Canadian Journal of Political and Social Theory/Revue canadienne de théorie politique et sociale. Vol. 8, No. 3, (Fall/Automne, 1984).

THE COMPUTER AND JAPANESE LANGUAGE

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I

Casting Their Dreams at the Computer

The purpose of this essay is to describe how the computerization of Japanese society is operating to change the Japanese written language.

This description provides a concrete example of the manner in which culture changes *and* is changed in response to the computer, both to the machine itself and to the mode of thinking which it engenders.

It also shows how the way of thinking of the postwar period of economic development in Japan has penetrated language itself. I shall call this the industrialization of the Japanese language.

Today, Japan is in a fever of enthusiasm over the computer and the new technology associated with it. The country is engrossed in their development, production and sale, and in the prospect of how much the businesses (offices and factories) which use them will be able to increase their productivity.

At any of the big computer shows which are held several times each year in Tokyo, there is a collective enthusiasm as though on the stage of a kind of mass theater. Middle-aged managers, young office workers (male and female), engineers from the companies represented and from smaller companies, small-business entrepreneurs and store owners, students from colleges, high-schools and junior high schools, and, finally, journalists: all walk about in rapt enthusiasm. There they face the computer, and at it they cast their dreams, at least for the moment, they are possessed by the idea that it is the computer, the machine and its philosophy, which will fulfil their wishes.

So, what is wrong with industrializing the Japanese language:

A language with a long tradition and rich cultural heritage, and also a language which was such an important weapon in Japan's modernization? But at the same time, from the standpoint of the business of today, a language of low productivity. If, through the computer, Japanese can be made easy to use — what's wrong with that?

The industrialization of Japanese has only just begun. But it contains the possibility of proceeding very rapidly. And what is significant (or frightening) is that no one raises any objections. In fact, most people are unaware that the process is happening at all.

While people cast childish dreams at the computer, at the same time they

don't know enough about what it is, and about what is actually happening in that field (or even imagine what is happening there).

Before entering the discussion of the Japanese language and the computer, there is another matter which must be discussed first.

For English speaking readers of this paper who don't know Japanese it will be necessary to give a simple explanation of what kind of language Japanese actually is.

II

The Written Language: Genealogy and Problems

Japanese is a member of the Ural-Attaic language group. It is written with imported Chinese characters, called *kanji*, plus two sets of phonetic symbols which were derived by the Japanese from *kanji*, called *hiragana* and *katakana*.

It is difficult to determine how many *kanji* the average Japanese "knows". The large newspapers which are read by the majority of the people limit the number of characters which they use, but even then the number is around 3000. So we can say that the bulk of the people are able in one way or another to read this many. ("To read" here includes cases in which the reader understands the meaning of the character without knowing how to pronounce it. This is quite common in reading *kanji*).

On the other hand, the number of characters taught in the nine years of compulsory education is just under 2000. These characters one is supposed to be able not only to read, but also to write. So perhaps we can say that this is the number of characters that the bulk of the people can "use".

Hiragana and *katakana* each comprise 46 phonetic symbols (representing the same 46 sounds) and resemble each other in shape and function. *Katakana* is primarily used for words of foreign origin. Writing with a combination of Chinese characters (*kanji*) and the two phonetic systems (collectively called *kana*) is called "*kanji-kana* compound writing," and written Japanese has been the historical development of this form. Today the language can be written either horizontally or vertically, but formerly it was written only vertically.

Originally the Japanese language had no written form. But in the 5th and 6th centuries the introduction of Chinese characters flourished. This was not only a matter of writing but a process which entailed the introduction of the culture of China and Korea.

Chinese characters are based on a different principle from phonetic letters such as the Roman alphabet. Most Japanese characters are made up of a combination of symbols. For example the character for "letter" (字) is simple, but is made up of one element which represents "house" (宀) and another which represents "child" (子). The element "child" is a character which can be used independently, while the element "house" is not. If the element "child" is replaced by the character for "woman," the new character (安) means "ease" or "peace." If it is replaced by the character for "cow," (牛) the new character (牢) means "prison."

In this way, most Chinese characters are made up of combinations of a certain number of basic elements, each of which has its own meaning and pronunciation. Complicated characters are composites which comprise several of these basic elements within a single character.

Chinese characters are not phonetic symbols, but represent with their form both a sound and a meaning, and used in a variety of methods of combination can carry a meaning that transcends both time and space. In the vast territory of China there are many dialects, but though the pronunciation and syntax of the spoken languages may differ so greatly as to be mutually unintelligible, meaning can be transmitted through the characters of the written language. Moreover, using the same characters as employed in daily life one can transcend time and enter directly into the world of the classics.

