PARSONS RESEARCH CENTER

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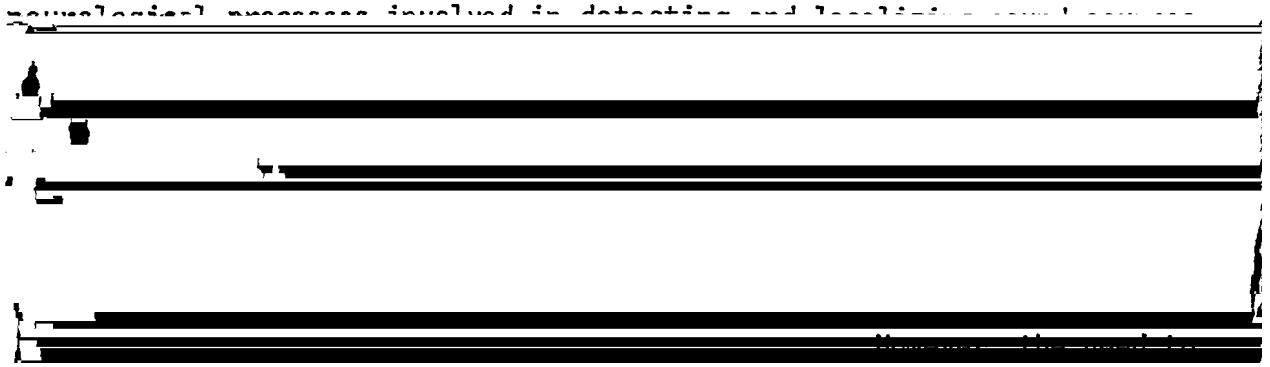
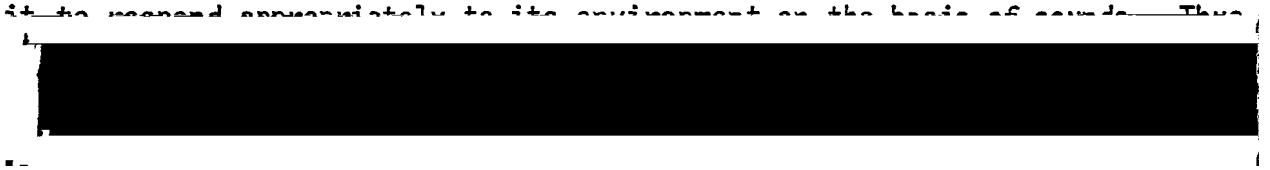
Perception of Biologically Meaningful Sounds by Dogs[1]

Over the past years, a number of studies have been concerned with the



identify a sound source is crucial to an animal's survival in that it enables



[redacted]

their source. [redacted]

[redacted]

dog and non-dog categories could be chosen which overlapped in frequency and intensity (e.g., dog bark and seal bark, dog whine and sheep bleating). In addition, it was possible to set aside a subclass of dog vocalizations (howls)

[redacted]

for use only as test stimuli to see if dogs trained to respond to dog barks,

Subjects

Eight mongrel dogs (2 male and 6 female) were used.

tapes using a 4-channel tape recorder (TEAC 3340S) and a Dolby noise reduction unit (Advent 100A). Each tape contained 16 sounds, 8 dog and 8 non-dog,

[redacted]

However, to insure that the animals were not learning to discriminate differences between channels (e.g., variation in frequency response), four different tape recorders were used for playback. In addition, a duplicate of one of the tapes was made in which both the dog and non-dog sounds were recorded on all four channels. In no case could any indication be detected that the animals were using possible differences between channels as a cue.

On playback, the sounds were first led from the tape recorder to the Dolby unit, then to an amplifier and finally to a loudspeaker (Acoustic Research 3a). The loudspeaker was mounted over the testing cage which was located in a single-walled sound-proof chamber.

Procedure

The dogs were placed in the cage and trained to press the windows with their nose in order to receive a water reward (see Fig. 5). The animals were then trained to begin a trial by pressing the center window of the 3-window panel. This response caused a tape recorder to play one of the 16 sounds. Following presentation of the sound, the dogs were required to press the right window if a dog sound had been played and to press the left window if a non-dog sound had been played. A correct response was rewarded by making

a small amount of water available at the water spout (signaled by the light above the spout as well as by a relay click) while [redacted]

Two separate tests were used: a "generalization" test; and, an "equivalence" test.

