Algorithms in Ancient India

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Ancient India

Vedas: Around 3000 BC (or even more ancient)
Vid: jñāne (to know), Vedas: Knowledge
Oral Tradition
4 Vedas: Ṛgveda, Yujurveda, Sāmaveda and Atharvaveda
Śruti (what is heard) Versus Smṛti (what is remembered).
Each veda is further subclassified into 4 major text types

- Samhitā (mantras and benedictions)
- Āraṇyaka (Rituals, ceremonies, sacrifices)
- Brahmaṇas (Commentaries on rituals etc.)
- Upaniṣadas (Philosophy, spiritual knowledge)

The oral tradition of Vedic chanting has been declared an intangible heritage of humanity by UNESCO. In a meeting of jury members on November 7, 2003, at Paris, Mr. Koichiro Matsuura, Director-General of UNESCO, declared the chanting of Vedas in India an outstanding example of heritage and form of cultural expressions. The proclamation says that in the age of globalization and modernization when cultural diversity is under pressure, the preservation of oral tradition of Vedic chanting, a unique cultural heritage, has great significance.

The Jury members included

- Dr. Richard Kurin, Director of the Center for Folklore and Cultural Heritage of the Smithsonian Institution (United Nations),
- Mr. Juan Goytisolo, Writer (Spain),
- Mr. Yoshikazu Hasegawa (Japan),
- Ms. Olive W.M. Lewin. Pianist, ethnomusicologist, Director of the Jamaica Orchestra for Youth (Jamaica).

Tradition of Vedic chanting

Inscribed in 2008 (3.COM) on the Representative List of the Intangible Cultural Heritage of Humanity (originally proclaimed in 2003)

The Vedas comprise a vast corpus of Sanskrit poetry, philosophical dialogue, myth, and ritual incantations developed and composed by Aryans over 3,500 years ago. Regarded by Hindus as the primary source of knowledge and the sacred foundation of their religion, the Vedas embody one of the world's oldest surviving cultural traditions. The Vedic heritage embraces a multitude of texts and interpretations collected in four Vedas, commonly referred to as "books of knowledge" even though they have been transmitted orally. The Rig Veda is an anthology of sacred hymns; the Sama Veda features musical arrangements of hymns from the Rig Veda and other sources; the Yajur Veda abounds in prayers and sacrificial formulae used by priests; and the Atharna Veda includes incantations and spells.

Tradition of Vedic chanting

Inscribed in 2008 (3.COM) on the Representative List of the Intangible Cultural Heritage of Humanity (originally proclaimed in 2003) ...

The Vedas also offer insight into the history of Hinduism and the early development of several artistic, scientific and philosophical concepts, such as the concept of zero. Expressed in the Vedic language, which is derived from classical Sanskrit, the verses of the Vedas were traditionally chanted during sacred rituals and recited daily in Vedic communities. The value of this tradition lies not only in the rich content of its oral literature but also in the ingenious techniques employed by the Brahmin priests in preserving the texts intact over thousands of years. To ensure that the sound of each word remains unaltered, practitioners are taught from childhood complex recitation techniques that are based on tonal accents, a unique manner of pronouncing each letter and specific speech combinations.

Although the Vedas continue to play an important role in contemporary Indian life, only thirteen of the over one thousand Vedic recitation branches have survived. Moreover, four noted schools – in Maharashtra (central India), Kerala and Karnataka (southern India) and Orissa (eastern India) – are considered under imminent threat.

