The findings of Geisler, van Borgek, and Frishkopf indicate separate origin for the simple and complex units in the bullfrog.\(^3\)

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2 The present paper will deal with the unit's threshold to a 0.5-sec tone burst as a minimum.


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**Note on the Variability Hypothesis in Category Scaling**

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The "variability hypothesis" attributes the nonlinear relation between category and magnitude scales to the growth of variability along the psychological continuum. The findings of some earlier research seemed to contradict this hypothesis. Now, an alternative interpretation of these findings is presented.

In a recent report of research on "Ratio Scales, Category Scales, and Variability in the Production of Loudness and Softness," we showed that the curvatures of the category scales for loudness and softness differ when these scales are plotted against their corresponding magnitude scales, although the variability observed in the magnitude productions of loudness and softness did not differ. These findings were viewed as conflicting with the "variability hypothesis," which attributes the nonlinear relation between category and magnitude scales to the growth of variability as we progress upward along the psychological continuum.

S. S. Stevens has called our attention to an alternative interpretation of these findings that does not contradict the variability hypothesis. The findings that the variability of loudness and softness productions does not differ is in accord with the following assumption: an observer's estimate of the loudness or of the softness of a sound is controlled, in either case, by the sound's loudness: he merely makes a reciprocal transformation on the numbers assigned to the apparent magnitude before reporting "softness." The difference in concavity between the category scales for loudness and softness (relative to their respective magnitude scales) then becomes the result of an arbitrary transformation on the psychological scale of loudness. From this point of view, softness is just one of several possible transformations that an observer could be asked to make on the scale of loudness. An analogous interpretation applies to the relations between scales for shortness and length, smallness and largeness, dimness and brightness. In general, the differing concavities of the psychological scales associated with inverse pairs of attributes would be excluded from the domain of the variability hypothesis.

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**Time Requirements for the Tonal Function**

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Use of short pure-tone bursts to test perception of tone rather than click in a patient with disturbed blood supply to the brain stem in humans has shown that the threshold of tone processing provides an approach to measurement of neural processes in pitch perception.

SCHÖTTEN, RITSSMA, and CARDINDO have recently presented findings that "strongly point towards a pitch-extracting mechanism different from and subsequent to the basilar membrane and operating in the time domain." Our own experiments with musical tunings in melody,\(^2\) autocorrelative hypotheses of pitch perception, such as Licklider's,\(^3\) and all residue concepts assume a neural process operating in time to produce the sensation of pitch. Opportunity to test these concepts was offered by a group of surgical patients with vertebral-artery insufficiency.\(^4\) In these patients, stenotic lesions appear to reduce the blood supply to the brain stem, including the nerve centers for hearing, and to the cochlea.

Presenting symptoms in this syndrome include true rotary vertigo, and frequently tinnitus. Many patients complain of difficulty in hearing, especially under noisy conditions. Of these, some show hearing loss by conventional audiogram; some do not. In most instances, audiologic study has not adequately confirmed the subjective hearing complaint, nor the reported improvement following corrective surgery.

The tone-click phenomenon in short tones, which has been investigated for normals by several experimenters, and in some detail by Doughty and Garner,\(^1\) was chosen as a possible technique for testing the time factor in these cases of perceptive confusion. Normal listeners will hear a 10-msec spurt of a 1000-cps frequency as a short tone, but if the duration is reduced they reach a point where the stimulus is heard as a click, without tonal quality. In the present study, we have found some abnormal subjects requiring 200 or 300 msec to achieve a sensation of tone, reporting shorter durations as click, and two subjects who required a full second. One of the latter commented on a duration of 800 msec, "It's not a tone, but too long for a click; it sounds like static."

So far in the pilot study, the Boomsliter-Creel test has been used on 41 candidates for surgery; on 23 we have pre- and post-operative scores. In all, to date, 205 tests have been made on 114 subjects.

Our present apparatus uses a standard Misco audiometer as