Through these characters, China has been able to maintain its identity over time and space.

Again, through using these characters the countries surrounding China were brought within the sphere of Chinese culture. Even when they are used in a different language system, with different grammer and different pronunciation, Chinese culture (meaning) is still contained within the form of the characters themselves.

When the Japanese were importing Chinese characters, at first they used them to write in Chinese, but gradually they developed a way of using them to set down Japanese, a language of entirely different grammatical construction. This system was gradually refined. At first the method was to use the characters as phonetic symbols for writing Japanese sentences. Later, those few characters which had been selected for use as phonetic symbols were abbreviated into the two phonetic systems that are in use today, *katakana* and *hiragana*.

1. Kanji/Kana

The history of the Japanese language can be seen as the history of the tension between the characters brought from China and the phonetic *kana* which were derived out of them.

Until the Meiji Restoration (1868) Japan was overwhelmingly under the influence of the *kanji* culture of China and Korea. "Culture" itself came to Japan via Chinese characters.

At first, as I mentioned above, these characters could only be used for writing the Chinese language. Later, the ruling class and intelligentsia succeeded in developing a special method for reading and translating Chinese. They devised a set of symbols which when written into the original Chinese text allowed one to change the order of words and read it directly as Japanese. This Chinese-classic-translation-style came to be not only a method of translation, but also one important way of writing Japanese. The very peculiar mode of expression which had been developed for writing translated Chinese, using many *kanji* words (that is, Chinese words), became the style of the ruling class and intelligentsia — particularly among men.

On the other hand, another style was developed in which the phonetic *hiragana* were employed to write, this time using Japanese rather than Chinese

words. The great example of this style is the *Tale of Genji*, which was written by a woman. But even here the influence of *kanji* is present.

Given the structure of Japanese, *kanji* were not a difficult tool to use. If they had not happened to fit the structure of the language, they probably would have been discarded after the phonetic *kana* had been developed.

Both the Japanese and Korean languages are constructed out of word stems and suffixes. By using *kanji* for the stems and phonetic *kana* for the suffixes, a linguistic order could be established out of a combination of both writing systems. It was out of the tension between two different writing systems, *kanji* and *kana*, which also means the tension between Chinese and Japanese words, that the present method of writing Japanese, "*kanji-kana* compound writing," developed.

2. Kanji/Modernization

The modernization of Japan began some 120 years ago with the Meiji Restoration, which overthrew the Tokugawa Shogunate and put an end to the feudal system. The Meiji government established the emperor system, and began importing ideas concerning politics, economics, military science and strategy, education, science and technology, from the West. In this modernization process, *kanji* are accredited with having played an important role.

Kanji are extremely well suited for coining new words. As I described above, each *kanji* is constructed of several smaller symbols, has several pronunciations and can indicate several meanings. it is easy to connect two or more *kanji* together to form new words with new meanings. In this way the Japanese of that period were able to coin new *kanji* words with which to express the basic words and concepts then being brought in from the West. Through this *kanji* substitution, Japan was able to make the concepts of Western social structure, scholarship and technology its own. Many of these new words coined in Japan for the purpose of modernization were later adopted in the other countries in the sphere of *kanji* culture: Korea and China.

This opinion, that the role of *kanji* in Japan's modernization is of first-rank importance, has become increasingly current in recent writings on the language. It is argued that it was through the possession of a language with the ideal combination of elements — *kanji* with their capacity for coining new words plus the phonetic *kana* — that Japan was able to modernize, and, indeed, that the failure of other Asian counties to modernize can be attributed to the fact that they do not possess such a language.

This trend is one reflection of the self-confident great-powerism that has characterized Japan after its period of rapid economic growth. It entirely screens out the question of the ill effects of *kanji* and includes no historical and cultural sense of the strength of native Japanese words.

3. Power/Language

The *kanji-kana* composite writing form is not without its problems.

The first is that one needs to learn many *kanji*. At least, if you do not you cannot read or write. In order to have the people learn those *kanji*, a powerful

educational system is necessary. The Meiji government built an educational system in which state power was strong, and which penetrated every corner of the country, and it was within this system that *kanji* were taught to the children. However in the period before the end of World War II, when the number of people who received higher education was few, one can say that the ability to write in this form making full use of *kanji* belonged to only one part of the population.