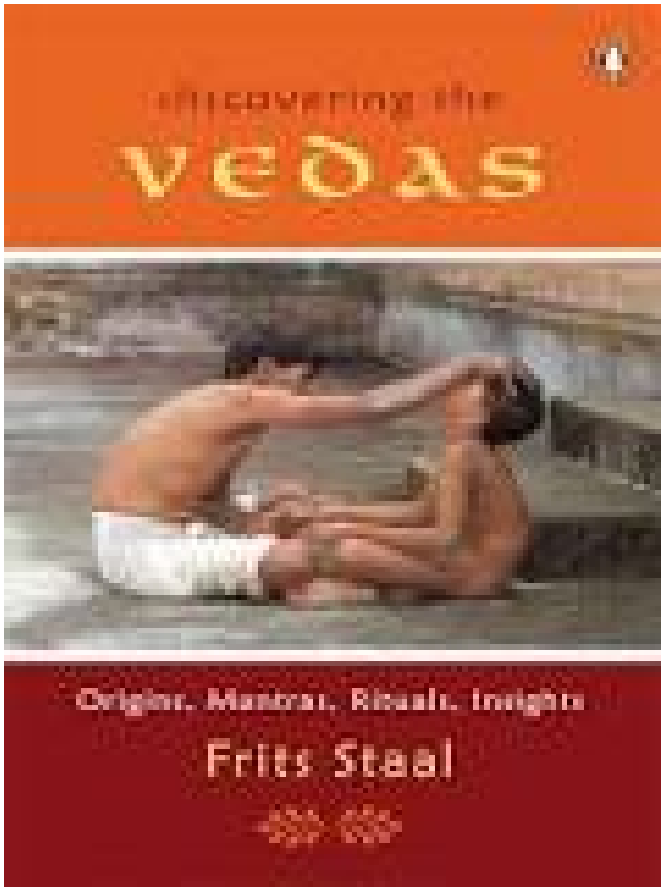
Preservation of Vedas: Oral Tradition

According to the Taittiriya Upaṇiṣad — śikṣā-valli there are 6 main factors that need to be taken into consideration.

- Varṇaḥ (Pronunciation)
- Svaraḥ (Accent)
- Mātrā (Duration)
- Balam (Emphasis)
- sāma (continuity / flow in chanting)
- Santānaḥ (Punctuation/ Pause)

Preservation of Vedas: Oral Tradition

Oral tradition With Mudras and face position



Preservation of Vedas: Oral Tradition

Various recitation styles to allow complete and perfect memorization

- Prakṛti pāṭha
- vikṛti pāṭha

Preservation of Vedas: Oral Tradition

Prakṛti pāṭha

- Saṁhitā: Continuous recitation
- Pada: Pause after every word
- Krama: consecutive words are paired and recited
  1 2; 2 3; 3 4; 4 5; ..

Preservation of Vedas: Oral Tradition

vikṛti

- Jatā (matted hair)
  1 2 2 1 1 2; 2 3 3 2 2 3; 3 4 4 3 3 4; 4 5 5 4 4 5; ...
- mālā (Garland)
  1 2; 2 1; 1 2; 2 3; 3 2; 2 3; 3 4; 4 3; 3 4, ...
- Śikhā (hair tied in a knot)
  1 2 2 1 1 2 3; 2 3 3 2 2 3 4; 3 4 4 3 3 4 5; ...
- Rekhā (line)
  1 2; 2 1; 1 2; 2 3 4; 4 3 2; 2 3; 3 4 5 6; 6 5 4 3; 3 4; 4 5 6 7 8; 8 7 6 5 4; 4 5; 5 6 7 8 9 10; 10 9 8 7 6 5 ; 5 6;

Preservation of Vedas: Oral Tradition

vikṛti ...

5 Dhwaja (Flag)
1 2; 99 100; 2 3; 98 99; 3 4; 97 98; 4 5; 96 97; 5 6; 95 96; .....; 96 97; 4 5; 97 98; 3 4; 98 99; 2 3; 99 100; 1 2

6 Daṇḍa (rod)
1 2; 2 1; 1 2; 2 3; 3 2 1; 1 2; 2 3; 3 4; 4 3 2 1; 1 2; 2 3; 3 4; 4 5; 5 4 3 2 1; ...

7 Ratha (Chariot)
1 2; 5 6; 2 1; 6 5; 1 2; 5 6; 2 3; 6 7; 3 2 1; 7 6 5; 1 2; 5 6; 2 3; 6 7; 3 4; 7 8; 4 3 2 1; 8 7 6 5; ...

