The History Corner: Titchener’s Sound Cage

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The sound cage is an instrument once used to study the human ability to localize sounds in space. The best known of these, Titchener’s Sound Cage, was introduced by Edward Bradford Titchener in 1901 in his laboratory manual, *Experimental Psychology*. There is an example of the sound cage, also known as a sound perimeter, in the collection of the Archives of American Psychology (see Figure 1).

Figure 1

Our ability to localize sounds accurately without visual cues as to their source has been known since our ancestors used it as a survival skill, but we have only been able to measure the accuracy of this ability in relatively recent times. In 1875, the English physicist, Lord Rayleigh (J. W. Strutt), reported an experiment that measured this ability:

An observer with his eyes closed was placed in the middle of a lawn, and several assistants moved round about him, and, speaking at intervals, asked him to point out where they were. We found that this could be done, after a little practice, with considerable accuracy, the error not being more than a few degrees in extent, from a single word or even a single vowel. We found also that it made very little difference whether the speaker was to the right or to the left, in front or behind the hearer, who could in every case tell without any difficulty or uncertainty, within a little, from what quarter the sound proceeded. (Strutt, 1875).

Lord Rayleigh’s study gave useful information about localizing sound stimuli, but it lacked placing

stimuli in precise locations around the head and above it. A device to do that was constructed for Hugo Muensterberg's psychological laboratory around 1892. The apparatus, shown in Figure 2, was described as follows:

Figure 2

The apparatus consisted of a graduated circular metal rim 1 m. in diameter, which rested horizontally upon supports, and could be adjusted to any desired height, and of arcs of the same curvature as the rim, which could be adjusted in the median, transverse, or any other desired plane. The subject sat in the centre of the horizontal circle with the ears in its plane. The head was supported from the back by a metal ring. The sounds were given by means of telephones of equal intensity and quality. The telephones could be fixed by hooks on any pace on the large rims in the direction of the radius, so that they were directed exactly towards the middle of the line which connects the two drum-membranes of the subject. (Muensterberg & Pierce, 1894)

The experimenter was able to send stimuli to one or more of the telephone receivers at the same time. The chair was rotated, and the telephone receivers and the sound cage stayed fixed.

In E. B. Scripture's laboratory at Yale, Matataro Matsumoto constructed a sound cage in 1896 similar to that of Muensterberg and Pierce, although the "cage" was rigid, and the chair remained fixed (Matsumoto, 1897).

Sometime around 1900, Edward Bradford Titchener at Cornell University designed a device, that he called a sound cage, to serve a similar purpose (see Figure 3). Basically, the observer would sit in a chair beneath head clamps that held the head in a fixed position. Surrounding the observer's head were the horizontal and vertical metal frames, which were arranged like a double perimeter. A telephone receiver was installed along the frame and could be varied in position.

Figure 3

The observer would close his/her eyes while the experimenter placed the telephone receiver into a particular position. Once set, an electrical transient would be sent through the wires and the receiver would click. Then, the observer tried to localize the sound in space, calling out the coordinates where he/she believed the receiver was located. The experimenter recorded the responses and recorded the accuracy of the response. Although it was suggested that the observer be asked to introspect on the experience, Titchener admitted that the result would likely be scanty for this experimental situation. Titchener featured the device in the first volume of his four volume *Experimental Psychology*, the student manual of qualitative experiments, commonly known as "Titchener's manuals.

In a 1900 article, Titchener's list of instruments essential for any psychological laboratory (Titchener, 1900) included the sound cage. The article attracted the attention of Christian Stoelting, whose Chicago Instrument and Scale Co. — later named the C.H. Stoelting Co. — would become the premier American firm making instruments for psychology laboratories. Stoelting advertised that he could provide any of the instruments found in Titchener's *Experimental Psychology*. Stoelting even offered a package deal for a complete student laboratory for the experiments in Titchener's manual, including the sound cage, for $460.00. The cage could also be purchased separately for $35.00 (Titchener, 1902). The sound cage remained in the Stoelting Catalogues well into the 1940s. One of Stoelting's main competitors, the Marietta Instrument Company, continued to supply a Titchener sound cage as late as 1969, at which time the price had risen to $495.00.

After the appearance of Titchener's student manual, other sound cages appeared in the psychological literature in quick order. Devices by James Rowland Angell (1903) at the University of Chicago and by Carl Seashore (1903) at the University of Iowa both appeared in a single issue of the *Psychological Review* in 1903.

It was, perhaps, the popularity of Titchener's manuals into the late 1930s that kept the sound cage popular. The cage was also popular because it was as accessible to the research methodology of functionalists, and even behaviorists, as it was to those of Titchener's structuralist school. ?