There is also a problem in the capacity of *kanji* for coining new words. Using *kanji*, one can easily take words and concepts from daily life and, without thinking in rational concepts, form abstract words. And once such an abstract *kanji* word is made, it can be used on the strength of its form alone without thinking each time about its meaning. Or rather, *kanji* contain within them something which operates to defy analysis of their meaning. The capacity of *kanji* for coining words and for expressing meaning is not analytical but rather depends on their symbolic function, and in an authoritarian, dominating society this ability becomes the ability to do violence.

In prewar Japanese society, which was centered on the Emperor and which had a powerful bureaucracy, military and police, authoritarian, dominating *kanji* words were forced upon the people. Words without concrete referents, whose meaning content was vague, were vigorously manufactured and used for the purpose of political rule. Before and during the war, the military administration, buried irrational sentiments inside *kanji*, and used them like a kind of magic, along with violent power, to maintain the legitimacy of the military and the emperor system. If it is possible to make the extreme argument that *kanji* were a necessary condition for Japan's modernization, it is also possible to claim that they were a necessary condition for Japan's emperor-system fascism.

Another disadvantage of *kanji* is that there are many homonyms. This is especially true because in Japan there was a great difference between the written and the spoken languages, and the use of *kanji* developed primarily in the context of the former. It often happens that when one uses a *kanji* word in conversation, the meaning is not communicated, and the listener does not understand until told what *kanji* one is using. *Kanji* are used in such a way that you often cannot understand their meaning until you see them. The inconveniences of this characteristic of *kanji* increase as the spoken and written languages are brought closer together.

In addition, in *kanji-kana* composite writing there is no orthography. Since a given word can be written in either *kanji* or *kana*, the lack of a clear orthography (which would reduce these choices to a set of rules) can generate large mistakes in meaning. Moreover, when a word is composed of stem and suffix, it is often difficult to say how much of it should be written in *kanji* and how much in *kana*. In short, a standard orthography is hard to produce. Even in the schools, the students are not taught orthographic rules but rather are given only standards of writing considered to be desirable.

However, while lack of an orthography is a weakness, it can also be a way of expression. All significant Japanese writers develop their own orthographic practices, which become an aspect of their style.

Reform of these weaknesses in the writing system began immediately after World War II. As was true for all reforms of that period, it was instigated by pressure from the General Headquarters (GHQ) of the Allied Occupation. These groups responded to this call for reforms: the Roman Alphabetists (who argued that Japanese should be written entirely in ABCs), the *Kana* Phoneticists (who argued that it should be written in *katakana*), and the *Kanji* Limitationists (who argued that a limit should be set to the number of *kanji* which could be used). GHQ took sides with the Alphabetists, who wished to eliminate *kanji* altogether. A U.S. investigation team which studied Japanese education also leaned in its report toward the Alphabetists and the phoneticists.

In this fashion, the reform of the written language moved in the direction of limiting *kanji*, and of emphasizing phoneticization. Thirty years later, the reforms made under the Occupation receive severe criticism. Nonetheless, it was a reasonable reform. The number of *kanji* taught in the compulsory education system was limited. Steps were taken so that the number of *kanji* in general use should not be unreasonably expanded. *Kanji* of complex shapes were simplified. *Hiragana* was further phoneticized to correspond to pronunciation in actual use. In teaching language in the schools, a writing style close to the spoken language was emphasized.

In a sense, all of these reforms were perfectly natural. In fact, they were welcomed by many people who sought liberation from the authoritarian and dominating pressure of the language and of *kanji* that had characterized the pre-war and wartime period.

However these reforms did not move very far in the direction of phoneticization. And why? Perhaps because there is something in the language which resists phoneticization.

III

Now we can return to the question of contemporary Japanese and the computer.

I wrote at the beginning that Japan is now in a period in which all the people are casting their dreams at the computer. What, then, is their expectation concerning the relation between the computer and the language? What is the dream here?

It is of an efficient Japanese language.

Kanji-kana composite writing is, in comparison with languages written in the Roman or other phonetic alphabets, clearly inferior from the standpoint of efficiency in the modern sense. It is impossible to write Japanese, with its thousands of characters, on a typewriter. There did exist a mechanical Japanese "type-writer" with a keyboard of some 2000 letters, but this was something that could be operated only by a typist who had received special training, and actually was a "clear copy machine", in a category quite different from the Roman-letter typewriter. Without exception, all writing was done first by hand. Then in those cases where it was absolutely necessary, as with a contract for example, it would be sent to a typist who would make a clear copy.

The fact that there did not exist a typewriter with which Japanese could be typed rapidly and easily meant that Japanese business offices were less efficient that those of countries that did possess such typewriters (or at least, so the Japanese believed). With regard to writing in the worlds of business, academia, and journalism, there was in Japan an aspect entirely different from the West. Because of the lack of a typewriter, it took longer to translate things into written form, which meant that fewer things were so set down. To make a detailed written record, and then to discuss those details, was an infrequent practice.