8 Ghana (hard)
1 2 2 1 1 2 3 3 2 1 1 2 3; 2 3 3 2 2 3 4 4 3 2 2 3 4; 3 4 4 3 3 4 5 5 4 3 3 4 5; ...

Gāyatri mantra

ॐ भूर्भुवः स्वः तत्सवितुर्वरेण्यं । भर्गो देवस्य धीमहि, धीयो यो नः प्रचोदयात् ।।

We meditate on the effulgent glory of the divine Light; may he inspire our understanding (S Radhakrishnan)

Gāyatri mantra Ghanapāṭha

ॐ तत् सवितुस् सवितुस् तत् तत् सवितुर् वरेण्यं वरेण्यꣳ सवितुस् तत् तत् सवितुर् वरेण्यम्। सवितुर् वरेण्यं वरेण्यꣳ सवितुस् सवितुर् वरेण्यं भर्गो भर्गो वरेण्यꣳ सवितुस् सवितुर् वरेण्यं भर्गः। वरेण्यं भर्गो भर्गो वरेण्यं वरेण्यं भर्गो देवस्य देवस्य भर्गो वरेण्यं वरेण्यं भर्गो देवस्य। भर्गो देवस्य देवस्य भर्गो भर्गो देवस्य धीमहि धीमहि देवस्य भर्गो भर्गो देवस्य धीमहि। देवस्य धीमहि धीमहि देवस्य देवस्य धीमहि धीमहि इति धीमहि। धियो यो यो धियो धियो यो नो नो यो धियो धियो यो नः। यो नो नो यो यो नः प्रचोदयात् प्रचोदयात् नो यो यो नः प्रचोदयात्। नः प्रचोदयात् प्रचोदयात् नो नः प्रचोदयात् प्रचोदयात् इति प्रचोदयात्॥

ॐ भू ॐ भुवः ॐ स्वः ॐ महः ॐ जनः ॐ तपः ॐꣳ सत्यम्। ॐ तत् सवितुर्वरेण्यं भर्गो देवस्य धीमहि धियो यो नः प्रचोदयात् ॐ आपोज्योतीरसोऽमृतं ब्रह्म भूर्भुवःस्वरोम्॥

Error Correction Error Detection Code

Error Correction and Error Detection
for Reliable delivery of Digital Data
over unreliable communication channels

Error Correction Error Detection Code

- Error Detection: Detection of errors due to noise
- Error Correction: Construction of the original error-free data

Error Correction Error Detection Code

Various Error Detecting Methods in Information Coding

- Repetition Code
  Duplicate / Triplicate the data
  $1010 \rightarrow 1010\ 1010\ 1010$
- Add Parity bits
  Even Parity: $1010 \rightarrow 10100$
  $1011 \rightarrow 10111$
- CheckSum
- Cyclic Redundancy Check
- Hash Function

Error Correction Error Detection Code

Various Error Correcting Methods in Information Coding

- Parity bit: Single Error correction
- .
- .
- .

Understanding Vedas

Six Vedaṅgas (Auxiliary disciplines) to understand Vedas

- Śikṣā: (phonetics, phonology, pronunciation)
  The place and articulation of various sounds, possible sounds in Sanskrit, accent, stress, and rules of euphonic combination of words
- Chandas: (prosody, Meter)
  Poetic meters
  - Akṣara vṛtta: based on fixed number of syllables per verse
  - Mātrā vṛtta: based on fixed number of morae per verse
  - Gaṇa vṛtta: based on fixed pattern of morae per verse
- Vyākaraṇa: grammatical and linguistic analysis
- Nirukta: etymology, explanation of words, particularly those that are archaic and have ancient uses with unclear meaning.
- Kalpa: ritual instructions, Geometry
- Jyotiṣa: Astronomy, Astrology