those engaged in areas where English has become a "second language": foreign trade and commerce, international communication, and negotiations between nations. A simpler spelling of English has much to offer here.

And finally we have the parents of our school children, 25 percent of whom are two to six years behind grade level in reading and writing; the mothers and fathers of 700,000 dropouts each year, and the friends of 20,000,000 functionally illiterate U.S. adults.

While we're enlisting concerned parents, social agencies, international businessmen, the U.N., diplomats and others, we should not overlook the importance of persuading the printing industry to seek spelling improvement. Printers — particularly graphic designers, type directors, and typographers — have spent many years studying the legibility, and artistry, the graphics and mechanics of the printed page. They, better than anyone else, know what makes a page easy to read, what interferes with reading, and what gives a page warmth. Profound advantages for many millions of people await the gradual improvement of phonetic representation of English. It makes sense to use computer power for this purpose. □

Computing and Data Processing Newsletter

DARTMOUTH STUDENTS CAN LOOK FOR JOBS VIA AN INTERACTIVE COMPUTER

Robert P. Graham
Dartmouth College News Services
303 McNutt Hall
Dartmouth College
Hanover, NH 03755

"Man should set the goals and tell the computer how to work towards them" wrote Dartmouth College President John Kemeny in 1972.

In that philosophy, the Career and Employment Services at Dartmouth College has utilized a computer to develop a new and different approach to the usual classified advertisement for jobs.

As of the fall of 1977, Dartmouth students have computer assistance in their job-hunting efforts. A new computer program, DART-JOB***, is now offering students new, more efficient means of finding local employment.

The program lists odd jobs, part-time jobs, and full-time leave-term jobs both at Dartmouth and in the surrounding community. The program presents the student with an accessible, up-to-date body of information.

In order to use DART-JOB***, a student merely calls up the program on one of the college's 300 computer terminals. Then, in a "conversational" exchange with Dartmouth's interactive computing system, he asks for the particular type of job he wants. The computer then prints out all available jobs of that type, describing each individual job, its requirements, the period of employment, the hours per week, the pay, and presents the address and telephone number of the contact person.

Conversely, the program offers an employer the opportunity to reach a large percentage of the student body. Any college or local employer can list a a job opening with the service at no cost. To have a job listed with DART-JOB***, an employer either fills out an advertisement form and sends it to Career and Employment Services in College Hall, or he telephones and asks to have the job listed. Listings are updated daily.

Before DART-JOB***, students had difficulty obtaining all information on all available jobs. In the past, jobs were listed in books, and students could browse through books of listings that were cumbersome and difficult for the office to organize and keep updated. Information on many jobs was available to students only by making the rounds of all potential employers in the community.

Now a student can quickly get a full list of only the type of job of interest. For example, if he or she is interested in odd jobs, the computer will print various categories of odd jobs available. The student then selects a category (office work, physical labor, baby-sitter, etc.) and the computer prints all available jobs in that category. The user can then continue in this manner until he finds a job that he is interested in.

In addition, a student is not restricted by office hours. Employment information is available for the 20 hours a day during which the computer operates. Figures indicate that in the first month of operation more than 50 percent of DART-JOB*** use was after regular office hours.

The program was researched and designed by Ginny Darrah of Norwich, Vt., with the assistance of Eve Pratt of Longmeadow, Mass., and Carl Worrell of Montreal, Que., both members of the Class of 1979 at Dartmouth. They initially advertised the program within the college community, emphasizing that DART-JOB*** could be used for department or office requirements or for personal use, such as the need for a baby-sitter or for help around the house. In January, Career and Employment Services will begin advertising within the Upper Valley business community to make local businesses aware of the potential of DART-JOB***.

The concept behind DART-JOB*** may have important implications in the use of the computer in a college community with computer resources similar to Dartmouth's Time-Sharing System. It is proving an efficient, easier way to make a centralized body of information available throughout the college.

CONTINUED GROWTH FOR THE COMPUTER INDUSTRY FORECAST FOR 1978

Gerald G. Probst, Pres.
Sperry Univac Division
Sperry Rand Corporation
P.O. Box 500
Bluebell, PA 10422

During 1978 the general purpose computer market is expected to follow the growth patterns of recent years. Our forecast is that gross shipments by all manufacturers world-wide will grow in the range of 16 percent in 1978 over the prior year increasing from a value of $13 billion in 1977 to more than $15 billion in 1978.

