
Bharadwaja's Vimana Shastra deals with advanced metallurgy, material science, machine design, mechanical engineering and rocketry. The text describes detailed procedures in the preparation of several hundreds of materials such as Alloys and Glasses which are unknown to modern science. Most of these materials can be reproduced in the laboratory even now. Some of the principles of metallurgy which are brought out in the textual description indicates an advanced development in technology and engineering. About 31 machines (yantras) are also described with their construction procedures. Experimental investigation has been conducted for the materials part of the text. Several materials can be reproduced in the laboratory. By investigation it was found that they have special properties which are not available in any known materials of modern times. One machine "Vakra Prasarana Yantra" was reproduced as a working model and is found to be novel gear mechanism with sixteen gear wheels. In addition, "Agni Sthambana", a fire proofing spray, "Anahara" a food substitute have also been produced. Patents are also being obtained for some of these items.

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1. Introduction.

This paper aims at presenting the preliminary results of the study and investigation on a few rare ancient Indian Scientific Shastras in Sanskrit. While there is a general opinion that at some point in the prehistoric or protohistoric times India had a highly developed technological society, there has been till now no real corroboration of this opinion.

The recent study and experimental investigations of a few rare and obscure Sanskrit works of Scientific nature has provided some basis, especially in the fields of Chemistry, Metallurgy and material science that there could have indeed existed an advanced technological status of the society, atleast in these fields, at some point of time in India's pre or protohistory.

This paper attempts to present these initial results which include the procurement and decipherment of manuscripts and also the experimental laboratory preparation of the deciphered materials. A working model of a machine "Vakra Prasarana Yantra" is made.

2. History & Background

During January 1991 a set of Sanskrit manuscripts have been procured from a source at Bangalore. While most of the manuscripts procured were never published, limited publication was done for (a) Vimana Shastra and (b) Amsu Bodhini, both ascribed to Maharishi Bharadwaja.

Based on the study and investigation performed till now, the following history, background and origin of the system of Ancient Sanskrit Shastras have been identified:

(i) An integrated system of ancient scientific shastras has been identified. This system is based on an integrated framework of concepts and principles unique and characteristic to ancient Indian literature including Vedic, Puranic and Ayurvedic components. These concepts have not much in common with modern science. However, the concepts can be tested only by independent physical verification. Since theoretical models of physical phenomena can be varied with time, the conceptual framework or model may not affect the physical phenomena themselves or the experimental results thereby achieved on empirical basis.

The Shastras covered in this system run into over a hundred in number with subjects as wide ranging as Chemistry, Metallurgy, Engineering, Architecture and Medicine (human, veterinary and plant). We will be presently dealing with only the specific set of shastras which have been located by us during 1991, though there may be many other sources of shastras traditionally or otherwise which have not been dealt by us.

(ii) While only a few of the total system of Shastras have actually been orally delivered and subsequently recorded into writing around 1912 A.D., more than twenty of them are supposed to have been actually available physically with the main source, namely the late Pandit T Subbaraya Sastry of Anekal (near Bangalore) during the period of 1875 to 1930 A.D.

(iii) Pandit Subbaraya Sastry was apparently only a medium for oral delivery from his memory (which he reportedly acquired from his Guru) of the Shastras which were written down either in parts or in whole by others (as G Venkatachala Sharma of Bangalore) who acted only as scribes.

About twenty Shastras were orally delivered by him in parts and handwritten manuscripts (on old paper) were produced during 1911-1940 as indicated by the dates recorded by the scribe. (though he himself had access to them even during 1865-1911).

Some extracts of the Shastras were also printed in a few articles in journal 'Bhoutica Kalanidhi' by late Shri B Suryanaraya Rau (grandfather of Shri B V Raman of Bangalore who displayed them also).

(iv) While reportedly Pandit Subbaraya Shastry had access to these Shastras through his Guru Maharaj (who was also a Yogi) the exact means and channels of acquisition have not yet been determined clearly. Possibilities of Yogic meditation, trance or other extranormal states being the cause for this cannot be ruled out, apart from regular memorization for oral delivery.

(v) The small set of Shastras actually delivered have quoted extensively from various other texts, including dictionaries, attributed to various authors of Vedic, Post Vedic periods on varied subjects of scientific nature. None of these texts have been located from any other sources, though the subject matter covered in them can be traced to be common to many Sanskrit works on related subjects e.g. Ayurvedic texts and Nighantus (Dictionaries).

(vi) Notwithstanding the unclear origin of these texts (for which reason many persons claimed that these shastras are not authentic or genuine) some of the contents of these texts have been investigated in terms of physical experimentation by trying out in the laboratory, the given formulae for the preparation of materials as alloys, glasses, ceramics, etc., as described in these texts. The decipherment process was primarily involved in tracing the synonyms of the words used for the input ingredients for making various materials by using Ayurvedic sources as Dictionaries.

List of procured manuscripts of Ancient Scientific Shastras in Sanskrit.