Generalization test. The dogs were first trained to classify 32 different sounds (16 dog and 16 non-dog). The animals were then presented with 16 new sounds on each of the next six sessions, thereby receiving a total of 96 new sounds (Table 1). The first response of an animal to each novel sound was [redacted] the degree of generalization to the new sounds. These sounds included barks, whines, whimpers, and growls, but not howls.

[redacted]

Equivalence test. The dogs were given additional training on the 96

these sounds could be presented many times without the animal being trained to respond one way or another to them. A total of 24 different sounds were used in the equivalence test with two test sounds presented each session [redacted] animal had accumulated about 20 trials per month.

Results

Generalization Test

Figure 6 illustrates the ease with which dogs learn to discriminate dog sounds from non-dog sounds. Each letter in the figure indicates a different set of 16 sounds (8 dog and 8 non-dog). With the exception of early sessions (circled A), all 16 sounds of a particular set were presented within a session. All of the dogs successfully discriminated sounds on the first or second [redacted]

Figure 6 appears about here

Figure 7 shows the percentage of correct classifications of the 96 novel sounds of Test I. These scores are based only on the response of the animals to the initial presentation of each sound and show that all of the animals generalized to the new sounds at a level greater than that expected by chance [redacted]

Figure 7 appears about here

Equivalence Test

While the generalization test allowed us to assess the degree to which

Table II appears about here

These results, along with those of the generalization test, indicate

occurred only in response to one of the howls indicating that that particular sound was more difficult to identify than the others. In this case, two of

opportunity to discriminate sounds on the basis of source, but also to rule

Since it is impossible to completely rule out the use of another cue, our problem became one of reducing the possibility that the animals were using

Our first step in this direction was the choosing of a discrimination which the animals would naturally make themselves. The discrimination between members of one's own species as opposed to other species is one which all animals must make, if only to reproduce, and thus constituted an ideal choice for this experiment. Indeed, it is difficult to conceive of a more likely sound source discrimination. Thus, the extremely rapid learning of the dog vs non-dog discrimination should come as no surprise and, indeed, longer learning times would have suggested that a less natural cue was being used.

Our second step in reducing the possibility of the dogs using a different cue was to carefully analyze and select our sounds so that the discrimination

we had access to a large number of recordings, we were able to choose sounds

Thus, it is difficult

While one cannot completely rule out the possibility that the animals were performing some sort of complex frequency-intensity-time discrimination

test suggests that they were using an easily detectable cue. Not only did the animals generalize to these sounds as a whole, but an analysis of their final scores revealed that there were only three of the 96 sounds (2 dog and 1 non-dog) which any of the animals failed to learn to classify appropriately. These results along with those of the equivalence test indicate that the

The results of the equivalence test goes one step further. Here we found that the animals would classify together as dog or as non-dog sounds which were physically quite different from the ones with which the animals had been trained. Though some of the dogs had difficulty with the howl which lacked an appreciable onset cue, the overall results indicated that the animals responded to howls as they did to the other dog sounds.

On the basis of the evidence, we have concluded that the dogs were most

dog vs non-dog. As a result, we have begun to use this procedure as a test

References

Dewson, J. H., III, Pribram, C. K., & Lynch, J. C. Effects of ablation of

[illegible]	[illegible]

Table II. Results of Equivalence Test

Rat	Number of Sounds Correctly Identified	Incorrectly Identified	Failed to Identify
D-5	24	0	0
D-7	22	0	2
D-8	22	0	2

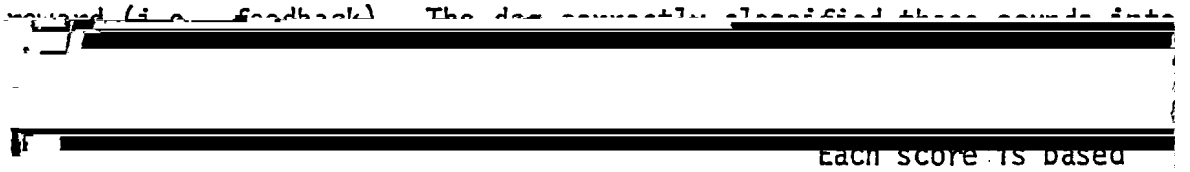
Note: An identification occurred when an animal responded to a given sound by consistently touching one of the windows over successive presentations of

Fig. 1. Sound spectrum of three consecutive barks produced by an adult female

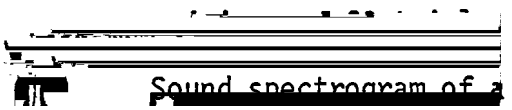
Fig. 7. [redacted]

of the 96 sounds of the generalization test. Dashed line indicated the 0.05 two-tailed level of chance.

