In 1961 the Russians claimed to have deciphered the Maya glyphs with the aid of a computer. This claim has been well publicised, extravagantly supported, and fiercely attacked — often on grounds which suggest that the exact nature of the computer's rôle has not been fully comprehended. To understand the background to this problem, a brief word about the Mayas and their script is necessary.

In the area of Yucatán (roughly Northern Guatemala, British Honduras and the southern provinces of Mexico) an important civilisation flourished from about the Fourth Century A.D. up to the time of the Spanish Conquest in the Sixteenth Century.[1]

One aspect only of the Maya civilisation concerns us here. It is their script, used during almost all of the periods of their civilisation. This was usually carved on their stone buildings or on special stone pillars (called stelae). Each symbol used in the script usually occupies a more or less rectantular area with rounded corners. It is highly stylized and apart from a number of human profiles there are few elements which strike the causal observer as being even remotely pictographic.

These symbols are known as 'hieroglyphs' or even just 'glyphs'. Most

29

archaeologists seem to prefer the word 'glyphs' for the Maya script, presumably so as not to beg any questions about its nature or purpose. As J. Eric S. Thompson says : 'We can be reasonably sure that, like the peoples of central Mexico the Maya had also hieroglyphic documents covering distribution and ownership of land, tribute lists, dynasties and mythology.[2] The adjective 'holy' would be appropriate only to the last of these.

In addition to the carved glyphs, three Maya books of glyphs also survive. They are called the Codex Dresden, Codex Paris and Codex Madrid after the cities in which they are preserved. Of these the finest is the Codex Dresden — or was, for it was apparently damaged during the second world war. It consists of 70 — odd pages of hieroglyphs and illustrations. It seems to have been written in about the 12th Century, but not in the main Maya area of Yucatán. The Codex Paris, also sometimes called the Codex Pérez, is quite short (a mere 11 leaves) and apparently a fragment of a larger work. Its date is uncertain, though it is thought to be certainly no earlier than the other two codices, but far inferior in stylistic quality and probably very much later in date, perhaps as late as the mid-fifteenth Century.

The languages of the people living today in the Maya areas are all related to each other and suggest a common root. The fact that (apart from Spanish) there are no languages not derived from this common root in the area also suggests that the population has been remarkably stable in the area for many centuries.[3] From the time when the Spaniards first encountered the Maya to the present day we have a good deal of evidence for the language and it is clear that it has altered only a little in the past four hundred years. It is a fair assumption that the language of the glyphs though it may have changed its pronunciation and grammar a little is still substantially the same as the modern Maya language.

30

A good deal of success has been achieved in deciphering the glyphs. The numerical system (with a base of 20) has been identified and from this part of the codices have been identified as calendars or astronomical tables and in consequence many of the glyphs relating to these matters are now elucidated. From this, archaeologists have started to examine the other glyphs and some of them can be deduced from their context with other known glyphs and also from the appropriatemess of the illustrations of the codices.

The volume of the material being handled necessarily makes this job slow and laborious, and it is scarcely surprising that a computer should be proposed as a method of handling the inscriptions and codices more simply. But three Russian mathematicians at Novosibersk, E. V. Yevrenov, Y. G. Kosarev and V. A. Ustinov, decided in 1960 to go further and try to use the computer as a direct aid to decipherment. The basis principle was extremely simple : to match the frequency of occurrence of the glyphs with the frequency of occurrence sounds of the Maya language. This would be done by preparing the glyphs of the Codex Paris in computer-usable from and performing sorting operations to obtain their frequencies. At the same time transliterated Maya words would also be sorted in this way and the resulting frequency — tables compared. As a source of Maya words they used the Motul dictionary — a 16th Century Maya-Spanish dictionary — and the books of Chilam Balam. These are books of prophecies written down in the period of Spanish domination using Spanish letters to represent the Maya words.

In 1961 at the All-Union Mathematical Congress, the decipherment of the Maya glyphs was proudly announced, and a subsequent article in the UNESCO Courier[4] gave further publicity to the announcement and even gave a sample.

The young maize god fires pottery from white clay;
The god of death, the destroyer, fires a pot;
The god of the North Star fires a pot;
The yellow jaguar fires a pot.