That which is written by hand and that which is written by machine (the typewriter) give an entirely different impression both to the writer and to the reader. That which is written by hand is inseparable from the writer as an individual, whereas that which is written by machine has less connection with the writer and can more easily be held in common with others. For Japanese (as well as for Chinese and Koreans) the activity of writing *kanji*, while it may be a business activity, is at the same time in some sense an artistic activity. (The writing [in one's own style] of classic Chinese poems on a single sheet of white paper with brush and India ink is no longer as common as it once was in the ordinary household, but within the sphere of *kanji* culture it used to be a perfectly natural form of art).

For these reasons, the standardization of writing had not been given much thought. Writing was done by hand, vertically, horizontally, in different forms, on different sizes of paper, with a different style for each individual and for each company. The question of what form of writing would be most easily read by others was given little consideration.

Moreover, since it was not the practice to use typewriters and make carbon copies, the art of systematically filing and preserving documents did not develop. With the appearance of the Xerox machine, on which handwritten documents can be copied, this has changed rapidly.

Thus in all businesses which made use of written Japanese (and doing business without writing is virtually impossible) inefficiency has long been a problem. However since the problem was built into the nature of the written language, it was generally considered insoluble.

One important argument of those who advocated Romanization or *kana* phoneticization was that this would make possible the use of the typewriter, and thus the language would become more convenient. One leading prewar advocates of *kana* phoneticization, Yamashita Yoshitaro, a director of Sumitomo, had Sumitomo use a newly developed *kana* typewriter in an experiment to improve efficiency. However it is hard to say that the experiment was a great success.

In recent years the expression "OA" has come to be used constantly, almost as a kind of magical incantation, both by the mass media and in ordinary conversation. What is meant by "OA" (office automation) in Japan is the use of the computer to improve the efficiency of written Japanese. The problems of speed, quality, and quantity of writing, the process of circulation, management, and universalization of writing, and procedures for printing can all be solved (they say) by the computer, and efficiency thus achieved. Through the computer, a true Japanese language typewriter is made possible for the first time. Through

the computer what had been a handicap in the Japanese language will now disappear.

On the underside of this passion for increasing the efficiency of the Japanese written language there is also the pull of a complex toward the efficiency of the phonetically written English and other European languages: or perhaps a complex toward these languages themselves.

4. The Rationalization of Japanese Language

To increase the efficiency of Japanese business writing is a good thing, and to improve the performance and generalize the use of the Japanese language word processer is also a good thing. At least so everyone believes.

What, then, are the problems?

I will begin with the simplest and most easily understood. This is the problem of how many *kanji* should be put into the computer, and how they should be chosen. In order to put *kanji* into the computer, it is necessary to have a set of standards.

This set of standards has, of course, already been established. It is called Code of the Japanese Graphic Character Set for Information Interchange JIS C 6226-1978. It carries the status of a Japan Industrial Standard (JIS), Japan's most authoritative industrial standard, which is fixed by the Ministry of International Trade and Industry in collaboration with the makers in question.

The Code comprises a Number One Character Group of 2965 basic characters, and a Number Two Character Group of 3384 additional characters, for a total of 6349. Each character is given two byte codes. This list was compiled in 1978 for the purpose of facilitating exchange of information among computers by unifying the various *kanji* codes. For this purpose the roughly 3000 most commonly used *kanji*, and another 3400 less commonly used *kanji*, were selected, and a code ascribed to each.

By what standard were these *kanji* selected? How was the difference established between the two groups? Why 3000 and 3400? Are those *kanji* not included not to be used?

How to make a list of *kanji* for the purpose of establishing a standard has always been a problem. Such lists have always been born of argument and have always stirred up argument. Why questions of *kanji* lists, their number, their form, and their use, should provoke controversy is understandable, taking into consideration the history of *kanji-kana* composite writing. *Kanji*, unlike phonetic symbols, are units each of which contains within its form meaning and thought. To make a decision that this *kanji* should be used and that one not, or that a part of a similar *kanji* should be used instead, or that a complicated *kanji* should be simplified, raises serious questions.

One who fully accepts the function of *kanji* will see any limitation of their number or interference with their use as a violation of freedom of thought and expression, and also as an injury to the thousands of years of tradition of *kanji* culture. Seen from this point of view, limitation of *kanji* is not a limitation on the use of letters but a limitation on the free use of words.