Fig. 8. Example of the response of dogs to animal sounds in the absence of [redacted]



[redacted] Each score is based



[redacted] Sound spectrogram of a howl produced by a spaniel.

Fig. 10. [redacted] back as to whether or not their responses were correct. Dashed line indicates 0.05 two-tailed level of chance.

Fig. 11. [redacted]

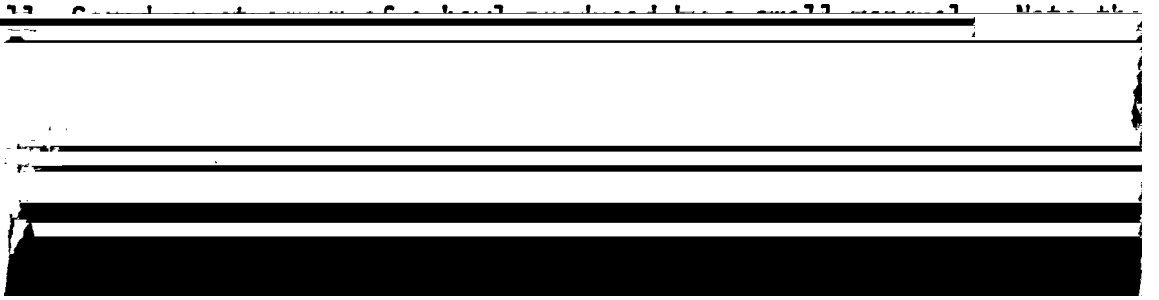
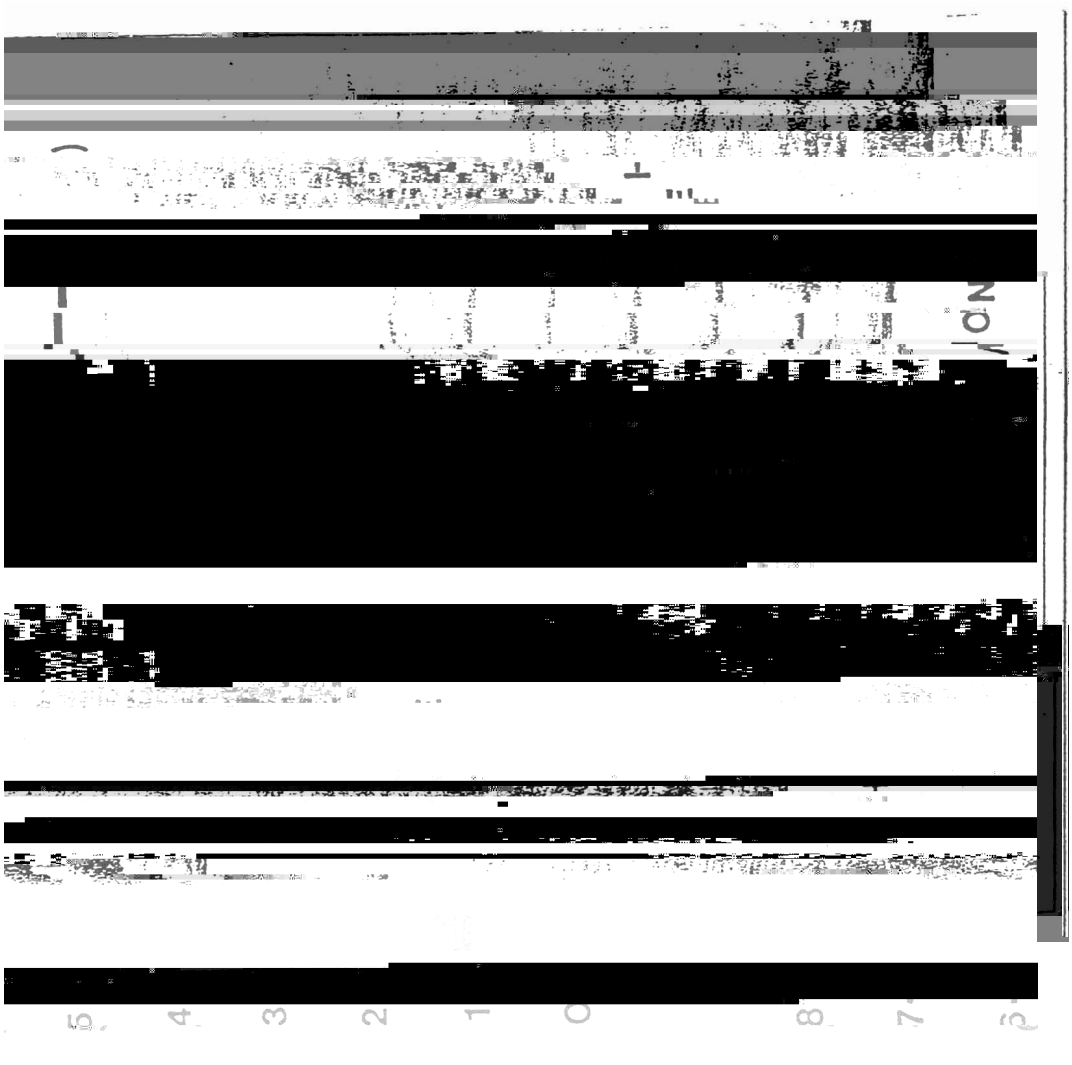