This growth will come from expansion of existing computer installations, new applications, greater user development of computer-communications systems, increasing usage of data base management systems and expansion of both teleprocessing and distributed data processing networks.

1977 has been another successful year for Sperry Univac, with computer revenues currently approaching 50 percent of the total revenue of Sperry Rand Corporation. Based on results for the first half

of the current fiscal year, Sperry Univac is expected to establish new records in terms of revenue, bookings and shipments for the full year.

Although the western European nations did not recover as fast from the last recession as had been anticipated in 1977, the United States was a particularly strong market throughout the year for Sperry Univac. The Middle East continued to be a rapidly developing new market with a number of significant orders received from Iran. In South America, Brazil continued to be a strong market.

A major event of the year for Sperry Univac was our entry into the minicomputer market — the fastest growing segment of the computer industry with a current growth rate in shipments averaging over 30 percent for the industry as a whole.

Our acquisition of Varian Data Machines, now known as Sperry Univac Mini-Computer Operations (MCO), has significantly expanded our capabilities for developing, manufacturing and marketing minicomputers both in the United States and in international markets abroad.

We are targeting a higher growth rate for MCO over the next five years than the average for the minicomputer industry from greater penetration of both existing markets and new marketing areas. We will continue to pursue the traditional minicomputer markets and, in addition, will place strong emphasis on using MCO products in distributed processing networks in conjunction with our larger systems.

Another important milestone was our entrance in January this year into the small business system market with the introduction of the BC/7 small business computer and its planned further extension into a complete family covering the needs of the small business marketplace. Within a short period of time we created an entirely new nation-wide sales and support organization dedicated to this market and product. The results to date have fully justified our commitment to this market, and led to the release of the BC/7 to the Canadian market in September of 1977.

In addition to the BC/7, we made several important additions to both our 1100 series and Series 90 computer families during the year. In the 1100 Series, we announced an entry level 1100/83 and 1100/84. The Series 90 line was expanded with an entry level 90/25 system and two new systems at the high end of this family — the 90/80-2 and the 90/80-3.

All of these new products maintain the price/performance advantages that Sperry Univac has traditionally enjoyed over the competition.

The incoming rate of new orders for all of our products has been in line with or above our forecasts. In particular, our largest system, the 1100/80, has been exceptionally well received. World-wide demand has boosted the order rate for the 1100/80 more than 200 percent above the plan for the year. We are confident that the impetus generated by this system will continue strongly in 1978.

One of the primary industry thrusts for Sperry Univac continues to be manufacturing — users have been exceptionally receptive to the SPERRY UNIVAC UNIS software package for manufacturing control. We are constantly providing new enhancements to UNIS in order to give our customers even greater capabilities for their applications. Among major companies ordering large-scale systems utilizing UNIS in 1977 were Raybestos-Manhattan, Inc., the Fafnir Bearing Division of Textron, Inc., and the Eureka Company.

State and local governments also continue to be a major market. Sizeable orders were received, for example, from the New York State Department of Social Services, the Texas Department of Human Resources, the Treasury of the State of Queensland, Australia, and the cities of Seattle in the United States and Kyoto in Japan.

Airlines, traditionally a strong market area, were also in the forefront of bookings with substantial orders being placed by Scandinavian Airlines, Trans-Australia Airlines, United Airlines, and Wardair of Canada.

The world-wide financial community has become a growing success area for Sperry Univac. During the year significant orders were obtained from Trustee Savings Bank in the United Kingdom, the National Bank of Iran (Bank Melli), Banco Popular Espanol in Spain, Yasuda Trust and Banking Company in Japan, and California Federal Savings and Loan in the United States.

We have continued our considerable investments in research and development during the year in such areas as bubble memory development, fibre optics, and voice input and output. In addition, our extensive software development program has resulted in numerous enhancements to existing operating systems and programs as well as the creation of new application packages and work in such important areas as the privacy and security of information. This year about 8 1/2 percent of our total revenues was invested in research and development to give us one of the highest R&D-to-sales ratios in the industry.

In terms of new facilities, we will be consolidating all of our existing ISS disc memory system plants in the San Francisco Bay area into a new 400,000 square foot facility in Santa Clara. In Winnipeg, Canada, we opened a new Defense Systems Division Facility which will produce electronic devices to be used by the Canadian Defense Forces.

