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New Developments in Stereophonic Sound

B. Paulson

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commonly experienced during the latter part of a series of 110-db bursts. Subjects differed significantly in their rate of accumulating additional loss in acuity. We conclude that number and rate of burst-pip sequences are important variables to be controlled in studies of "auditory fatigue" and/or "adaptation." The reaction of an ear to repeated stimuli appears to have possibilities as an index of the ear's susceptibility to stimulation deafness.

* Sponsored by U. S. Air Force School of Aviation Medicine.

L9. Channels of Reception in Pitch Discrimination. ANDREW G. PIKLER* AND J. DONALD HARRIS, *Naval Medical Research Laboratory, New London, Connecticut.*—Pitch discrimination was studied in four normal-hearing subjects monaurally, binaurally, and in a variety of other channels of reception. There was no difference in sensitivity between the two ears of any subject, nor were there differences in sensitivity of the monaural channels and the binaural channel, provided all channels were carefully matched in loudness. All channels were equivalent under conditions of matched loudness, except the successive interaural channels (standard stimulus in right ear, variable stimulus in left, and vice versa). These channels showed some slight deterioration of sensitivity and some increase in variance which can be attributed to momentary fluctuations of diplacusis. Similar fluctuations were also found in a channel utilizing a monaural standard stimulus and a binaural variable stimulus, the stimuli in the two ears being matched for loudness. Under these conditions, furthermore, a third pitch is sensed, a phenomenon we term triplacusis. Triplacusis must arise from interaural interactions, and indeed the data as a whole point toward a heavily nonperipheral explanation of pitch discrimination.

* Now at Navy Electronics Laboratory, San Diego, California.

L10. (Abstract withdrawn.)

L11. A Recorded Test for Determining Absolute and Masked Thresholds of Clicks, Bands of Noise, and Warble Tones. J. C. WEBSTER AND J. F. NICKERSON,* *Human Factors Division, U. S. Navy Electronics Laboratory, San Diego 52, California.*—A test has been constructed to screen out men who cannot hear well in low levels of noise and/or who have absolute hearing losses of 25 db or more. The test signals consist of one-millisecond clicks, or ¾-second pulses of various sounds. For low-frequency acuity pulses of 200–800 cps noise and tones warbling at a 5-cps rate for an extent of 62.5 cps around 500 cps are used. For high frequency acuity a 5000-cps click, pulses of 1600–6400-cps noise, and pulses of a warble tone of 4000 ± 125 cps are used. A warble-tone-pulse of 1000 ± 125 cps, and a 1000-cps click are used for testing the middle or working frequency acuity. These signals are always heard in a background of noise shaped to provide approximately equal masking at all frequencies. The levels of noise vary so as to cause zero, 25, or 35 db of masking at various times throughout the test. If the test is given our earphones the ambient room noise (over-all level, flat position) can reach 50 db without invalidating the test results. The mechanics of the test construction and some preliminary results of using the test will be presented.

* On a sabbatical leave from the University of Kansas, Lawrence, Kansas.

FRIDAY MORNING, JUNE 25, 9:00 A.M.

The Rudolph Koenig Session on Instrumentation

F. V. HUNT, *Chairman*

Contributed Papers

M1. Noise Characteristics of Cathode-Follower Input Stages. FRANCIS X. BYRNES, *U. S. Navy Electronics Laboratory, San Diego 52, California.*—Cathode followers are frequently used as the input stage for transducers with capacitive impedances; condenser microphones, crystal or ceramic microphones, and hydrophones are examples. The primary purpose of the cathode-follower-type connection rather than the plate-loaded connection for the input stage is to present a higher load impedance to the transducer, thus extending its low-frequency response. An additional advantage which is sometimes claimed for this circuit is that the signal-to-noise ratio is improved. This is supposed to be due to the greatly increased effective value of the input resistor, which in turn means a smaller resistive component and therefore smaller thermal noise of the input impedance. It will be shown both analytically and experimentally that this signal-to-noise ratio does not improve with the cathode-loaded connection and, in fact, in most cases is poorer than with the plate-loaded connection. A comparison of the signal-to-noise ratio for each of these connections with other factors held fixed will be shown. Other circuits which combine both the better noise characteristics of the plate-loaded circuit and the high input impedance of the cathode follower will be shown.

M2. New Developments in Stereophonic Sound. B. PAULSON, *Ampex Corporation, New York, New York.*—Stereophonic sound represents the latest and most promising effort in audio technology towards achieving realistic reproduction of recorded sound. A summary of the developments in stereophonic recording from its inception will be presented. Present-day status of the art will be analyzed, emphasizing new fields for the use of stereophonic recording techniques. The technical details of the Ampex 3-channel stereophonic recorder will be described, and this equipment will then be utilized in a demonstration of various stereophonic recording techniques.

M3. Scattering of Sound by Isotropic Turbulence. ISABURO HORIUCHI, *Acoustics Laboratory, Columbia University, New York, New York.*—Existing information concerning the characteristics of atmospheric turbulence is analyzed, and some representative figures on the resulting scattering of sound to be expected are obtained. The nature of such turbulence, the extent and causes of the anisotropy near the ground, the variation in its character with altitude, and the extent to which approximation of isotropy are valid are discussed. Other micrometeorological parameters are considered and their effects on sound propagation in comparison to those caused by velocity fluctuation estimated. A reasonable spectral function for isotropic turbulence is applied to