Fig 1

SEAL



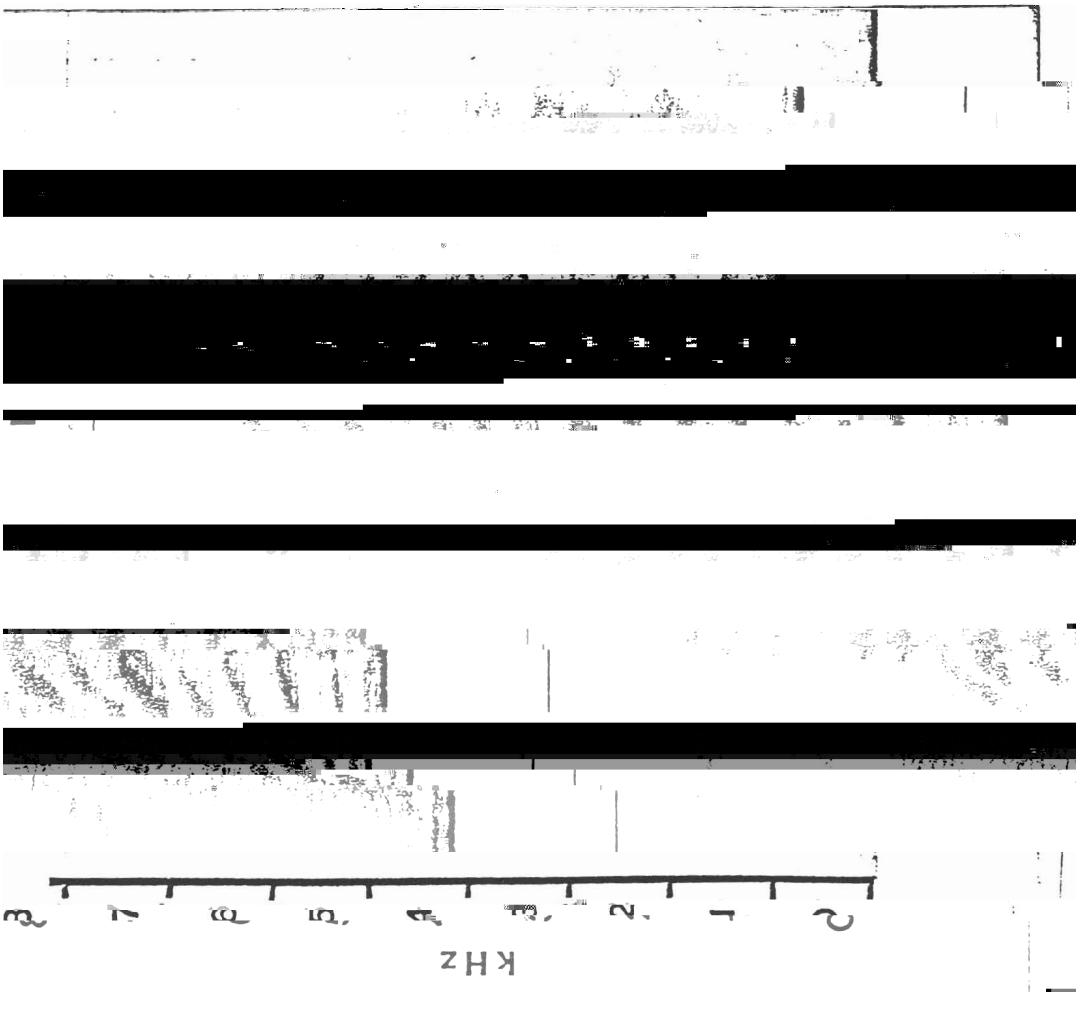