Overseas, a new complex of two multi-storied buildings has been completed in London, consolidating the various headquarters of our operations based in the United Kingdom including the International Division and the U.K. subsidiary company. We also opened at year's end a new Sperry Univac Executive Centre near Nice, France for holding international seminars for senior executives in business, industry and government. The Centre, succeeding a previous facility in Rome, Italy, was built to cope with the growth needs resulting from the increasing popularity among administrators and businessmen for the information exchanges we offer.

Despite the prediction of some economists of an economic downturn in 1978, we are looking forward to another good year. Past experience has not shown any close parallel between the growth of the computer market and the strength of general business conditions. On the contrary, in recessionary periods business and industry strive more than ever to be-

come more efficient in their operations and look to computers to play a leading role in reducing costs and extending the opportunities for potential growth.

On February 3, 1978, a new international conference center was opened by Sperry Univac near Nice on the French Riviera.

Known as the Sperry Univac International Executive Centre, the multi-million dollar facility is designed for seminars presenting the latest techniques of management science to leaders of business, industry and government. It supersedes a previous Sperry Univac Centre near Rome, Italy, and accommodates 50 guests.

The purpose of the Centre is to provide a forum where senior executives from a variety of management disciplines can exchange ideas with executives from other countries. The location is removed from day-to-day business pressures, on a 2.8 acre site at St. Paul de Vence, in the mountains about 10 miles north of Nice.

Conference facilities, equipped with the latest audio-visual and translation equipment, are designed to encourage a free-and-easy dialogue between speakers and guests.

The new facility is expected to accommodate over 4500 guest days per year — triple the capacity of the previous center in Rome, which opened in 1968. There, more than 6500 guests attended seminars covering such topics as "Real-Time Banking Today and Tomorrow," "Developments in the Field of Medicine," and "The Mechanics of Decision." Speakers have included ex-Democratic Senator Eugene McCarthy of Minnesota; Lord Harlech, a former British Ambassador to the United States; and Vance Packard, sociologist and author.

A center similar to the French facility is operated in Izu, Japan by Nippon Univac Kaisha Ltd., the Sperry joint venture computer marketing organization in Japan.

COMPUTERIZED LABORATORY INFORMATION SYSTEM BRINGS EIGHT PERCENT REVENUE INCREASE TO IOWA HOSPITAL

Patricia A. Conway
Control Data Corp.
Box O
Minneapolis, MN 55440

A computerized laboratory information system has produced an eight percent revenue increase for Mercy Hospital in Des Moines, Iowa. The increase came from more accurate reporting of patient test data. This occurred after the laboratory computer was linked to the one in the business office for automatic transfer of information for billing purposes as well as management reports.

Originally, the hospital looked at the link as merely a desirable level of automation, but unless the laboratory computer could communicate on-line with the business computer, the investment would not be a significant improvement to the overall procedure.

But after less than a year of operation, a comparative study showed an eight percent increase in laboratory revenue from practically the same test volume that existed with the manual system, which required billing data to be hand-carried to the business office. The hospital runs about 1.5 million tests annually.

Mercy Hospital management spent about three years studying computerized laboratory information systems before choosing PATHLAB, a system manufactured by the Medlab Company, a division of Control Data Corporation.

Lashing together two different types of computers — the IBM business system and the scientifically-oriented Control Data SYSTEM 17, which is the heart of the PATHLAB system — was not a usual procedure. Nor had such integration been attempted previously in any similar environment. Highly sophisticated software programs as well as some intricately designed hardware were developed from the ground up. A cable connection, in lieu of more expensive telephone lines, was installed between the CDC SYSTEM 17 and the IBM business computer. The two systems are about 1,000 feet apart and on different floors of the hospital. As a result, all patient test data necessary for billing and management reports flows automatically between the SYSTEM 17 and the IBM computer without human intervention.

The PATHLAB computer also operates on-line to Mercy's existing laboratory test equipment. Simple interface equipment made it possible for the various test devices to relay findings directly to the computer.

In addition, the laboratory computer handles test preparation data such as reading doctors' test orders from mark-sensitive cards and formatting them into worklists. Nursing personnel use these to schedule patients to test areas. This same information is printed on perforated adhesive labels which technicians attach to bottles as they collect specimens from patients. The computer even arranges patients' room numbers according to a convenient "route" through the hospital to expedite collecting specimens.

As patients progress through a series of tests, the results are automatically processed into their records and stored on the computer. These records are printed-out daily and delivered to the medical floors. Nurses no longer need to record test results, since the computer printout is sized to fit the patient charts.

