

undoubtedly were affected by these uncontrolled factors. The methodology may have been improved by not allowing the S to blink and by utilizing a flickering background to sustain the appearance of the afterimage. However, the stroboscopic effect in low light illumination could influence brain rhythm activity and direct the course of fading or regeneration sequences. Some criticism may also be leveled at the way information was elicited from the S, i.e., leverpressing and/or verbal accounts. Experimenters disagree on the weight to be accorded verbal responses in lieu of the S's fallible memory. But leverpressing also relies on the same fallible memory in instructions to the S before the test trials. It was felt that information might be gained by verbal reports without unduly forcing the S to categorize what he thinks is required of him by the E.

#### REFERENCES

BARLOW, H. B. Slippage of contact lenses and other artifacts in relation to fading and regeneration of supposedly stable retinal images. *Quarterly Journal of Experimental Psychology*, 1963, 15, 36-51.

BARLOW, H. B., & SPARROCK, J. M. B. The role of afterimages in dark adaptation. *Science*, 1964, 144, 1309-1314.

BENNET-CLARK, H. C., & EVANS, C. R. Fragmentation of patterned targets when viewed as prolonged after-images. *Nature*, 1963, 199, 1215-1216.

DITCHBURN, R. W., & FENDER, D. H. The stabilized retinal image. *Optica Acta*, 1955, 2, 128-133.

DITCHBURN, R. W., & PRITCHARD, R. M. Vision with a stabilized retinal image. *Nature*, 1952, 170, 36-38.

EAGLE, M., BOWLING, L., & KLEIN, G. S. Fragmentation phenomena in luminous designs. *Perceptual & Motor Skills*, 1966, 23, 143-152.

EVANS, C. R., & PIGGINS, D. J. A comparison of the behaviour of geometrical shapes when viewed under conditions of steady fixation, and with apparatus for producing a stabilised retinal image. *British Journal of Physiological Optics*, 1963, 20, 1-13.

EVANS, C. R., & MARSDEN, R. P. A study of the effect of perfect retinal stabilization on some well-known visual illusions, using the after-image as a method of compensating for eye movements. *British Journal of Physiological Optics*, 1966, 23, 242-248.

EVANS, C. R. Further studies of pattern perception and a stabilized retinal image: The use of prolonged afterimages to achieve perfect stabilization. *British Journal of Psychology*, 1967, 58, 315-327.

HEBB, D. O. The semiautonomous process: Its nature and nurture. *American Psychologist*, 1963, 18, 16-27.

HECKENMUELLER, E. G. Stabilization of the retinal image: A review of methods, effects, and theory. *Psychological Bulletin*, 1965, 63, 157-169.

McKINNEY, J. P. Disappearance of luminous designs. *Science*, 1963, 140, 403-404.

MINARD, J. G., & BATCHELOR, J. Disappearance of naturally fixated luminous stimuli and stability of phase sequences: A selective review and related experiment. *Perceptual & Motor Skills*, 1967, 24, 747-752.

PRITCHARD, R. M. Stabilized images on the retina. *Scientific American*, 1961, 204, 72-78.

PRITCHARD, R. M., HERON, W., & HEBB, D. O. Visual perception approached by the method of stabilized images. *Canadian Journal of Psychology*, 1960, 14, 67-77.

RATLIFF, F. The role of physiological nystagmus in monocular acuity. *Journal of Experimental Psychology*, 1952, 43, 163-172.

RIGGS, L. A., RATLIFF, F., CORNSWEET, J. C., & CORNSWEET, T. N. The disappearance of steadily fixated visual test objects. *Journal of the Optical Society of America*, 1953, 43, 495-501.

SCHUCK, J. R., BROCK, T. C., & BECKER, L. A. Luminous figures: Factors affecting the reporting of disappearances. *Science*, 1964, 146, 1598-1599.

YARBUS, A. L. *Eye movement and vision*. New York: Plenum Press, 1967.

work (Kirchner, 1969, 1970), the present author hypothesized that V might be related to the activity and potency dimensions (Osgood et al, 1957) and unrelated to the evaluative dimension. Although considerable work has been directed toward studying the effect of evaluative factors on associative behavior (cf. Cramer, 1968, for an extensive review of this subject), much less effort has been directed toward that of other semantic dimensions, although Wimer (1963) presents data relating some of these dimensions and *m*, and Carroll (1965) offered speculations regarding the psycholinguistic significance of several dimensions.