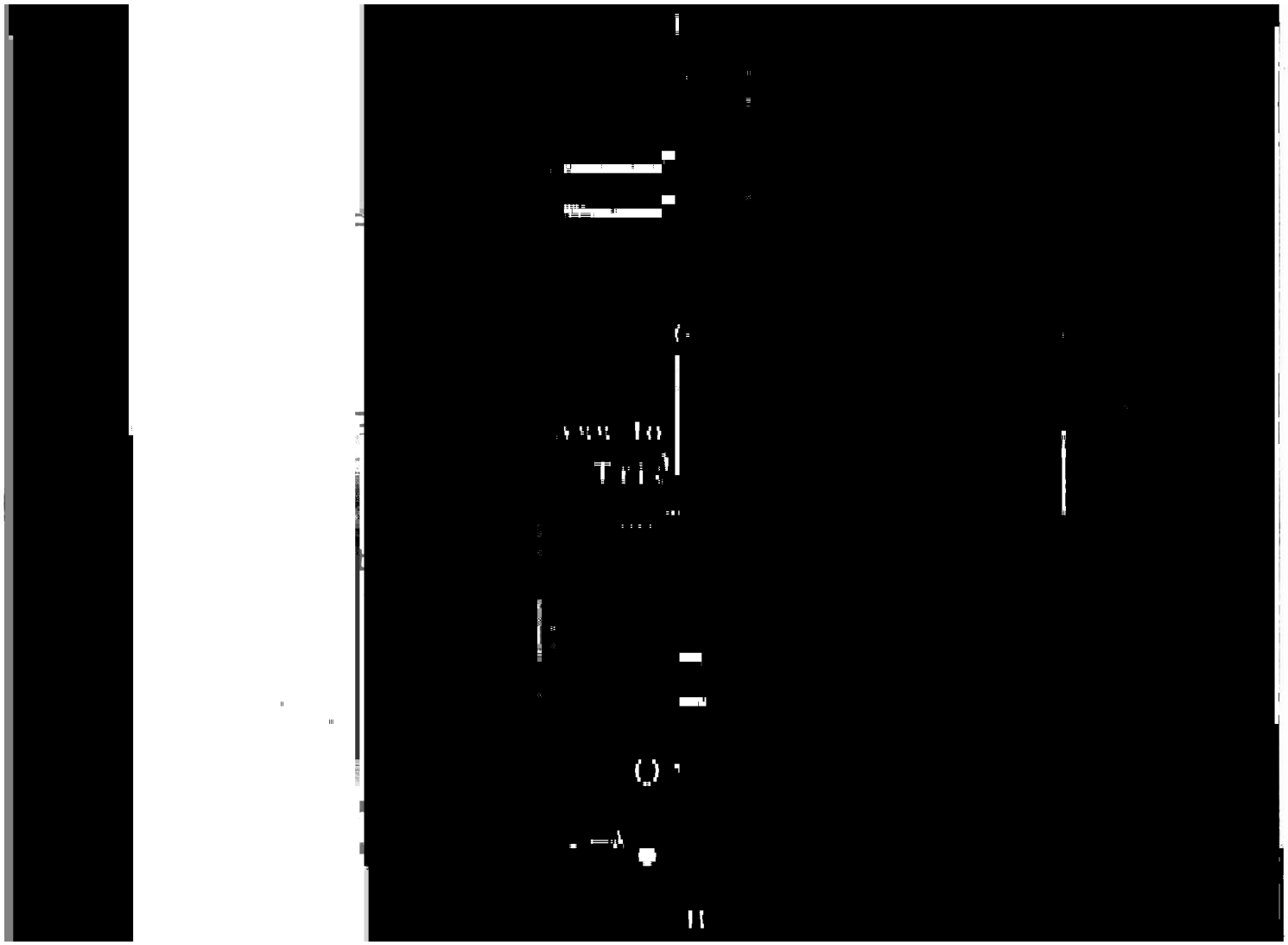