Installation of the PATHLAB system is part of Mercy's building-block approach to a completely computerized, integrated hospital information system. The hospital has 500 beds, admits more than 18,000 patients annually and handles another 33,000 as outpatients.

SUIT ALLEGING ILLEGAL TIE-IN BETWEEN BANKING AND DATA PROCESSING

Richard C. Reed
Statistical Tabulating Corp.
2 North Riverside Plaza
Chicago, IL 60606

The Northern Trust Bank in Chicago has been sued for $50,000 in Federal District Court by Statistical Tabulating Corporation (STAT:TAB). The suit alleges

(please turn to page 18)

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.)

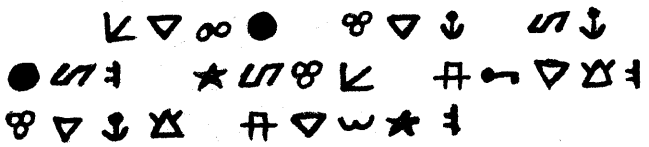
NAYMANDIJ 783

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

MAXIMDIJ

In this kind of puzzle, a maxim (common saying, proverb, some good advice, etc.) using 14 or fewer different letters is enciphered (using a simple substitution cipher) into the 10 decimal digits or equivalent signs 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 783



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 783

```
      G O L D
x       N O W
-------------
      R R L O
    N D G W
  L I D N
-------------
= R S L N I O
```

30984 00044 45

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

SOLUTIONS

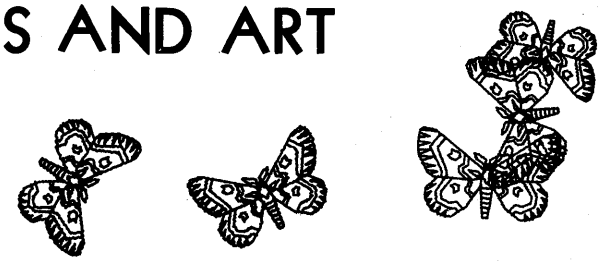
MAXIMDIJ 782: The future is bought by the present.

NAYMANDIJ 782: Make twelve 99's.

NUMBLE 782: A lie has short legs.

Our thanks to S. Shulman of Edison, N.J. for sending us the following solutions: Maximdij 781, Naymandij 781, Numble 781.

COMPUTER GRAPHICS AND ART



COMPUTER GRAPHICS and ART is a new international quarterly of interdisciplinary graphics for graphics people and computer artists. This new periodical is aimed at students, teachers, people from undergraduate and graduate institutions, researchers, and individuals working professionally in graphics. Its topical coverage is broad, embracing a variety of fields. It is useful, informative, entertaining, and current.

Send your manuscripts, papers, art, and ideas to:

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Berkeley Enterprises, Inc. – Chico Branch
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Here Are Some Samples:

Learning Through Graphics
by Dr. Al Bork, University of California, Irvine, California
A ten-year forecast for computers, education, and graphics by a leading authority.

Art of the Technical World
by Dr. Herbert Franke, Munich, Germany
Computer art as the bridge between the two realms of art and leisure.

Expanding the Graphics Compatability System to Three Dimensions
by Richard F. Puk, Purdue University, Lafayette, Indiana
Design considerations for a user-oriented 3-D graphics system.

A Personal Philosophy of Ideas, New Hardware, and the Results
by Duane Palyka, University of Utah, Salt Lake City, Utah
The frame-buffer from Evans and Sutherland allows the artist to treat the computer as a paint and brush medium.

How to Build Fuzzy Visual Symbols
by Alex Makarovitsch, Honeywell Bull, Paris, France
A new approach to computer art and graphics by a computer scientist.

The State of the Art of Computer Art
by Grace C. Hertlein, Editor
Comparisons of early computer art and today's newer art. What is art? What is art in computer art?

Inexpensive Graphics from a Storage Cathode Ray Tube
by Charles J. Fritchie and Robert H. Morriss, Tulane University, New Orleans, Louisiana
Illustrations and photographic techniques used to achieve graphics from a storage tube CRT.

An Investigation of Criteria for Evaluating Computer Art
by Thomas E. Linehan, Ohio State University, Columbus, Ohio
The new aesthetic of computer art requires a departure from the previous, formalist-traditionalist doctrines for evaluating art.

List of Coverage for Up-Coming Issues

Applied Arts and Graphics
Architectural Graphics
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