Sound Installations in Gardens Across India

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Bamboo Grove, Auroville

Image credit: Author

Lithophone, Auroville

Image credit: Author

Metallophone, Auroville

Image credit: Author

SOUND is created by vibrations that travel as longitudinal waves through solids, liquids, or gases. When these waves reach our ears, the brain interprets them as sound. Sound has five basic properties: pitch, which depends on frequency, with higher frequencies producing higher pitches; loudness, determined by amplitude, where larger amplitudes result in louder sounds; timbre, the unique quality of a sound, formed by its specific combination of harmonics and overtones, which is why a piano and a violin sound different even when playing the same note; duration, or how long a sound lasts; and velocity, the speed at which sound travels through a medium. Designing musical instruments relies heavily on the relationships between the physical properties of sound (frequency, amplitude, waveform, etc.) and human perception (pitch, loudness, timbre, consonance, dissonance) to create, organise, and express music.

Sound Installations Abroad

Outdoor installations worldwide use natural forces — wind, water, and waves to create musical sounds. These sound sculptures include the Singing Ringing Tree (Burnley, UK), the Aeolus Wind Pavilion (Bristol), the Wave Organ (San Francisco), the Sea Organ (Zadar, Croatia), and the Funnel Wall (Dresden, Germany). Beyond nature-powered designs, interactive installations invite public participation through artworks like Sonic Bloom's sound-producing flower sculptures in London and sensor-activated Musical Stepping Stones. Parks and playgrounds feature weather-resistant instruments, such as idiophones, chimes, and drums, enabling spontaneous musical exploration.

Image credit: Svaram

ISIS Speaks at Sikkim Science Centre, Gangtok

Sound Installations in India

In 1979, the Nehru Science Centre, a unit of the National Council of Science Museums (NCSM), established the first Children's Science Park in Mumbai, featuring 60 interactive exhibits. Six of these focused on the physics of sound, with two producing musical sounds. NCSM has since replicated these six sound exhibits at more than 50 science parks nationwide. Beyond NCSM, three organisations have created interactive sound installations. The Sound Garden at the Indian Music Experience Museum in Bengaluru features seven exhibits, while the DoScience Centre in Hyderabad has six. The largest is the Svaram Sound Garden at Auroville, with 20 exhibits, most of which are unique to that location.

We describe below 24 sound installations and how they work, organised into four distinct sections. Many of these exhibits are present in multiple science parks and gardens at the locations mentioned above.

A. Sound Transmission Demonstrations

These interactive sound-transmission installations demonstrate how geometry and enclosed paths convey speech, focus sound, generate echoes, and enable visitors to whisper and be heard from a distance.

1. **ISIS Speaks — Whispering across a Distance:** there are two fibreglass statues resembling Isis, the Egyptian Goddess of healing and magic, and both have small openings at their mouths. They are installed face-to-face but separated by 30m. Two visitors can interact with the installation simultaneously. While one visitor can speak softly into the mouth of a statue, the other can listen to it. They can then switch roles. The mouths of the statues are connected by a metal or PVC pipe that runs underground. The pipe serves as a sound transmission tube.
2. **Elliptical Speaking Tube — Focal Point Conversations:** the fibreglass fish has an elliptical shape. It features two openings, one at the mouth and the other at the tail end, positioned at the focal points of the hollow elliptical body. Two visitors can experience the sound effect; one speaks into the mouth while the other listens at the tail end. They can then switch roles. This occurs because sound generated at one focal point converges at the other after reflecting off the elliptical wall.
3. **Whispering Discs — Parabolic secrets over distance:** the installation allows two people to converse in a whisper. It consists of two identical parabolic reflectors, each 2m in diameter, separated by 16m, on a playground with no obstructions. A visitor is to place his/her mouth close to the central ring placed at the focus of a parabolic reflector. Another visitor moves to the other parabolic reflector and places his/her ear close to its central ring. Thus, when one visitor speaks softly or whispers, the other can easily hear it. Sound originating from the focus of one parabolic reflector is first reflected by its

surface, travels in parallel lines to the other reflector, and is then converged to the focus of the reflector.

4. **Echo Tube — Long-tube Reflections:** the echo tube is constructed by connecting five 6m PVC tubes with an inner diameter of 45cm. When a visitor places his mouth near one end of the tube and says 'Hello', he hears a clear echo. Sound waves travel through the tube at 340 meters per second and are reflected from the other end. A visitor can listen to an echo if the reflected sound reaches their ears at least one-tenth of a second after the original sound.
5. **Delayed Sound — Wait a Moment:** speak into the mouthpiece and listen through the earpiece. Sound travels through air at approximately 340 meters per second. This exhibit features a pipe approximately 340 meters long. When you speak into the mouthpiece, the sound takes about 1 second to travel through the pipe, creating a noticeable delay before you hear your voice from the earpiece.


