Lecture 18 Notes from 3/01/95
Lecturer: Prof. Ben Gold
Scribe: Mike Horton
Email: horton@ic.eecs.berkeley.edu

Mid 1800's Ohm and Helmholtz proposed that the ear performs something like a Fourier transform on incoming sound. Furthermore, they proposed that pitch was correlated to the place of resonance on the Basilar membrane.

Later an experiment was performed that sparked the "Missing Fundamental Controversy ". The experiment was performed by playing a series of harmonics leaving out the fundamental frequency. However, the observer still hears the fundamental frequency.

Prof. Gold proceeded to play a demonstration of the experiment. The demonstration - The Virtual Pitch Demo - played a sequence of tones and replayed the sequence successively removing higher harmonics.

Another significant experiment in pitch perception was the Siren experiment. See siren experiment diagram.

Helmholtz responded to all of this evidence against the place theory with the following argument: The inner ear must have significant non-linearity causing the same place on the Basilar membrane to be activated without the fundamental being present. This argument was followed up by an ingenious experiment that disproved it. The experiment systematically blocked out the hypothesized non-linearity by using noise. However, the fundamental was still perceived.

This led to the idea that timing and periodicity were the key factors involved in the perception of pitch.

It was also proposed that the dominant mechanisms for pitch perception take place at high frequency vollies. Ritsma disproved this theory too.

A diagram was then shown which compared the different theories of pitch perception and where it occurs versus frequency.

Later Houtsma & Goldstein performed an experiment that showed pitch perception takes place at higher places in the auditory

Siren Experiment

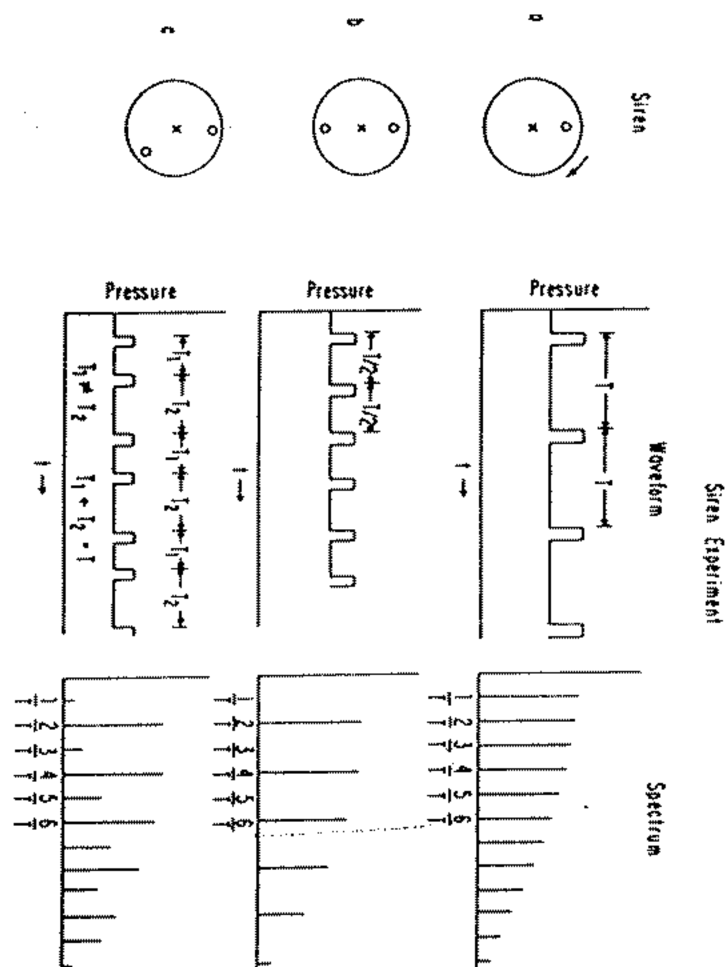

Figure 6.4. Seebeck's siren experiment. The sirens, the waveforms, and the spectra of the sounds are shown i columns of the figure. See text for a discussion of the experiment.