can seldom be sure whether animal's failure to respond is due to actual inability to *hear* that tone or due merely to extinction of the overt response. We have long been convinced that this problem, whose importance for questions of general auditory theory is commonly admitted, merits systematic re-examination; and the results hitherto obtained tend to confirm this conviction.

The actual acuity of a female dog A was measured by an established form of the conditioning procedure[4] at nine separate frequencies from 200 to 5,000 cycles. She was then exposed to a continuous 1,000-cycle tone (whose energy-level was about 110 decibels above her limen) for 18 hours within the space of five days. Her acuity was then found to have fallen by forty to fifty decibels, not at 1,000-cycles alone but throughout the entire test-range (Table I, row 2). Her limens remained virtually the same, despite continuance of the exposure, for an additional period of 8 days. Then, in hope of achieving still greater loss, we *interrupted* the exposure-tone 52 times a minute (each burst of sound continuing about 0.12 second). After 15 hours of this intermitted sound within the course of a single day, hearing was further reduced about thirty decibels (row 3), whereupon it again remained virtually level, except for a slow recession. When 148 hours of interrupted stimulation (distributed through 11 days) had been completed, all exposure was terminated. The animal was soon thereafter dispatched and preliminary steps for histological examination begun.

TABLE I

(1) Frequency ...	200	500	800	900	1000	1100	1200	2000	5000
(2) Loss in decibels after 81 hours continuous tone	49	38	52	46	48	48	49	36	53
(3) Total loss in db. after 148 hours interrupted tone	71	80	85	80	81	84	83	76	83

To make sure that this great reduction was not due in whole or in part to mere extinction of the conditioned response (flexion of right foreleg), whereby we test animal's ability to hear, we placed dog B under *complete general anesthesia* (Nembutal) during each exposure-time of ten hours. Inasmuch as the animal "slept" peacefully through the whole exposure, the response-mechanisms which had been conditioned into the higher neural centers were presumably shielded from disruption, whereas the peripheral acoustic apparatus was being affected much as usual. An interrupted tone of 3,000-cycles (intensity about 110 db. above B's limen) was used, and exposure continued for five 10-hour stages. Table II shows the loss in acuity after each of these 10-hour periods.

TABLE II

Cumulative exposure	Test frequencies							
hours	500	1000	2000	2500	3000	3500	4000	5000
10	33	20	40	32	33	30	25	17
20	46	47	59	60	55	62	59	55
30	67	56	70	71	70	71	75	72
40	59	49	74	79	73	78	78	71
50	56	47	77	79	72	78	78	71

Thirty-one days after the last exposure, B still shows no signs of recovery from the levels reached directly after the final exposure.

Several conclusions seem to emerge from these observations:

(1) Protracted stimulation by loud tones of medium pitch (1,000 and 3,000 cycles) induces an almost *horizontal subsidence* in auditory acuity throughout an extensive section of the audible range.

(2) No sign of functional restoration appears as much as thirty-one days after the last exposure.

(3) The *interrupted tone* proves to be an extremely effective instrument for acoustic impairment. It is well known that a steel bar, when exposed to repeated stresses of appropriate force, fails sooner than under a dead load of the same magnitude; analogous principles may be operative here. Certainly these recurrent bursts of sound are more distressing to the human ear than is a continuous tone of the same amplitude.

Until histological examination is effected, any theoretical inquiry would be premature. Several explanatory possibilities may be noted: (1) Wide-spread cochlear lesions; (2) middle ear effects, such as spastic degeneration of the tensor tympani; (3) even coagulation of proteins in the cochlear perilymph might be suggested.

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[4] For description of training and testing technique, see SCIENCE, 78: 269–270, 1933.

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