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The table below summarizes English-language Morse code. The letters have been placed in Morse-useful rather than alphabetic order, an arrangement which facilitated the various investigations. This code is used for all languages using Roman-letter alphabets, with certain additions necessary for some languages (note Icelandic edh and thorn). Languages using other alphabets have their own versions of Morse code. If there is enough interest, I will describe in a future article Morse code for Hebrew, Russian, Greek, Korean, Polish, Japanese, Thai and Hindi, together with the sources of this information.

**THE ALPHABET IN MORSE-USEFUL ORDER**

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PHILIP M. COHEN
Aliquippa, Pennsylvania

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If we divide the letters according to the number of bits they use, we get four groups: et/amn/dgkorsuw/bcfhlpqvyxz. What is the longest word we can form from each of these groups? For starters I offer: teetee; Miniamin; woodworks or sourwoods; flyby or xylyl. The Biblical Miniamin is unsatisfactory, try minima or amimia. If multi-word lexical items are accepted, an improvement is sourgourds.

It was mentioned above that fifteen is Morse-truthful. (It is not the only such number, though: 5 and 10, written in digits, are also Morse-truthful.) If we form a sequence ("one" has 6 bits, "six" has 9 bits, "nine" has 7 bits, etc.), we find that all numbers converge to fifteen unless we count the hyphen as six bits. In that case, there is also a cycle 25-29.

Similar calculations can be made for other languages. In what follows the counting forms will be used, since numbers may change in combinations or when inflected. Punctuation such as hyphens will be disregarded.

Finnish: all numbers converge to the cycle 45-47-53.
French: all numbers converge to the Morse-truthful 19 (dix-neuf), or the cycle 9-10.
German: all numbers converge to the Morse-truthful 19 (neunzehn) or 20 (zwanzig), or the cycle 8-11-9.
Korean: native Korean numbers converge to the Morse-truthful 10 or 29, or the cycle 25-28-33; borrowed Chinese numbers converge to the Morse-truthful 4, 5 or 8, or to the cycles 13-15-14, 17-20-18, 22-24, or 26-28.
Polish: all numbers converge to the Morse-truthful 56 (the largest Morse-truthful number I know of), or to the cycle 47-48.
Russian: all numbers converge to the Morse-truthful 34, or the cycles 20-22-30 or 26-35-33.

An interesting operation for transforming words is inversion. Let us call a word a Morse inverse (or iskot) of another if it has a dot wherever the other has a dash, and vice versa. Here is a table of the letter correspondences:

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Another operation is simple reversal, perhaps most interesting in constructing Morse palindromes. \( G (\ldots \ldots ) \) is the reverse of \( W (\ldots \ldots ) \), so where \( G \) occurs in a Morse palindrome, it must be matched by a \( W \) in the other half. Here is a table of the correspondences:

\[
\begin{array}{cccccccccccccccc}
N & J & * & W & T & Q & U & * & M & B & R & Y & I & A & S & F & K & O & E & G & * & D & P & L & * \\
\end{array}
\]

Examples are Knox/rasp, Omar/sink, inky/marl, game/unit, oxman/spina, and kneel/ratty. I'm sure there are iskots of six and more letters, but I leave it to the reader to find them.

This leads us to another thought. Just as the halves of palindromes are not expected to match word for word, why should Morse palindromes match letter for letter? No reason at all! We can require only that the sequence of dots and dashes, ignoring spaces, be palindromic, and this in fact turns out to offer many more possibilities. An example of a free Morse palindrome is "wrecking", with bit sequence given by:

\[
/\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots/. \\
\]

If two words have the same bit pattern, let us call them (following Roess Eckler's suggestion) isomorses. David Silverman noticed the interesting pair leg/run (\( / \ldots \ldots \ldots \ldots / \) ) several years ago, and wondered if there were any others. I have since found hem/sew, tap/keg, earn/urn, and atom/jot. There must be many more.

How many isomorses can belong to a bit pattern? For two or three bits, we can get the maximum: \( / \ldots / = a, e, t; \ldots / = d, n, t, e, i, s \). For four, my best is six: \( / \ldots / = b, d, e, n, n, t, i, s \). The most of all is probably reached with eight or nine bits; my best so far is the sequence \( / \ldots / \), with seventeen: ban, bate, beg, berne, depe, dewe, dime, dute, dune, neep, (Nam) Neun*, Nian*, nip, Telan, Tsan (Lake)*.

What is the longest pair of isomorses (measured by number of bits)? This is left as an exercise for the reader.

We can ensure that isomorses will differ in more than just a letter or two by defining strict isomorphism: two words are strict isomorses if no bit or sequence of bits represents a letter in both words. Obviously, a group of strict isomorses can be no larger than four, since no two can begin with the same letter. This maximum is attainable: tsein, beer, neif, deve; tsein, ber, def, Niue; and my favorite- dine, bed, nil, Tsai. That last word is from Tsai Ting-kai, a Chinese general found in the Biographical Dictionary of later printings of Webster's Second Edition.
Ross has posed the question, What is the longest word that can be made from a sequence of dots? Dashes? Alternating dots and dashes?1 We can generalize this by noting that a sequence of dots is a sequence of E's, so that we are looking for E-words. Similarly, words from the sequence /---.,---.,---.,etc./ are Y-words. (It can also be /----.,--.,--., etc./ if you like.) There are eight such repeating patterns that can be labelled with letters. Here are my best results for each:

E: hisses (16), shish (kebab) (16), sheeshehs (24) (Funk & Wagnalls New Standard Dictionary)
T: tootmoot (17)
A: tartar (12), entente (9), plus a Korean example of 17 and a Japanese example of 28
R: retinae (13), retinene (13), Karkar* (16), plus a Korean example of 28
W: yeggman (17), plus a Japanese example of 17
L: edenite (11)
P: Zmuds (16), admittee (13)
Y: goaty (13), attame (9), ytwyn (14).

Some fairly good sentences can be made using only E-words: "Sissie hisses she sees sheeshehs". This is particularly nice if we use the old sign for the period, /.../. Another question from Ross: can words be found for all sequences of a given number, n, of bits? For n = 4, this is easy; every letter is a word, and the four remaining sequences are easy: /.../ = eat, /.../ = aa, /.../ = oe, /.../ = to. I have found complete lists for n = 5, 6, 7 and 8, and give all but n = 8 here. It is interesting that the three chosen references sufficed through n = 7, though for n = 8 I needed six outside sources for 9 of the 256 words. N = 9 is probably doable with unlimited sources (perhaps even n = 10), but I leave these for others to try.

As noted, a linguistic morse was discovered of Dutch ni looking int...
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As noted earlier, this has been only a sampling of Morse recrea-
tional linguistics. Nothing has been said, for example, about near-isom-
comes (words differing in only one bit, like him/her) or interlingual
discoveries (such as the fact that Japanese hai 'yes' is an isomorse
of Dutch niet 'no, not'). I hope that others will find this field worth
looking into.