Fig. d



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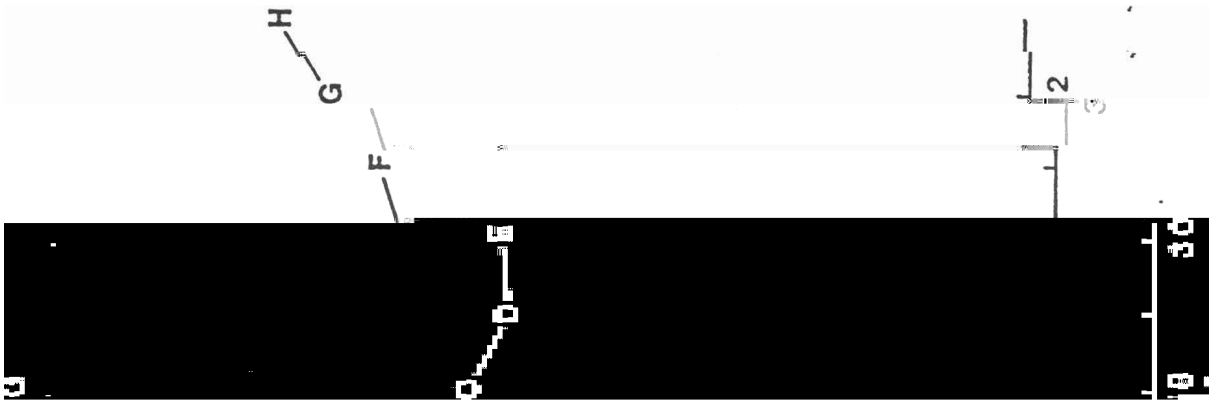
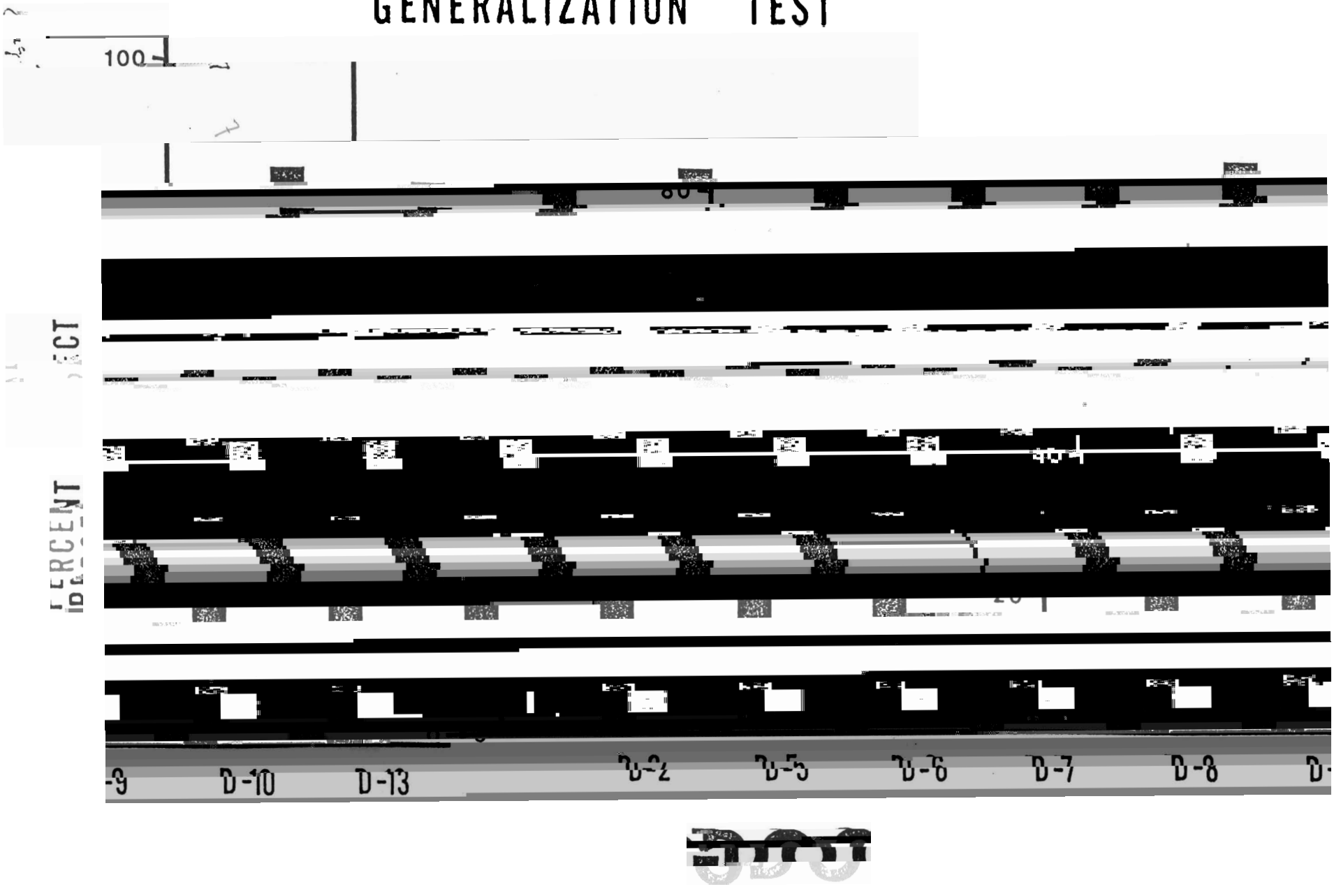