On the other hand, one who has doubts about the use of *kanji* will, precisely

because each character contains within its form both meaning and thought, wish to limit their number and lighten the burden of thousands of years of tradition of *kanji* writing. They would place value not so much on the tradition of the written language as on the tradition of the spoken language. Chou En-Lai once said that while the Japanese people must feel regret for the Japanese military's invasion of China during the last war, the Chinese people also have reason to feel regret towards the Japanese, namely for having forced the use of *kanji* on them a thousand years ago. The Chinese Revolution was also confronted with the weight of history, meaning, and thought contained within *kanji*.

However for the purpose of communication without misunderstanding, it is necessary to make standards that are in some degree binding. So *kanji* lists are made and debate is triggered. Pro-*kanji* and anti-*kanji* groups debate during the process of making such lists, and after the lists are made they continue to debate.

However the JIS *kanji* list has triggered no such debate. Why is it that while everyone talks enthusiastically about how the computer society of the future will dramatically increase the use efficiency of Japanese, no one understands that in that case the *kanji* list will be far more restrictive than any other list that has hitherto been made?

The JIS *kanji* list was compiled by a group with various computer makers and MITI at the center (and with some participation from universities, broadcasting companies, and newspaper publishing companies).

Traditionally, the question of the national language had always been under the jurisdiction of the Ministry of Education. Now, however, it was transferred to the Ministry of International Trade and Industry. The issue which up to then had been the subject of debate among educators, writers, linguists, publishers, and newspapers was now under the jurisdiction of computer manufacturers and settled from the standpoint of technocracy. And no one complained. Surely this means that there are no problems with the JIS list. Or is it ignorance? Has Computer Fever made the people unable to see?

One reason for the apparent satisfaction of *kanji* supporters is that the total number of characters included, some 6400, is extremely large. The number is not so large, however, when one considers that real aim of the list is in the direction of doing all writing with the No. 1 list of 3000. Or perhaps they are satisfied because the list contains not only new characters which have been abbreviated, but also old, complex characters and even non-standard characters (those which vary only slightly in shape from another of the same meaning).

However this list was not constructed from the standpoint of the "culture" which the *kanji* supporters had previously held to be so important. The representatives of MITI and the computer industry who assembled it did so without regard to culture, but entirely through the manipulation of statistics (with only the slightest alterations added to the result). From the standpoint of their supporters, are *kanji* — for the purpose of thought and expression, the most valuable inheritance from traditional culture — something that can be handed over to MITI and the industrialists, and to the logic of technology and business efficiency?

And what about the *kanji* opponents? Are they not opposed to this list that was made simply by throwing in everything and anything with regard to neither educational nor cultural considerations? Perhaps they have been rendered speechless by the fact that the increase in efficiency of the language, which they had argued would be achieved only through phoneticization (making possible the use of the typewriter), is now apparently being realized by the computer, using *kanji-kana* composite writing.

Until now, all *kanji* lists which have sought to impose limits on their use have been the product of the debate and the power relation between the pro- and anti-*kanji* forces. But this time, it is entirely different. The power of this list, backed by as it is by the power of the computer, will surely become immense, great enough to alter the language or perhaps eventually to create a new language. Despite this, both sides have so far remained virtually silent.

5. Technology against Culture

When using Japanese language in the computer, *output* is not the real problem. Output is just a matter of technology. However the problems which arise when Japanese is the *input* strike to the center of the language itself: these are not merely technological problems, but fundamental problems of culture.

When Japanese language is used as input, punching out on the keyboard the two byte codes assigned to each character presents no particular problem, technologically or linguistically. However looked at realistically, a system which would require the operator to punch a number code — 2-16, or 10-6, or 16-4 — for each letter is out of the question. The whole point, after all, is efficiency.

Then how about a keyboard with thousands of keys? But we already have a typewriter of this construction. There is no way to operate it rapidly.

In the end, the method adopted was to punch in Japanese a keyboard either in *kana* or in the Roman alphabet, after which the computer leaves the *kana* parts in *kana* and converts the *kanji* parts into *kanji*. This is called "*kana-kanji* conversion" and "alphabet-*kanji* conversion." Since both *kana* and Roman letters are phonetic, in transforming them into *kanji* the principle is the same.

The problem here is a problem contained in *kanji-kana* composite writing, and returns us the difficulty of phoneticizing this form of writing. That is, putting the Japanese into the computer in the form of phonetic symbols and having the computer convert this into *kanji-kana* composite writing gives birth to just the same sort of problems as would the complete phoneticization of that writing form. In effect, *kanji-kana* composite writing is translated into a phonetic writing form to be put into the computer, and then the computer retranslates this phonetic Japanese back into *kanji-kana* composite writing.