Singing Stone, Auroville
Image credit: Author


Rubbing Stone, Auroville
Image credit: Author


Humming Stone, Auroville
Image credit: Author

B. Musical Tubes Installations

Here, we describe six interactive sound exhibits featuring tubes that produce sound when struck. Longer tubes produce lower-frequency sounds, while shorter tubes produce higher-frequency sounds. The exhibits teach basic science concepts about sound while allowing visitors to create music.

1. **Hanging Musical Tubes — The Octave Pipes:** there are eight metal pipes of the same diameter but different lengths. Each is hung from one end and arranged in ascending or descending order by length. When struck sequentially with a mallet, they produce notes within one octave of the musical scale. The pitch of the sound from a freely hung pipe depends on its length: the shorter the pipe, the higher the pitch. The longest pipe, when struck, will produce the lowest pitch among all the pipes.
2. **Vertical Tubular Bells — A Harmonic Ring:** there are eight aluminium tubes, each precisely cut to different lengths, standing upright in a circle on the ground. A mallet striking them in sequence brings forth the notes of a musical scale. Another Tubular Bells installation features eight aluminium tubes of varying lengths, mounted on eight separate vertical structures arranged in a circular pattern. Each tube has a mallet positioned in front of it for striking. When struck by the mallets, the tubes produce notes of a musical octave. The longer the tube, the lower the pitch; the shorter the tube, the higher the pitch.
3. **Sound Railing — Walk-through Chimes:** the Sound Railing consists of a series of vertically installed aluminium tubes of varying lengths, resembling a railing. Each tube has a mallet in front of it for striking. Visitors move along the railing, striking the tubes one by one. The result is a continuous, melodious sound.
4. **Bamboo Grove — The Listening Walk:** the Bamboo Grove features many polished bamboo poles suspended in midair, interspersed with percussion elements, shells, and dried seeds. Visitors enter the grove, walk slowly through the array, touch and feel the materials, and listen to the subtle sounds produced by their vibrations before exiting from the opposite side. At the centre is a space where nothing touches and everything is still, a moment of silence.
5. **Spinner Chime — Rotating Tubes, Ringing Melody:** the Spinner Chime features a set of hollow aluminium tubes of varying lengths arranged around a central rotating spine. When struck in succession with a mallet, the tubes rotate and produce a series of musical tones.
6. **Large Chime — An Acoustic Sculpture:** the Large Chime features 144 hollow stainless-steel pipes suspended from a mild-steel frame across 60 square meters. Three concentric hexagons organise the pipes acoustically: wider pipes producing lower frequencies hang from the inner hexagon, while narrower pipes generating higher tones occupy the outer rings. Each pipe's diameter and length are


Organ Pipes, Auroville

Image credit: GSC, Goa


Thongophone at Goa Science Centre, Goa

Image credit: GSC, Goa


Pipes of Pan at Regional Science City, Lucknow

Image credit: GSC, Goa

calibrated to produce unique frequencies. At 3m high, the installation invites human interaction. Hidden percussion mechanisms trigger each pipe, transferring kinetic energy that causes vibration at the pipe's natural resonant frequency.

C. Sounding Stones Instruments

The Sounding Stones collection features a range of stone and metal-based percussion and friction instruments that transform simple physical actions — striking, rubbing, humming, or dropping pebbles — into unique musical tones through resonance and tuned vibrating parts.

1. **Idiophones — Playable melodic bars:** three types of idiophones are commonly displayed in the sound gardens. The xylophone is made from hard wooden bars, the metallophone from metal bars, and the lithophone from stone bars. These percussion instruments have bars of varying lengths; the number of bars ranges from 8 to 12. When struck by mallets, they produce musical notes of various frequencies, and the sound quality depends on the material of the bars.
2. **Humming Stone — Resonance Revealed:** the Humming Stone installation consists of a natural, stone block with a partial spherical cavity between a full sphere and a hemisphere. Visitors place their heads in the cavity and hum at various pitches, from very low to quite high. At a specific pitch (frequency), the hum is amplified. This occurs due to sound resonance and amplification principles, with the cavity serving as a resonator. The cavity's shape, which determines the resonant frequency, is central to the experience.
3. **Rubbing Stone Sound — Friction Wakes the Tones:** there is a large granite block with numerous square cuts at varying depths. Sound is produced when this surface is rubbed with a small handheld rock. Different frequencies are generated because the incisions in the hard, resonant material vary in depth, creating columns with different masses and lengths that vibrate at various pitches. The handheld stone acts as a frictional initiator, causing the standing columns to oscillate.
4. **Singing Stones — Tactile Soundscapes:** the Singing Stones are made of polished granite and have several cuts that produce musical notes when rubbed with water-moistened palms. The curved stone with cuts emits higher-frequency sounds, while the cuboidal stone produces lower-frequency sounds. This difference is due to the stones' size, shape, and cuts.
5. **Ringing Stone — a chorus of falling pebbles:** a tall stone with holes at the top and bottom forms the exhibit's centrepiece. Visitors drop pebbles into the top hole; as they fall through an embedded metal cylinder, they strike horizontal metal thongs of varying lengths and materials, producing a distinctive ringing sound before exiting through the bottom.