Title	Author ascribed
(i) Vimana Shastra (or Vaimanika Prakaranam)	Maharishi Bharadwaja
(ii) Amsu Bhodhini	- do -
(iii) Kritakavajra Nirnaya (of Ratna Pradeepika)	Not clear
(iv) Jalatatwa Prakarna	- do -
(v) Apatatwa Upanyasa	- do -
(vi) Rajya Tantra	Majahrishi Yanjyavalkya

3. The Decipherment Process

Among the various manuscripts procured, the following were mainly studied:

(i) Vimana Shastra (or Vaimanika Prakaranam a chapter of Bhardwaja's Yantra Sarvasva)

(ii) Amsu Bodhini

(iii) Kritaka Vajra Nirnaya

The decipherment process centrally concerned itself on the identification of practicable formulae for chemical preparations (in the laboratory) from the corresponding Sanskrit descriptions and recipes for the preparation of the materials as alloys, glasses and ceramics, as per the ancient methods in terms of notions, concepts and framework which were unique to the Shastras. The only common grounds with modern times were the input ingredient materials, which after decipherment could be identified either as equivalents of simple inorganic materials in the laboratory (as metals as copper, lead etc) or alternatively complex organic materials from the nature such as herbs, roots, gums, resins, barks and mineral ores largely known to the Ayurveda system, as is practised today, both by Ayurvedic Physicians and Ayurvedic Chemists and Pharmacists.

The decipherment process which was quite tedious and complex, primarily involved finding the equivalent modern Sanskrit words for names of input ingredients for preparations of various materials. Since most of the words used in the manuscripts were quite archaic they have gone out of use in more recent (classical) Sanskrit, the Ayurvedic Nighantus or dictionaries helped to a partial extent in giving the more recent equivalents for such words. However there are quite a number of words for which no more recent equivalents have yet been found. The search efforts are still in progress.

The second part of the effort lies in finding the equivalent Indian Language word for Sanskrit word i.e. Hindi or Bengali equivalent which can be used for actual identification of herb or mineral ore in the market or in the nature in general. In this connection substantial help was obtained from Ayurvedic Physicians and Chemists.

The third step is procuring the identified materials from natural sources (e.g. mineral ore), a task sometimes becoming a very difficult, as some of the materials are very rare and may not be available in the modern times.

The fourth step involves the actual preparation of the described material (as an alloy or a ceramic or glass) by mixing the identified input ingredients in the proportion given in the Sanskrit original.

At this stage the modern Chemistry laboratory was utilised and the melting and cooling procedures were performed according to the directions given in Sanskrit manuscripts.

The mixing proportions were given in terms of relative units in weight. The units of temperature used were in 'Kakshyas' and the exact interpretation of 'Kakshya' is not yet known, though roughly it has been equated (as 1 Kakshya = 12.5 C) at low temperatures (this scale may not be linear at higher temperatures).

The procedure for heat treatment was also given in Sanskrit sources in terms of either sudden pouring or gradual cooling or slow pouring to produce various effects and different properties.

As regards the equipment to be used, in all experiments only the modern laboratory equipment was used, though descriptions in Sanskrit were varied as various types of crucibles (mooshas), bellows (bhastris) and furnaces (kundas) of ancient times (which are not available now).

4. Status Report

Ancient Indian texts and manuscripts pertaining to Science & Technology have been studied with an aim to decipher and decode formulae for making new materials as alloys, ceramics and glasses. A formula for making protein rich food extract from common Indian grasses also has been deciphered.

The following twenty formulae for new materials, consisting of special alloys, ceramics and glasses have been deciphered and some of them were actually produced based on the formulae from the ancient Sanskrit texts of Vimana Shastra (quoting Lohatantra), Amsu Bodhini, Kritaka Vajra Nirnaya etc., based on the dictations of the texts and formulae by the Late Pandit Subbaraya Shastri of Anekal (1855 - 1940 A.D).

S.NO.	NAME	DESCRIPTION
1	2	3

1. **"Tamogarbha Loha"** A lead alloy capable of light absorption

Status :

Already produced in the laboratory, light in weight, black in colour, found to be resistant to acids.

Displayed high level of absorption for laser light (from red Ruby laser - as observed by prof. Robert Anderson of San Jose State University during his visit to India in December 1991). Some chemical and other properties found to be unique - patentable new alloy. A laboratory test done in 1996 in Physics Department of Osmania University, Hyderabad indicated laser absorption characteristics upto 79% of incident light from a laser. (this alloy was used in `Tamo Yantra' in the Vimana Shastra for the purposes of absorption of light escaping from a photochemical reaction which resulted in absorption of light, thereby generating `darkness').

2. **"Pancha Loha"** (not the well-known Panchaloha for making idols)" A copper alloy which is highly malleable and also highly corrosion resistant to salt (NaCl)

Status :

Already produced and characterised to possess:

- a) Golden Yellow Colour (described in the Sanskrit text as 'Hema Varnam' or golden colour).
- b) Corrosion resistance to moisture and salt water (displayed ² weight loss of only about 0.00335 mg/dm / day in 3% NaCl solution).
- c) High machinability and on micro structure analysis found to be single phase alloy with high malleability (described in Sanskrit as 'mridulam' or 'soft').
- d) Characteristics, composition and properties found to be not listed in ASM Reference (1988) and therefore patentable new alloy.

