

## Perforated Disk Siren

From the Smithsonian, Museum of Natural History  
Electronic Music Inquiry Unit

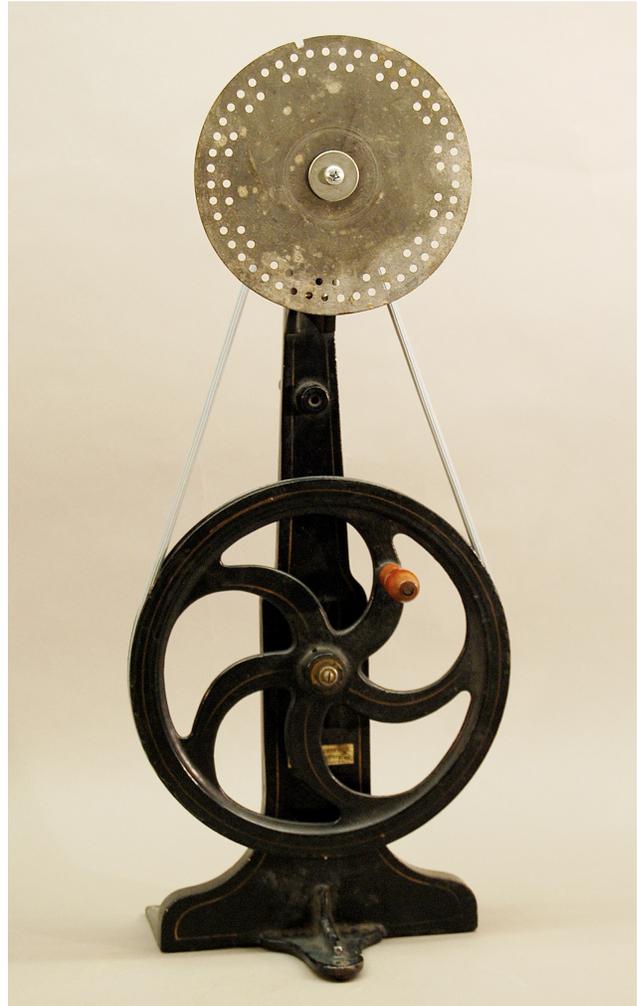
Woodwind instruments are some of the oldest used instruments, and several flutes have been discovered which date between 35,000 and 43,000 years ago. Despite their use throughout human history, the mathematics of acoustic resonance, the guiding physical principle of sound generation by pushing air through cylinders and holes, was not fully understood until the work of Herman Helmholtz in the 1850s and 1860s. Helmholtz's disk siren is a tool that demonstrates the principles of resonance, and how air can be used to generate sounds. Coupled with Helmholtz's work on the mathematical theory of sound waves, later electric and electronic instruments would use similar acoustic principles to generate sound by means of an electromagnet.

"This is about as simple a siren as it is possible to build. It's basically a single metal disk with two rows of evenly spaced holes. Here it is mounted on a "Rotator", a pulley device once common in American classrooms. In this demonstration, as one student cranked the rotator the disk would start spinning rapidly. A second student would then blow air through the holes with a flexible rubber tube. The faster the first student cranked, the higher the tone. The harder the second student blew through the tube, the louder the sound. Although the sounds this apparatus produced were not musical, this was an effective (and inexpensive) device for demonstrating basic acoustic principles."

### SOURCE:

<https://americanhistory.si.edu/science/sirens.htm>

While the developer of this siren isn't identified, the principal is similar to that of the Helmholtz model. To see a Helmholtz model click the link above and scroll down to the last image.



[https://americanhistory.si.edu/science/assets/large/rotator\\_w\\_perforated\\_disk.jpg](https://americanhistory.si.edu/science/assets/large/rotator_w_perforated_disk.jpg)

Accessed: Jan. 11, 2020

### **Video: Introduction to Acoustics Instruments from the National Museum of American History**

<https://www.youtube.com/watch?v=q8649LIZYsU&feature=youtu.be>

Steven Turner, curator at the Smithsonian's National Museum of American History, discusses the Smithsonian's scientific instrument collection. This video focuses on the history of acoustics during the 18th and 19th centuries, including demonstrations of wave models, tuning forks, sirens, resonators, and the Chladni plate.