I mentioned above that since the Japanese language developed with *kanji*, whose meaning is transmitted to the eye rather than to the ear, it contains many homonyms, and that in daily conversation it often happens that when a *kanji* word is used its meaning cannot be understood until the speaker explains what *kanji* he or she is using.

And I also mentioned that there is no fixed orthography for Japanese. A given sentence may be written using many *kanji* and few *kana*, or vice-versa, without

changing the pronounciation or meaning. (However, depending on whether there are many *kanji* or many *kana*, the sentence presents a very different impression to the reader. It is only a slight exaggeration to say that whether a particular *kanji* word is written in *kanji* or in *kana* is the free choice of the writer).

Moreover, in Japanese, unlike English, there is no concept of independent words each occupying its own space. Japanese is a language constructed of word stems and suffixes, where in many cases the stems are written in *kanji* and the suffixes in *kana*. The problem is that is the case of a given word, it has not been fixed how much should be written in *kanji* and how much in *kana*. It cannot be fixed. Standards of usage exist, but they are full of contradictions and have little binding authority.

When writing a word of a certain pronunciation, what a writer will do is first decide whether to write it in *kanji* or in *kana*. If in *kanji*, the writer will then select from among the many *kanji* of that pronunciation the one which correctly fits the meaning intended. If there are several which fit the meaning, the writer will select one from among these, basing the choice on nuances of meaning and personal style. Finally, if it is a word with a stem, the writer will decide how far to write it in *kanji* and from where to begin the *kana*. Consequently, when a writer is punching out Japanese on aphonetic keyboard which the computer is to convert into *kanji-kana* composite writing, the computer must not only determine the meaning of the writing from the phonetic symbols, but must also determine the writing method and taste of the author.

This is clearly not an easy job for a computer.

To be concrete, I will give the example of the word processer on which I am presently writing this manuscript. Let us say that I have punched a certain word on the *kana* keyboard and then punched the key which tells the computer to transform it into *kanji-kana* composite writing. The computer will begin its search from the last sound in the word, and will display the possible *kanji* on the screen. If it is a word with a suffix, only those *kanji* for which that suffix is grammatically possible will be shown. It is very rare that only one *kanji* comes up on the monitor. When there are more than one, the computer first displays the one with the greatest use frequency, and then all other possible words. There will be several, and grammatically there may be hundreds, but the better the word processer, the fewer will be listed, and the more likely the desired word will be among those displayed.

In short, from the phonetic input the computer selects all grammatically possible combinations, and from among these the human being selects one, from the standpoint of meaning. Then the process is repeated, over and over.

To one who is accustomed to an English or European language typewriter or word processer, this may seem like a bewildering description. However once one learns to operate the keyboard, it is a great step in the direction of efficiency.

These techniques have been developed through the researches of the various makers. All have been researching the problem of how to put Japanese into the computer efficiently, some from as long as ten years ago, some from more recently. Those doing this research are neither grammarians nor educators,

nor are they writers, journalists or other specialists in the written word. They are computer engineers and programmers. In no sense experts on the language (but in accordance with a decision of industry), they began studying it — from the standpoint of the computer. What they quickly discovered is that from the standpoint of the computer Japanese grammer is entirely useless. And so from the standpoint of the computer they themselves have begun to create a Japanese grammer that would not be useless. This is how the interference of the computer into the language began.

It may be hard for someone who doesn't know Japanese to understand the difficulty of punching in *kana* and getting out *kanji*. But in order to convert a short phrase into *kanji-kana* writing, the computer must first (since there are no spaces between words in Japanese) separate it into grammatically possible units (and it is rare that there will be only one possible way to do this) and then begin to search its dictionary for each possibility. Then it will choose the most likely form for the kana it was given and show it on the monitor. If it is wrong, the operator will push the key for the next candidate. To enable the computer to do this grammatical work, each makers' computer engineers have had to produce a new grammer and a new dictionary. (And it happens very often that they produce forms absolutely impossible in Japanese).

But hardly any of this research has been made public. It is an industrial secret. Several years have passed since the various companies began marketing Japanese language word processers, but the method each company arrived at for conversion into *kanji-kana* writing is slightly different, and each is of course an industrial secret.

Everyone admits that this is a transition period. It is so in two senses.

From the standpoint of technology, progress can probably be made but up to a certain point. The operating speed of the computer can be increased, the capacity and speed of the external memory equipment can be improved, the quality of the printer and the monitor can be improved, the operating system and the network can be consolidated. In this technical sense, the transitional period can be overcome.

