The transposability of a word can be defined as the ease with which its letters can be rearranged to form another word. This can be quantified in two ways -- the number of different words into which the letters can be rearranged, and their rarity (the sources that must be searched to locate them). As demonstrated by Dmitri Borgmann in "Elementary Transpositions" in the August 1978 Word Ways, it is usually possible to transpose a word if one is willing to stretch the concept of a "word" to its outer limits (and beyond).

Recognizing that few readers are willing to admit the words that Dmitri does, we propose in this article a way to measure the transposability of a word by relating it to various dictionary-sanctioned words. In particular, we allow only those words which appear in boldface type in Webster's Second or Third, or are readily inferred from such words (plurals, participles, past tenses, etc., often indicated in lightface type in Webster's Third). Because of this restriction, the majority of words have no transposals at all.

To measure the transposability of words having no transpositions, one allows certain changes to take place in the letters that constitute a word:

1) how many letters must one delete before the remainder can be rearranged to form a word (transdeletion)?
2) how many letters must one add before the augmented set can be rearranged to form a word (transaddition)?
3) how many letters must one change to other letters before the set can be rearranged to form a word (substitute-letter transposition)?

Obviously, the third approach, combining as it does the best features of the first two (removing rare letters, adding common ones) is the most likely to result in success. In fact, for all but the longest words it is conjectured that a substitute-letter transposition is always possible. To refine this measure, we propose a generalization of Dmitri Borgmann's paratransposition: viewing the letters of the alphabet arranged in a circle, with A following Z, what is the minimum number of steps one has to take to find a substitute letter? (If only one step is needed, as SATURN to URANUS (T to U), this is a paratransposition.)

If these three measures (number of letters subtracted, number of
letters added, number of alphabetic steps to the substitute letter) are used in concert, one has a fairly comprehensive measure of the transposability of a word. It is particularly suited for comparing the transposabilities of a group of different words. We demonstrate this by considering a well-known word set -- the days of the week -- and demonstrate at the end that the ordering of transposability difficulty achieved by our new measure correlates well with the more conventional one implied by Borgmann.

In the list below, letters that have been replaced or added before transposition have been underlined.

SUNDAY This transdeletes to unsad, Sudan, sandy, Dyaus and unsay, and transadds to unshady. There are four paratranspositions: _Mydaus, uneasy, cyąnus and dynast._

MONDAY This is the only day of the week that has a Websterian transposal: dynamo.

TUESDAY This transdeletes to sudate, steady and stayed, and transadds to day guest, unstayed and unsteady. Dasyure is achieved by a two-step shift (T to R), and subdate by a three-step one (Y to B).

WEDNESDAY Sandweed is the only transdeletion, and candyweeds the only transaddition. Yew-shaded has a six-step shift (H to N), and candyweed a ten-step one.

THURSDAY There is no single transdeletion, but several double ones: trashy, shardy, dastur, sudary and Tursha. Similarly, there is no single transaddition, but hydraulist is a double one. Interestingly, Saturday is a seven-step shift (A to H), although this is bettered by the paratransposition dust-gray and the two-step phrase yard rush.

FRIDAY Fiard, fraid and fairy are all transdeletions, and fair day is a transaddition. There are numerous double transadditions: brandify, fishyard, draftily, fairydom and driftway. Bigary and acrify are paratranspositions, bettering the two-step shift to afraid.

SATURDAY This transdeletes to daystar, and transadds to subdatary. The phrase sprat day is a five-step letter shift (P to U), slightly bettering the previously-mentioned Thursday.

Summarizing, it appears that the days of the week can be arranged in the following order of increasing transpositional difficulty: Monday; Friday-Sunday, Tuesday, Saturday, Wednesday; Thursday -- where a hyphen denotes a small difference, a comma a larger one, and a semicolon a substantial one.

How well does the search for transposals in other reference works substantiate this ordering? In the A-G Oxford English Dictionary Supplement, the term FRAIDY CAT is listed under the main entry, 'fraid.
For Tuesday, AUDYTES is the plural of audyte, an obsolete variant under the main entry audit in the OED. Also in the OED, one can find SUDANY listed in boldface under the main entry Sudan. SUDAYN, an obsolete spelling of sudden in the OED, is a second Sunday transposal.

We were unable to locate any transposals for the three hardest words -- Saturday, Wednesday and Thursday -- in any of the reference works at our disposal. (No doubt Dmitri Borgmann can locate one or more for each, using the techniques of transposability proposed in "Elementary Transpositions"!) This demonstrates that the measurements of transposability proposed in this article correlate reasonably well with the more typical one of the word-rarity of the commonest transposal.

The authors are indebted to Tom Kurtz of Dartmouth College for providing a listing of Webster's Second Edition in anagrammatic form (based on the computer tape used by the Air Force a decade or more ago to compile a reverse English dictionary). This unpublished corpus is expected to be of considerable value in future logological investigations.

A PAPERBACK PANEGYRIC ABOUT PERPLEXING PUZZLES

Broadly speaking, the history of word puzzles can be divided into two parts: the versified wordplay of the eighteenth and nineteenth centuries (preserved by the National Puzzlers' League), and the crossword puzzles of the twentieth. Helene Hovanec's The Puzzler's Paradise (Paddington Press, 1978; $5.95 softbound) is the first book I've seen that traces out the history of both puzzle types, showing how the one arose out of the other; in addition, she touches on the related subjects of cash prize word puzzles, board games such as Scrabble, and even TV quiz shows! The book is lavishly illustrated with pages from early puzzle books, cartoons about puzzlers, crossword variations, contest puzzles, and the like, which give one a feeling for a vanished age not conveyed by the printed word.

The history of puzzling is a rich and complex one, scattered through thousands of puzzle pages in newspapers and magazines over three centuries, as well as in the publications of dozens of ephemeral puzzle societies and clubs. Helene Hovanec's book has but scratched the surface of a subject that could furnish material for several full-length books. The more people buy this book, the more willing will publishers be to consider further books of this nature.