#### METHOD

Selection of words for inclusion in this study was based upon the intent to sample words representative of: (1) the Thorndike & Lorge (1944) frequency range (counts varying from 1 per million to over 100 per million); (2) flat and steep response hierarchy (selected from the norms of Palermo & Jenkins, 1964, and of Bousfield, Cohen, Whitmarsh, & Kincaid, 1961); (3) concrete and abstract nouns (Mednick, Mednick, & Jung, 1964); and (4) semantic space (Jenkins, Russell, & Suci, 1958). Also included were words judged to be vivid and dull by the author. The word list was thus designed to encompass the ranges of the variables of interest rather than to consist of randomly selected words.

#### PROCEDURE:

##### SEMANTIC RATINGS

In a procedure following that of Jenkins et al (1958), each of the 62 words utilized in this study was rated on a 7-point scale by 30 Ss (in groups of 20 to 40 Ss, approximately half male, half female). Each of the total of 93 Ss rated 20 words, the order of word presentation being randomized. Thirteen scales were used in the rating procedure: nine scales were selected from Jenkins et al (1958); three scales (moral-immoral, wrong-right, and abstract-concrete), for which data are not reported here, were included for purposes extraneous to those of the present study; and one scale (aggressive-nonaggressive) was included because of its hypothesized relationship with V (Gofstein, 1956). The 10 scales to be reported here are listed below.

- (1) Vivid-colorless.
- (2) Good-bad. This is the pivotal scale for the first semantic differential factor of evaluation, having a loading of 1.00 on that factor.
- (3) Hard-soft. This is the pivotal scale (with a loading of .97) for the second semantic differential factor, potency.

## What is vividness?\*

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The vividness of verbal stimuli is highly related to the semantic differential rating of active (and, in decreasing order of magnitude, to ratings of fast, aggressive, new, hard, and beautiful). Studies manipulating vividness may thus involve demonstration of the effects of the activity dimension on verbal learning.

Vividness (V), a variable of venerable age in theory (Brown, 1854), has been operationally defined in recent work as an intrinsic dimension of verbal stimuli, and its impact upon the learning of verbal materials has been reported (Kirchner, 1969, 1970; Tulving, McNulty, & Ozier,

1965). However, the relationship of V to other variables of contemporary interest has not been delineated.

The present study explored the relationships of rated V with several of the familiar semantic-differential dimensions of Osgood, Suci, & Tannenbaum (1957), with frequency of occurrence (Thorndike & Lorge, 1944), and with associative productivity (*m*, Noble, 1952). In previous

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Table 1  
Intercorrelations of Vividness, Other Dimensional Ratings, Frequency, and *m*<sup>a</sup>

1	Vivid-colorless													
	2	3	4	5	6	7	8	9	10	11	12	13		
	Good-bad	Hard-soft	Active-passive	New-old	Aggressive-nonaggressive	Beautiful-ugly	Cruel-kind	Fast-slow	Masculine-feminine	T-L Frequency	Male <i>m</i>	Female <i>m</i>		
093														
316	-704													
819	-109	571												
432	734	-405	178											
727	-374	759	925	-039										
281	919	-643	003	784	-251									
120	-927	867	359	-641	604	-865								
763	-130	610	953	208	916	-008	375							
201	-519	792	498	-456	651	-526	696	527						
-100	-194	097	-043	-076	081	-167	127	013	127					
-125	-153	025	-059	107	-007	-142	069	002	-070	529				
-130	-096	-030	-113	121	-075	-090	028	-074	-107	383	844			

<sup>a</sup>Correlations of .250 are significant at the .05 confidence level; correlations of .325 are significant at the .01 confidence level.

- (4) Active-passive. This is the pivotal scale for the third semantic differential factor, activity (with a factor loading of .98).
- (5) New-old. This scale loads .97 on the sixth factor, novelty.
- (6) Aggressive-nonaggressive.
- (7) Beautiful-ugly. This and the following three scales were included for the possible relevance to V and/or their use in judging consistency with closely related scales.
- (8) Cruel-kind.
- (9) Fast-slow.
- (10) Masculine-feminine.

#### PROCEDURE:

#### ASSOCIATION VALUE

The 62 stimulus words were utilized in a continued association task following the administration and scoring procedure of Noble (1952). Each word was presented to 98 Ss (49 male, 49 female), who did not participate in the semantic rating phase. Each S gave continued associations to only 31 words arranged in random order in booklets, each page of which contained a stimulus word presented 20 times.

#### SUBJECTS

All Ss were Pennsylvania State University students enrolled in an introductory psychology course; their volunteer participation was rewarded by the customary credit toward course grade.