D. Percussive and Atmospheric Sound Effects

These interactive sound installations reveal how physical structure shapes sound. Visitors discover the relationship between properties — such as pipe dimensions, shell volume, string tension, and gravity-driven mechanisms — and the resulting pitch, timbre, harmonics, and musical scales.

1. **Pipes of Pan — Hear the Tone:** inspired by the ancient Pan Flute, this exhibit features seven metal pipes that represent the seven musical notes. Each pipe has an inner diameter of 6 cm and ranges in length from 80 cm to 2m. The pipes can be arranged side by side or mounted around a central pole. When visitors place their ear near the lower end of a pipe (1 m above the ground), they hear a distinct musical

note. Each pipe produces a different note based on its length: longer pipes generate lower frequencies. When visitors move their ear away from the pipe, they hear only ambient noise.

2. **Metal Gong — Tones Shaped by Metal and Vibration:** the metal gong is made of a rectangular aluminium or brass plate suspended by two strings from a horizontal bar. When struck by a mallet, it produces a melodious, bell-like sound, the character of which depends on the metal plate and its vibration. There is another version of this installation, called the Flower Gong, which is shaped like a lotus with eight upright petals. Each petal has a brass plate gong mounted at a certain height above the ground, with a mallet placed in front for striking. When struck individually, each gong produces a bell-like sound.
3. **Thongophone — Hand Drums Reimagined:** a thongophone is a simple percussion instrument made of seven pipes of varying lengths mounted vertically on a frame. The pipes stand side by side, with their open ends 1 m above the ground. Typically constructed from PVC, they produce musical notes when struck with handheld rubber pads, producing a sound like hand drums. Each pipe length yields a different pitch, and the pipes are often arranged to resemble the seven notes of a musical scale.
4. **Organ Sound — Singing Piston Pipes:** six vertical pipes with piston-like rods move up and down. Upward movement draws air into the hidden organ pipe; downward movement pushes it through, breaking the air column on the labium to produce specific pitch and frequency. The pipes are tuned to a pentatonic scale and harmonise with one another. Pistons can be played gently for sustained sound or rhythmically - ideally by two or three players.
5. **Storm Drum — the Membrane Roars:** the Storm Drum is a long, cylindrical steel drum suspended from a height, such as a tree branch. A membrane and steel spring rope are attached at the top. When a player on the ground winds the spring and releases it, the recoil transmits vibrations to the membrane. The vibrating membrane produces sound, which the cylinder amplifies, creating a storm-like noise audible to listeners standing beneath.
6. **Percussion Drums — Hear the Difference:** three vertically mounted drums can be played by one or more visitors. A drum's sound depends on the drumhead and shell. Heavier drumheads damp high frequencies; lighter ones emphasise them. The shell's dimensions determine the volume of the resonating air column. Larger volumes favour lower frequencies, smaller volumes higher frequencies. Greater diameter or depth produces deeper tones; smaller or shallower shells produce brighter tones.
7. **Bow Harp — Buzzing Harmonics:** the Bow Harp is a plucked string instrument featuring a vertical Y-shaped structure supporting a bow-shaped tube. Twelve strings attach to the base, pass over the hollow bow, and tie at the opposite side. The curved shape creates varying string lengths, each of which is adjustable for tuning. The hollow bow serves as both a bridge and a resonator, producing a buzzing sound when the strings are plucked.


Water Bell, Auroville

Image credit: Svaram

8. **Water Bell — Gravity Plays the Tune:** the Water Bell is an active sound sculpture in which falling water activates mechanical mallets that strike three metal gongs in sequence. Water fills each metal pipe until its weight causes the pipe to tilt and spill. As it empties, the pipe swings back, and a connected mallet strikes a bell, creating a gentle, percussive sound.

Ingenuity is Unlimited

Ingenuity is limitless when creating new interactive sound installations for public spaces, as inventive design, accessible technology, and thoughtful engagement combine to create immersive sonic experiences. We hope to see more sound installations across the country. Mr Aurelio C Hammer, Creative Director of the SVARAM Sound Garden and founder of SVARAM — Musical Instruments & Research in Auroville, also believes that such installations are more important than ever. In an age dominated by digitalisation and AI, he argues, direct sensory experiences and hands-on craft work with diverse materials remain essential for education and for understanding our physical embodiment as human beings.

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Dr Jayanta Sthanapati served as Director of the Birla Industrial and Technological Museum, Director of the National Council of Science Museums Headquarters, and Deputy Director General of the National Council of Science Museums.