But what of the other transition period, that which relates to the character of written Japanese itself, the problem of conversion into *kanji-kana* writing? How will this contradiction just at the point of contact between technology and culture be resolved?

The time will come when computers will no longer, as they do now, offer up on their moniters *kanji* words which are in fact impossible. But the real problem has to do with the writing system itself.

No matter how computer technology progresses, it is difficult to see how a way can be found for the computer to convert a phonetic input into a *kanji-kana* output without changing the very structure of the writing system. The difficulty here is just the same as that faced by those who, whether for educational reasons, for efficiency, or to liberate the language from *kanji*, had argued for phoneticization in the past. However, the Japanese people seem to be strangely unaware of these difficulties. It is as if they believed that *the problems of the language and of culture can be solved by the computer.*

IV

The Computer Imperative

There are two ways by which the computer might solve the problems of the culture and the language.

The first is to change them so as to fit the computer. The "common sense" which defines everything which does not fit into the computer as irrational will be of assistance to this method.

The second is to develop a computer which can fully understand Japanese language and culture. This is the method advocated by those who believe that the computer will be able to fully comprehend Japanese.

Altering the language to fit the computer is no easy matter. It is, however, happening little by little.

The JIS industrial standardization of *kanji* is one example. If industrial standards such as these concerning Japanese continue to be put into use by the makers, and if the computer permeates every corner of Japanese society as has been predicted, then we can expect that the language will gradually become structured by industrial standards, and will be changed.

The most important point is *kana-kanji* conversion. At this point, the method is imperfect. The imperfection is that the judgement of the human being operating the computer is needed. If this human interference is to be dispersed away with the language will have to be changed, but at present the various computer manufacturers have not developed a unified set of standards for *kana-kanji* conversion. Each company has its own method. Should these methods ever become unified, that will amount to a set of industrial standards which will clearly alter the language.

On the other hand in May, 1983 at the Business Show in Tokyo (one of Japan's major computer shows) Gary Kidall, president of Digital Research, Inc., announced at a press conference that *kana-kanji* conversion is to be built into the operation system (OS) which has been developed and is being sold as software by his company. This may appear on the market within a few months.

In this fashion industrial standards (and in this particular case standards set by a U.S. company) gradually change Japanese, and Japan today moves in the direction of the industrialization of its language.

6. "The Computer Understands Everything"

In addition to the method of changing Japanese to fit the computer, there is another idea widespread in Japan, that since "the computer understands everything" there is nothing wrong with having it understand and manipulate Japanese.

I have described how difficult it is for the computer to take phonetic Japanese input and convert it into *kanji-kana* writing. If, however, the computer could be made to understand in the manner of a human being the meaning of the sentences, (which means to understand context) then the problem would be solved.

Can the computer, then, understand the meaning of sentences in a natural language like Japanese? Will the day come when computers can use natural languages like we do?

To make this argument actually requires much preparation, but if I may make a rough statement of my own thought, it is that the computer is entirely incapable of understanding the meaning of natural language in the way human beings do. Computers are able to use natural languages to a certain degree and in an extremely imperfect manner. *Seen from the outside*, the computer may appear to be "understanding" natural language. However the linguistic order used by the computer and the linguistic order which we use in our daily lives are two entirely different things. In the case of computer language the meanings of words are — just as in mathematical and symbolic games — fixed and set down clearly in advance. The case of natural language is entirely different. Here meaning is continuously redefined by the context in which the words are used. In natural language, meaning is born of context.

Whether the meaning of natural language can be expressed in computer language becomes the question of whether computer language can express this thing called context.

Certainly a part of the meaning of natural language can be put into computer language. But the assertion that it can express virtually all of the meaning contained in natural language — language which is connected to the very essence of this strange existence called the human being — is another question entirely.

There is a universe of meaning which can only be expressed in computer language, with its entirely different symbol system. It has some correspondence to the universe of meaning we use in the natural language of our daily lives, but at the same time the two are entirely different universes.

To say that this entirely different computer symbol system has the power to comprehend and express natural language is not a question of science but ideology. And if there is ever such a thing as computer fascism, this ideology will surely form its basis.

In Japan today, under state initiative, the ideology is being propagated that almost the entire meaning contained in natural language can be set down in the formal language of the computer.

In the software section of the *Fifth Generation Computer Development Plan*[1] (part of a ten-year plan being carried out under the auspices of MITI with the cooperation of both universities and computer producers), one important theme is the use by computers of natural language. The interface between the computer and natural language is one of the chief pivots of the plan. It is stated repeatedly, that the computer will indeed develop the capacity to "understand" human language.