#### RESULTS AND DISCUSSION

Table 1 presents the intercorrelations of the various measures (decimal points are omitted). These Pearson correlations are based upon the means of the dimensional ratings and of *m* for the 62 words; in the case of frequency, Thorndike-Lorge (1944) ratings of A were arbitrarily assigned a value of 50 and AA ratings were given a value of 100, thus restricting the upper range of frequency and introducing a certain imprecision in correlations involving the frequency variable. It is felt that the correlations among the various more traditional semantic differential

ratings in the matrix impart a certain face validity to the data presented in Table 1.

The findings reported in Table 1 suggest that V is highly related to the active-passive scale (the pivotal scale for the activity dimension of the semantic differential) and that V can be further specified, at the .01 confidence level, as fast, aggressive, new, and hard.

At the less-impressive confidence level of .05, V shows a positive relationship with the beautiful-ugly scale. No significant relationship is found between V and the good-bad scale, although the beautiful-ugly and the good-bad scales themselves show a .92 correlation. Partial correlations involving these three dimensions strengthen the appearance of a relationship between V and beautiful-ugly (partial correlation when good-bad is held constant is .51), suggest that V relates negatively with good-bad ratings (partial correlation when beautiful-ugly is held constant is -.44), and indicate the maintenance of a high relationship of the good-bad and beautiful-ugly scales (partial correlation with V held constant is .93). These subsidiary indications, then, suggest that it is the bad and the beautiful which are more likely to be vivid than the good and the ugly.

No significant relationships of V with frequency or with male and female *m* are found. These findings are in accord with pilot studies in this area. The lack of relationship between frequency and the evaluative dimension, however, is not in accord with previous evidence (Johnson, Thomson, & Frincke, 1960), showing a significant positive relationship between goodness and frequency.

In conclusion, this study, which delineates V as a variable primarily characterized as active, fast, aggressive, new, and hard, offers belated empirical support for Brown's (1854) use of the term "liveliness." Previous studies on V (Kirchner, 1969, 1970) may well partially represent a demonstration of the effects of

the activity factor on verbal learning.

#### REFERENCES

- BROWN, T. *Lectures on the philosophy of the human mind*. Hallowell, England: Masters-Smith, 1854.
- BOUSFIELD, W. A., COHEN, B. H., WHITMARSH, G. A., & KINCAID, W. D. The Connecticut free associational norms. Technical Report No. 35, November 1961, University of Connecticut, Contract Nonr-631 (00), Office of Naval Research.
- CARROLL, J. B. Review of C. E. Osgood, C. J. Suci, & P. H. Tannenbaum, *The measurement of meaning*. Language, 1959, 35, 58-77.
- CRAMER, P. *Word association*. New York: Academic Press, 1968.
- GOFSTEIN, A. B. Hostile drive, conflict, and the recall of hostile material. Unpublished Master's thesis, University of Pittsburgh, 1960.
- JENKINS, J. J., RUSSELL, W. A., & SUCI, G. J. An atlas of semantic profiles for 360 words. *American Journal of Psychology*, 1958, 71, 688-699.
- JOHNSON, R. D., THOMSON, C. W., & FRINCKE, G. Word values, word frequency, and visual duration thresholds. *Psychological Review*, 1960, 67, 332-342.
- KIRCHNER, E. P. Vividness of adjectives and the recall of meaningful verbal materials. *Psychonomic Science*, 1969, 15, 71-72.
- KIRCHNER, E. P. Vividness of connotative adjectives and their paired-associate learning. *Psychonomic Science*, 1970, 19, 83-85.
- MEDNICK, M. T., MEDNICK, S. A., & JUNG, C. C. Continual association as a function of level of creativity and type of verbal stimulus. *Journal of Abnormal & Social Psychology*, 1964, 69, 511-515.
- NOBLE, C. E. An analysis of meaning. *Psychological Review*, 1952, 59, 421-430.
- OSGOOD, C. E., SUCI, C. J., & TANNENBAUM, P. H. *The measurement of meaning*. Urbana: University of Illinois Press, 1957.
- PALERMO, D. S., & JENKINS, J. J. *Word association norms: Grade school through college*. Minneapolis: University of Minnesota Press, 1964.
- THORNDIKE, E. L., & LORGE, I. *The teacher's word book of 30,000 words*. New York: Bureau of Publications, Teachers College, Columbia University, 1944.
- TULVING, E., McNULTY, J. A., & OZIER, M. Vividness of words and learning to learn in free recall learning. *Canadian Journal of Psychology*, 1965, 19, 242-252.
- WIMER, C. An analysis of semantic stimulus factors in paired associate learning. *Journal of Verbal Learning & Verbal Behavior*, 1963, 1, 397-407.