pipette after the flask is attached to the manometer. The gas outlet tube is closed to the flask as it is filled with mercury; a small pressure bulb is attached to the tube, and it is rotated so as to be open to the flask. The mercury is gently blown into the flask, thus filling the side arm. This operation is repeated as often as necessary and takes only a few seconds.

This refinement of Schales' procedure eliminates the necessity for spilling even a drop of mercury.

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Correction

Referring to my paper "Microcrystallographic Data on Sodium-D-Glutamate (Monosodium Glutamate)", *Science*, 1949, **110**, 304, Dr. B. F. Buchanan, International Minerals & Chemical Corporation, Chicago, informs me that the monosodium glutamate upon which this study was made is the L-form and should be designated as sodium-L-glutamate, being the monohydrate with the following empirical formula: $C_5H_8O_4NNa \cdot H_2O$.

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Oral Stress and Meaning in Printed Material

In experiments conducted by the writers, evidence has been secured indicating that the ability of the subject to understand a prose passage may be given in quantitative terms by noting which words the subject stresses as important when he reads the passage aloud.

This apparently novel observation, so far as measurement is concerned, reinforces a belief which many teachers of reading hold, that certain assets have been sacrificed in the current emphasis on silent reading as contrasted with the older oral reading methods. Our conclusion was developed in relation to experiments on the electrical recording of eye movements during long-continued reading of prose set in type forms arranged to emphasize certain ideas.

In the printed material so far studied, words which should be stressed are defined as those words which the author or competent judges stress when they read the material aloud. It has been discovered that readers who stress words which the author indicates should be stressed obtain significantly superior scores when given a written comprehension test on the same reading material. The association between a subject's ability to differentiate between delicate levels of stress and his comprehension of the material read is marked. Correlation coefficients ranging from 0.45 to 0.65 have been consistently found in several hundred high school and college subjects so far studied.

It is not necessary for subjects to read aloud to demonstrate the association between stress and meaning. It is enough that subjects be instructed to mark those words that they would stress were they reading the material in question aloud. The determination of which words the subject would stress can be made conveniently by presenting the subject with a multiple-choice test.

That the *manner* in which a passage is read is correlated substantially with understanding of the passage has implications with respect to methods of teaching reading at the primary grade levels. This finding suggests that more emphasis on oral reading than has recently been recommended may be appropriate.

This relationship between oral stress and meaning is important in considering the possibility of improving the efficiency of print as a transmission system. Attempts have been made down through the years to introduce boldfaced type or italics and to spread out letters as means of indicating stress. Aesthetic and other arguments have been used by those who oppose the use of such varied type. It is clear, however, that vocal stress supplies the listener with information over and above the information which he would receive if speech were conducted exclusively in monotones and at an unchanging rate. It appears a matter for regret that this added oral meaning has not yet been introduced into print in a form which is acceptable. The results of the present experiment suggest that the opposition to the use of varied type has less weight now that there is available a working principle such as is here presented for indicating *consistently* which words or phrases should be stressed.

Our study so far indicates that when a reader wishes to glean the last bit of meaning from a written document he prefers stress indications in the printed matter if he is offered a choice between stressed material and the conventional unstressed material. As an illustration, a group of students who were to be examined in part upon the lectures previously given by a college instructor were offered a choice between a set of notes in standard type or a set of notes arranged so that the print showed the actual vocal stresses which the instructor employed when delivering the lectures. A majority of students preferred the notes printed so as to indicate oral stress. There are other situations where exact understanding is of such critical importance that readers prefer stresses to be shown in the printed documents. Some military orders and directives, for example, fall in this category.

The discovery of the relatively high correlation between the ability to understand and the ability to indicate stressed words, as outlined in this note, is being used in further experiments by the authors on changing the readability of prose. It is anticipated that this less ambiguous system for the transmission of meaning in print will result in decreasing significantly the number and duration of fixation pauses and movements of the eye which are ordinarily required in reading. These experiments are being conducted with due consideration for the aesthetics of the printed page and for modern typographic conventions.

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