



## ***Perspectives on Acoustics in Hinduism***

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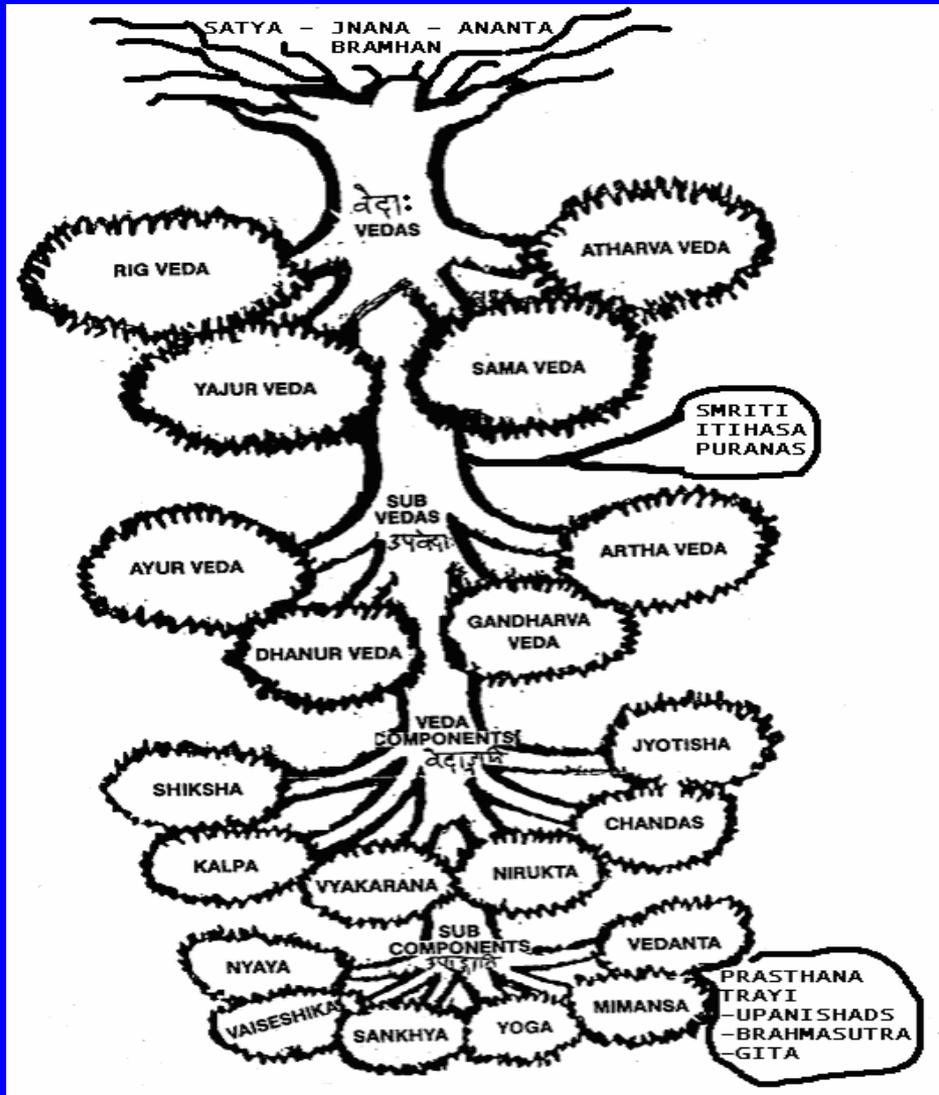
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# Vedic Hinduism

- ❖ *Vedas are the source literature.*
- ❖ *Vedas are infinitely large collection of mantras (chants)*
- ❖ *Vedas and Vedic literature deal with all aspects of life.*
- ❖ *Acoustics plays an important role in Vedas and Vedic literature.*

# Vedic Knowledge as an Inverted Tree



*Bramhan - God  
Non - Dual Reality*

**4 Vedas**

**Vedic literature**

# Veda Mantras

- ❖ *Mantras (chants) are orally transmitted from teacher to disciples.*
- ❖ *Precision in intonations and phonetics.*
- ❖ *Intrinsic pitch difference can be overridden*
- ❖ *Provides experience and meaning.*
- ❖ *Oral transfer of knowledge through ages through memory*

# Vedic Chanting at Sarvaraya Veda Pathasala, Andhra Pradesh, India



# Sound carries spiritual vibrations

- ***Shankha* (Conch Shell) produces an unusually pure tone**
  - Reflects the sound of OM
  - Used in Hindu rituals
  
- **Sound interacts with the flame to bring about various shapes**
  - A particular tone breaks the flame into seven tongues (Tyndall effect)