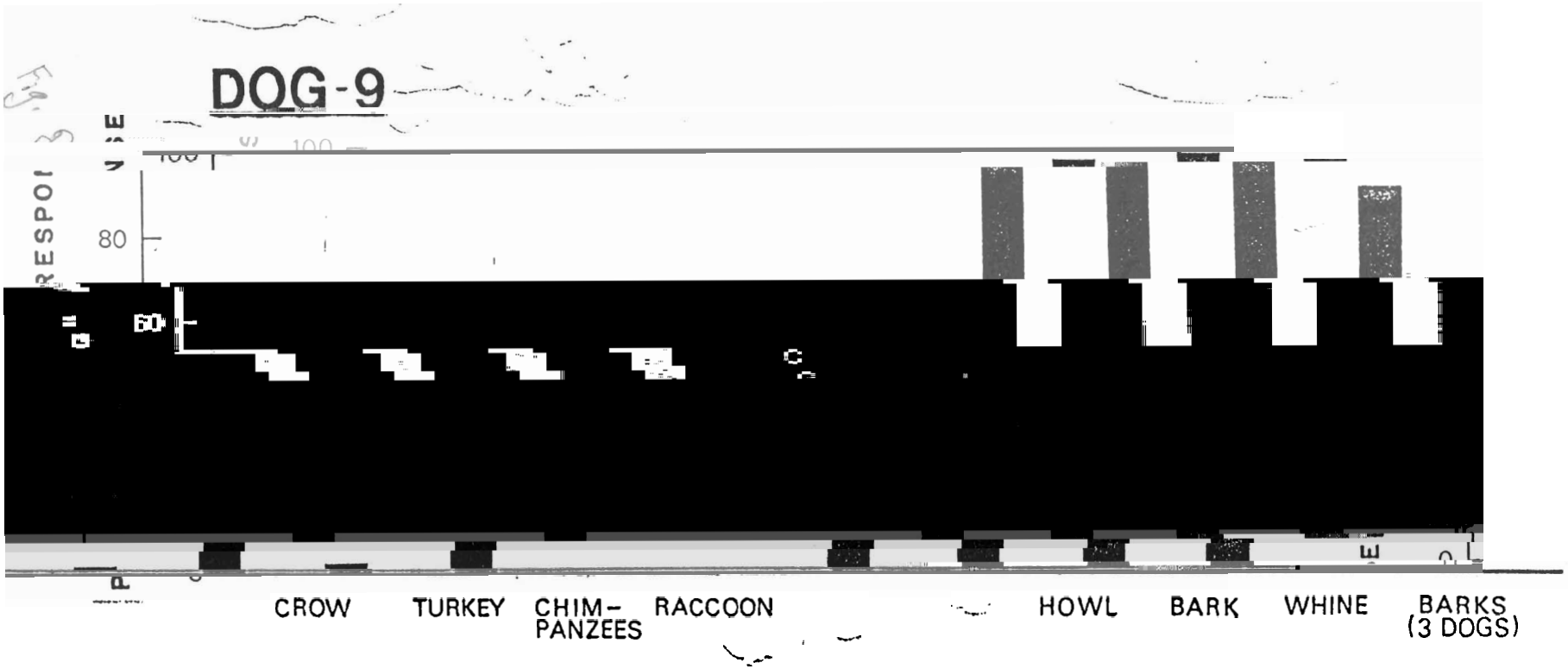
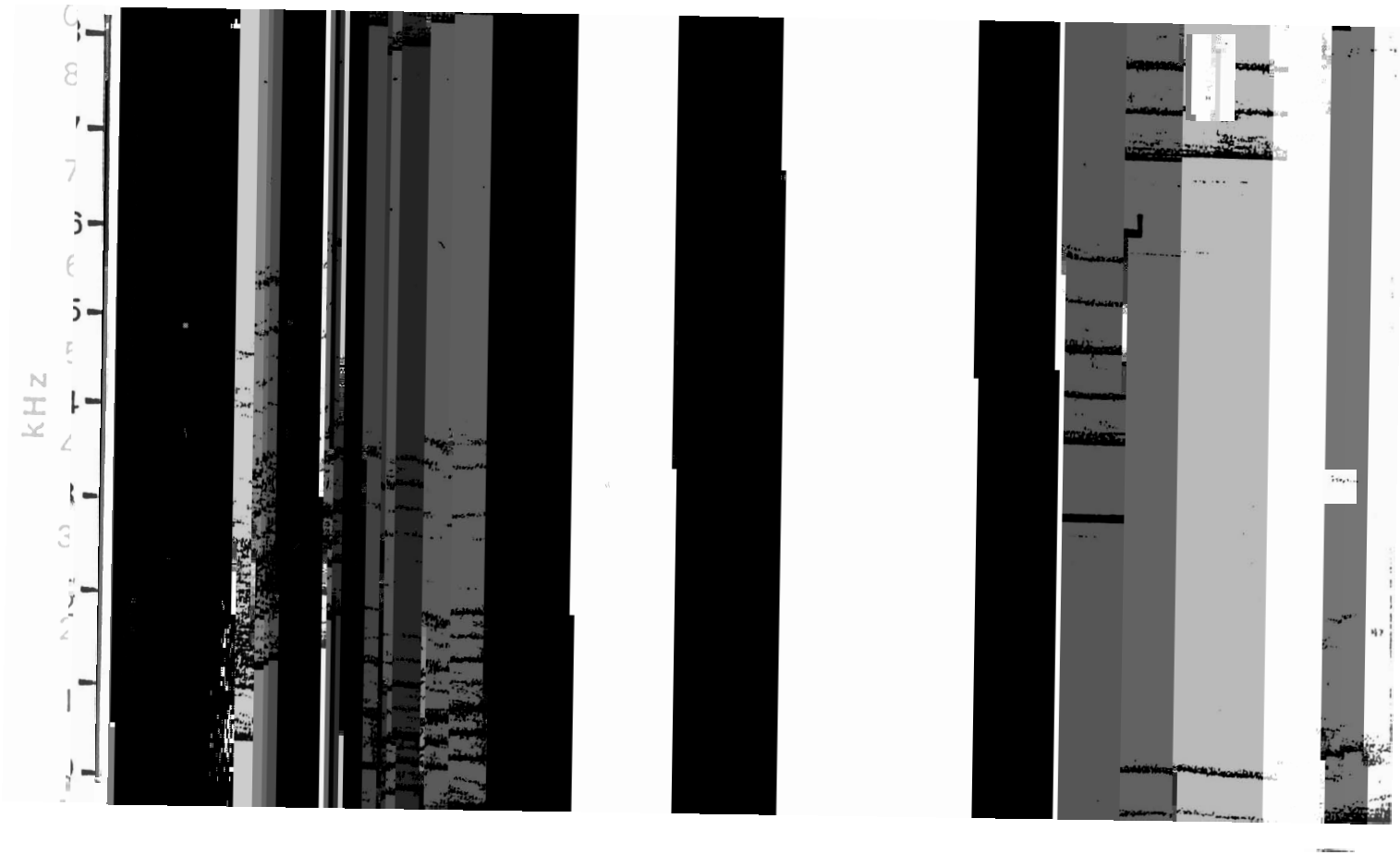
el


H
G
F
2
3.0

GENERALIZATION TEST




DOG-9
80
60
CROW
TURKEY
CHIM-
PANZEES
RACCOON
HOWL
BARK
WHINE
BARKS
(3 DOGS)



HOWL (SPANIEL)

Sound
PERCENT

[redacted]

الموثق

kHz