Since then scholars working on the Maya script have attacked the Russians' efforts.[5] One Scholar at least feels that use of computers is a desecration : 'subtle mental processes behind the glyphs leave little room for robot treatment'.[6] I sympathize with this attitude, particularly as in this case, I think the objections to the Russians' decipherment are cogent. But I think the Russians' attempt was wrong not because they were introducing the deadhand of technology in a field where it doesn't belong, but rather because they were misusing their instruments. A chisel used as a screwdriver is not just sacriligious; it is also inefficient.

To understand the objections to the Russian's decipherment, we must examine in more detail the methods used and the principles underlying them. Doctor Yevrenov and his colleagues identify their basic assumptions as follows : -
1. the glyphs are phonetic, ideographic or determinative.
2. there is a correspondence between the texts and the language of the dictionaries.
Scholars working on the glyphs may be divided into groups --
The first is those who believe the script is largely phonetic with a mixture of syllabic and ideographic signs representing sounds. The leader of this group is Y. Knorozov, and he has been followed by his compatriots, Dr. Yevrenov and his colleagues. The second group consists of those who believe that there is a strong non-phonetic element in the script so that glyphs are used to express words that are related contextually rather than phonetically. The champion of this group is Dr. J. Eric S. Thompson.

32

Both these groups undermine the Russians' assumption — but at different points.

Dr. Knorozov lays his mines under the second assumption, that there is a correspondence between the texts and the language of the dictionaries. He points out[8] that the pronunciation of the language has changed. As the Russians are basing their decipherment on the phonetic value of the glyphs, we must know how Maya was pronounced at the time the glyphs were made. The dictionaries only tell us how they were pronounced during the Spanish colonial period. Dr. Yevrenov's method results essentially in the transliteration of the texts into Maya and if it is a translation into a form of the language whose exact pronunciation is unknown, the results will be of more than doubtful value. Dr. Knorozov gives the example a glyph generally recognized as meaning "white". The modern Maya word is "sak". If Dr. Yevrenov is right, then every time this glyph appears the phonetic value "sak" is intended, whether it is the word "white" of merely a part of a different word. Dr. Knorozov believes, however, that this word was probably pronounced "suh" at the time the glyphs were written. If this is so, then the Russians' figures for the frequency of the syllable "sak" are useless as a guide to the use of this glyph; and we have no complete guide for the occurrence for the phonetic syllable "suh".

All this is serious enough. But there is worse to come from the other side. Dr. Thompson believes that the glyphs often give rise to a cluster of meanings related contextually, not phonetically. An example is the word "xoc".[9] It means "fish". It also means "to count", as that too is pronounced "xoc" and Maya (like English) has a large number of homophones. This does no harm to the Russians' position until we discover that the glyph for "xoc" is also applied to the Fish's natural element "water". This is a natural enough transference on the part of the Maya scribe :

33

anyone might use a fish to symbolize water. But it is fatal to the Russian's case for "water" is not pronounced "xoc" or anything like it. It is pronounced "muduc". So not every occurrence of the "xoc" glyph is to be pronounced "xoc". There will, in fact, be no correlation between the occurrence of the sound "xoc" and occurrence of the glyph associated with it. As an analogy to the Russians' mistake, we may imagine a man who knows nothing of English except it s alphabet. He is confronted by a list of prices : $ 15.00 $ 17.50 $ 5.00, etc. and he deduces from this that the sound "O" must be the commonest sound in the English language. If Dr. Thompson is correct, then it would seem that not all 'x' glyphs are pronounced 'x'.

But Dr. Thompson is able to do still further damage to the Russians' case. He tells us that "of those glyphs which have been identified, there are very few which do not have at least two shapes. These are a symbolic or geometric form and a human form, and they are usually known respectively as the normal form and the head variants ... In some cases ... the head variants (for there is more than one) are totally distinct from the symbolic form".[10]

The natural conclusion from this is that it is now no longer true that all words pronounced the same way — that is, homophones — must be represented by the same glyph. On the contrary, they could be represented by two or more different glyphs. Thus the frequency of phonetic values and of glyphs will bear very little relation to each other and we must now face the following conclusions :

    (a)   not all 'x' glyphs are pronounced 'x'.
    (b)   not all words pronounced 'x' are represented by the 'x' glyph.