For example, one major theme is mechanical translation by computer, and the report says that in ten years the computer will be able to translate foreign languages with 90% accuracy using a vocabulary of 100,000 words. The computer will not only solve the problem of writing Japanese efficiently, but also the problem of translation between Japanese and English and other European

languages (an area in regard to which the Japanese have long suffered from compulsions and complexes).

On the basis of this fanciful report, newspapers, magazines, television and other media are broadcasting the idea that perhaps the computer can do everything.

But what do the MITI officials, the university and industrial researchers, connected with the Fifth Generation Plan really think? If they truly believe in the goal of developing a computer which can manipulate and manage human language and culture, that is a frightening thing.

But it may be that they do not believe in the goal itself, but only in its ideological efficacy. Or it may be that they do not accept the ideology either, but only raise these chimerical themes and goals because they bring in money and allow them to do research. Or it may be that they are thinking of nothing at all other than catching up with and passing the U.S. Or perhaps it is none of these, or again all of them hazily mixed together.

Whatever the motivations of its authors, it is a fact that this Fifth Generation Computer Development Plan functions, and powerfully so, to spread throughout Japan the ideology that the computer has the capability of managing human culture.

7. Even Cultural Conservatives Cast Their Dreams . . .

How are the intellectuals — especially writers, language scholars, and educators — responding to this?

There has been no significant opposition. Nothing to compare to the debates which raged in the past over the question of limiting the number of *kanji*.

However, there have been several interesting reactions.

Fukuda Tsuneari, a playwright and scholar of English literature who has been one of the most vigorous and conservative critics of the postwar language reforms, offered this strange judgement in response to a question from an Asahi Newspaper reporter: "There is no reason to think that the language can be changed by a machine." [2] Isn't it precisely from a stuanch language conservative like Fukuda that we should expect the sharpest statements on the relationship between the language and the computer?

And then there are Maruya Seiichi, a well-known writer and a follower of Fukuda in his criticism of the post-war language reforms, and the famous linguist Ohno Susumu, both of whom have in recent writings given high praise to the computer's ability to use *kanji*.[3] Both seem to be overjoyed by the fact that the development of the computer's ability to use *kanji* has rendered meaningless the phoneticists' argument that the efficiency of the language could only be achieved through its phoneticization.

In this way, remarkably, the technological reform of the language is receiving the support of Japanese language conservatives. It is still to early to judge whether this is the result of ignorance or whether it reveals their true character.

With even the conservatives offering their approval, there are virtually no writers or other intellectuals in the cultural field with a proper grasp of the problem.

The computer and computer science were born suddenly and developed rapidly, slipping past established knowledge and philosophy to become a dominating presence. Most of the cultural intellectuals active today completed their education before the computer was fully developed. They have little basic knowledge about it, and their imagination apparently does not operate when thinking about it. They do not seem to be able to see through the ideological information about it spread by the mass media.

Those few who have offered warnings concerning the effects of computers on society have had their voices silenced both by the power of the existing computer itself and by the influence of the computer specialists.

And so the computer is running on alone.

Like the military, the computer contains within itself a peculiarly closed logic and a great capacity for violence. To keep the military from getting out of hand, there exists the concept and the institutions of civilian control. For the computer there is no parallel system of control.

In matters of culture a proper degree of conservatism is necessary (though determining what degree is "proper" is of course a problem). When culture encounters a powerful technology like the computer, it is then that its inherent conservatism should be displayed. Only then can new technologies and new powers find their place within and come into harmony with human society. However in Japan today this conservatism is seen nowhere. On the contrary, the language conservatives themselves are throwing their support behind technology.

The computer/efficiency ideology is industrializing the Japanese language. How far this will go, I cannot now predict. I feel both optimism and pessimism. However I believe that these developments will have a far more serious effect on Japanese than the centralized national television and radio networks have had on the spoken language. Unless the computer is quickly put under "civilian control," the matter is going to become very grave.

I have written this paper not as an analysis but as a report. I conclude with the hope that it will not become a new source of misunderstanding between the Japanese-speaking and the English-speaking people.

Notes

1. *Report on Development of Basic Computer Technology — Software Section: 1981* Ministry of International Trade and Industry Investigation Commission (March, 1982).

2. "The True Face of the Word Processer" *Asahi Shimbun*, April 18, 1983.

3. "History of Language Reform (Pre-war)" Ohno Susumu, in *The World of Japanese, 16 — Criticizing Language Reform* Chuo Koron-sha, 1983. "Language and Letters and Spirit" Maruya Seiichi, in the same.