## Shankha

Lisa Taylor, M.G. Prasad, R.B. Chatterjee

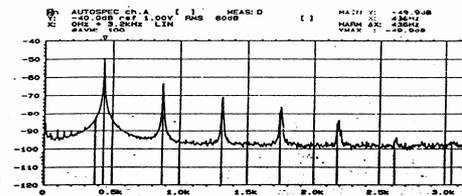


Figure 2. Sound spectrum of conch shell trumpet

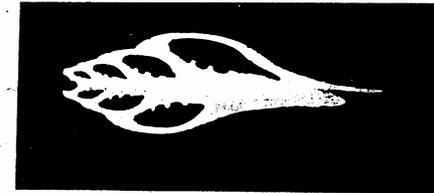
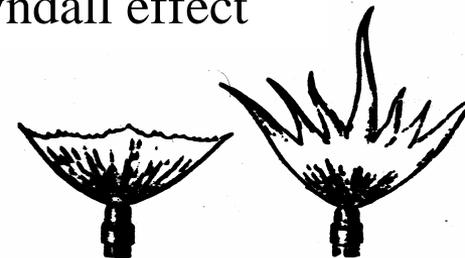


Figure 3. X-ray tomography picture of conch longitudinal section.

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## Tyndall effect



EFFECT OF SOUND ON FLAMES (TYNDALL)

# Conch shell, Bells and Gongs in temples

## The Hindu Temple and Cultural Society, Bridgewater, N.J



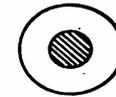
# Vocal and instrumental music expresses the experiential aspects of Vedic Hinduism

- Vocal music has its origin in *Vedic* chants
- Melody characterizes instrumental music; rhythm the Percussion instruments
- The design of *Mridangam* and *Tabla* have both melody and rhythm. This is from the tonal combination like string instruments.

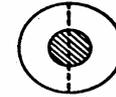
FROM: JASA, vol 26, 523-529, 1954 (B.S. Ramakrishna & M.M. Sondhi)

## F INDIAN MUSICAL DRUMS

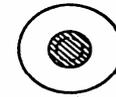
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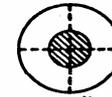
$$\Psi_{01} : \frac{\lambda_{01}}{\lambda_{01}} = 1.00$$



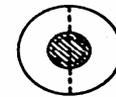
$$\Psi_{11} : \frac{\lambda_{11}}{\lambda_{01}} = 1.94$$



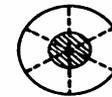
$$\Psi_{02} : \frac{\lambda_{02}}{\lambda_{01}} = 3.06$$



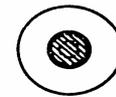
$$\Psi_{21} : \frac{\lambda_{21}}{\lambda_{01}} = 2.95$$



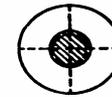
$$\Psi_{12} : \frac{\lambda_{12}}{\lambda_{01}} = 4.10$$



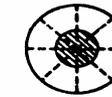
$$\Psi_{31} : \frac{\lambda_{31}}{\lambda_{01}} = 3.97$$



$$\Psi_{03} : \frac{\lambda_{03}}{\lambda_{01}} = 4.83$$



$$\Psi_{22} : \frac{\lambda_{22}}{\lambda_{01}} = 5.15$$



$$\Psi_{41} : \frac{\lambda_{41}}{\lambda_{01}} = 4.96$$

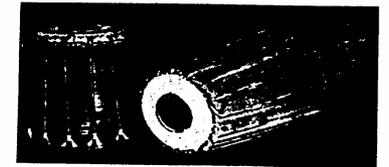


FIG. 1. Photograph of the Indian drums *Tabala* and *Mridanga* (left to right) which possess an approximately harmonic set of overtones.

FIG. 3. Nodal lines (shown dotted) of the ideal composite membrane corresponding to the first nine modes of vibration. Cross-hatched portion shows the loaded central region. The modes and their frequency ratios with respect to the fundamental are indicated below each. The various modes are arranged in different rows according to the harmonic to which they closely correspond.

# Melody and Rhythm from percussion instrument

From tabla played by maestro Zakir Hussain



# Vedic order of natural elements and perception

<u><i>Element</i></u>	<u><i>Sense of perception</i></u>
<i>Space</i>	<i>Sound (hear)</i>
<i>Air</i>	<i>Touch and Sound</i>
<i>Fire</i>	<i>See, Touch and Sound</i>
<i>Water</i>	<i>Taste, See, Touch and Sound</i>
<i>Earth</i>	<i>Smell, Taste, See, Touch, Sound</i>

- ❖ *Space is characterized by only sound*
- ❖ *Sound is the most subtle sense of perception*

**Music from pillars**  
**Purndhara mantapa (16<sup>th</sup> century), Hampe,**  
**Karnataka, India**



# Acoustics in Hinduism

- ❖ *Major importance in all aspects*
- ❖ *Critical role in human life*
- ❖ *Connects spiritual to worldly domains*
- ❖ *Further work required in this area*

# Oh! Sound

*You surround everything around.*

*You are everywhere to be heard.*

*You are outside but also inside.*

*You are produced ever in nature.*

*You come from humans and machines.*

*You are with motions and patterns.*

*As an annoying noise, you displease someone.*

*As a diagnostic tool, you are useful to someone.*

*As a painful noise, you can hurt anyone.*

*As a soothing music, you comfort everyone.*

*It isn't easy to place you as music or noise.*

*Either wanted or unwanted, you are always sound.*

**M.G. Prasad**