34

At this point all meaning to the Russians' second assumption about the correspondence between the script and its sound is exploded. We can see that the Russians' attempt is doomed because their basic premises, although simple, are at variance with the known characteristics of the script. The Russians including Dr. Knorozov, have halted work on the Maya glyphs and are now turning their attention to the Rongo-rongo script of Easter Island which also seems to be a case of a script relating to a known language.[11]

There is, of course, no cause for smugness when scholars make elementary mistakes. The misfortunes of the Russians provide a salutary warning to us. The computer is not to be treated as s an infallible oracle, but rather as a tool, more powerful than some perhaps, but one which must be used with care and intelligence. No task should be attempted with a computer, unless the principles on which that task is to be completed are fully worked out and the nature of the data has been understood and compared with these principles. As I remarked above, to use a chisel as a screwdriver is not only bad for it; it is also inefficient.

Dr. Yevrenov and his colleagues have not frightened everyone else off using computers on the Maya texts. At the University of Mexico in Mexico City a team under Professor Daniel Cazes is attacking the matter in a less flamboyant but more rewarding way.[12] They accept Dr. Knorozov's theories that the script is basically phonetic but are conducting research into the sounds of the Maya languages at the time the codices were written. They are also constructing complete indices of the glyphs and the pictures which accompany them. No doubt the Russians did the same but this humbled but useful work has not been released to Western scholars. The Mexicans also hope to obtain a decipherment more or less on the same lines as the Russians' attempt but meeting Knorozov's criticisms —

35

hence the word on earlier pronunciations of Maya, begun under the direc-
tion of the late Dr. Swadesh. I feel less happy about this part of the pro-
ject, since if Dr. Thompson's theories about the non-phonetic structure of
the script are correct, then Mexicans will get no further in decipherment
than the Russians did. They will however have accumulated some very
useful tables and concordances for other scholars.

<div align="right">

Richard MORGAN
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36

NOTES

1. There is more than one dating system for the Maya civilisation. The dates I have followed are those of the Goodman-Hernández-Thompson system. Another system, that of Spinden would bring all dates (except of course that of the Spanish conquest) forward by about 300 years. Charles Gallenkamp : Maya (1960) 92.

2. J. Eric S. Thompson : Maya Hieroglyphic Writing (1960) Second Edition 23.

3. Attempts have been made by the late Dr. Mauricio Swadesh to deduce at what point the various dialects of Maya became distinct from each other. Dr. Swadesh puts this well before the main periods of Maya civilisation. Mauricio Swadesh : Interrelaciones de las lenguas mayeses. Anales — Instituto nacional de antropología e historia, Mexico 111 42 (1960) 231-268.

4. Felix Shirokov : Computers Decipher Maya Hieroglyphs, UNESCO Courier 1962 No. 3 page 26.

5. The best articles on this are : A. Barrera Vásquez : Investigación de la escritura de los antiguos mayas con máquinas calculadoras electrónicas : — estudios de la culture maya 11 (1962) 319-342. and Y. Knorozov : Aplicación de las matemáticas al estudio lingüístico : Rb. 111 (1963) 169-185.

6. J. Eric S. Thompson : Deciphering Maya glyphs, Cranbrook Institute of Science Newletter 37 (1968) 82.

7. J. Eric S. Thompson : Algunas consideraciones respecto al desciframiento de los jeroglificos mayas — estudios de la cultura maya 111 (1963) 119 and the authorities cited there.

8. Knorozov op. cit. 175, 177

9. J. Eric S. Thompson : Maya Hieroglyphic Writing (1963) Second Edition 46, 274, 277.

10. Ib. 44.

11. A description of this script appears in Alfred Metraux : Easter Island — translated by Michael Bullock (1957) Ch. XII, 183-207. It is worth noting that the author of that book believes the script to be a "mnemotechnic instrument" giving the user mere hints about the order and structure of sacred chants which he has already committed to memory. If this theory is correct, it means that the Easter Island symbols do not represent complete words or sounds and the Russians' efforts here will be as fruitless as they have been with the Maya glyphs.

12. Information on this is contained in the 'Escritura maya-boletin de información, Mexico of February 1967 and on, and I have also recieved a very helpful letter from Dr. Cazes himself and I make grateful acknowledgement of his help here.