3. **"Araara Tamra"** A copper alloy zinc, lead and iron of light absorption

Status :

Already produced and characterised to possess:

- a) Golden Yellow to reddish tinge (described in Sanskrit text as 'Hema Varnam' or golden colour).
- b) Brittle, light and hard on micro structure analysis found to be two phase alloy.
- c) Very hard (Young's modulus 16.9) (described in Sanskrit text as 'Dridham' or 'strong').
- d) Characteristics, composition and properties found to be not listed in ASM Reference (1988) and therefore patentable new alloy.

4. **"Chapala grahaka"** (ceramic)" A fine porcelain type of ceramic

Status :

Already produced and characterised to be resistant to all acids and alkalis.

5. **"Chapala grahaka (glass)"** A soft glass (of low temperature melt)

Status :

Already produced and characterised to be resistant to acids and alkalis.

Refractive index found to be 1.614. (highest known among soft glasses made at low temperatures).

6. **"Ravi Shakti Apakarshana darpana (glass)"** A special glass concentrating (visible) light energy in sun light

Status :

Already produced and study of optical properties is not yet done.

7. **"Ushna Shakti Apakarshana darpana (glass)"** A special glass for concentrating the heat energy in sun light

Status :

Fully deciphered and to be produced in the laboratory.

8. **"Badhira Loha"** A sound proof alloy

Status :

Fully deciphered and to be produced in the laboratory.

9. **"Vidyut darpana"** A special glass that has capability to neutralize electrical discharges as lightning

Status :

Fully deciphered and to be produced.

10. **"Raja Loha"** A high-heat-absorbing alloy used for the bodies of various flying crafts.

Status:

Fully deciphered and to be produced in the laboratory.

11. **"Rudanti Mani"** A special material

Status :

Fully deciphered and to be produced in the laboratory.

12. **"Rutika Mani"** A special material

Status :

Fully deciphered and to be produced in the laboratory.

13. **"Abhra Mrid
darpana"** A special mica glass

Status :

Fully deciphered and to be produced in the laboratory.

14. **"Sunda Mrit
Kacha"** A special glass

Status :

Fully deciphered and to be produced in the laboratory.

15. **"Pingala
Adarsha"** A special glass

Status

Fully deciphered and to be produced in the laboratory.

16. **"Somanka Loha"** A special alloy

Status

Fully deciphered and to be produced in the laboratory.

17. **"Ravi Shakti
Apakarshana
darpana"** A special glass with solar
heat collecting properties.

Status

Fully deciphered and to be produced in the laboratory.

DR. RUPNATHUJ (DR. RUPAK NATH)

18. **"Hatakasya Loha"** A Copper alloy with golden appearance.

Status

Fully deciphered and to be produced in the laboratory.

19. **"Vata Stambhana Loha"** A copper, iron, lead alloy

Status

Fully deciphered and to be produced in the laboratory.

20. **"Ghantarava Loha"** An alloy that has high sensitivity to different types of sounds.

5. Vakra Prasarana Yantra – Design and Fabrication.

The Arara Tamra (item no.3 above) was described to be basic alloy material for making the cylindrical frame enclosure for the Vakra Prasarana Yantra given in Vimana Shastra. This machine has been reproduced as a working model at M/s MTE Industries, Hyderabad. This Yantra is an advanced machine. This machine was stated to enable sharp turns, circular motion and reverse turn of Vimana or any vehicle. This machine is found to be a gear mechanism with sixteen gear wheels in a conical design. This has one input and two outputs. One of the two outputs moves in the same direction as the input while the other output moves in the opposite direction as the input. The speed of the second output also is higher than the first output. Multiple outputs can be taken out. Such a mechanism is unknown and new in today's machine design. Patent application is being made for this Yantra.

6. Low cost Protein rich food from Grass

In addition to the above materials, a formula for producing a protein rich food extract (powder) from specific Indian grasses is also deciphered. The Central Food Tech. Research Institute, Hyderabad has certified that the powder extracted from the specified grasses shows about 13% protein content. Other tests from nutrition and medical angles are to be taken up. This activity is aimed at producing low cost protein rich food products (as powder, biscuits, malt etc) based on this formula

7. Agni Sthambhana or Fire Resistance

In addition to materials produced or deciphered as above, a technique for preventing and resisting fire and burning is also developed. Two techniques / solutions have developed for Agni Sthambhana or Fire resistance :

- a) for preventing burning of inflammable objects as paper, cloth and wood
- b) for preventing burning of human body.

It has been noted that in both the above cases the fire will not be allowed to be caught (or burning to start) even after continuous exposure to flame for upto 30 seconds. (Normally fire catches any inflammable material with 0.5 seconds and any moist material within 3 dampened with this liquid do not catch fire and can also be used to put off fire or escape unburnt in fire even after long exposure to flame). A Patent has been obtained for this invention from Madras Patent Office.

8. Anahara or Avoiding food

A recipe for a special type of biscuit has been developed. This biscuit when consumed upto 50 g dose can help overcome hunger and skip a meal for about 3 - 4 hours. Upon medical trial, was found very useful in obesity and diabetic cases.

(Note: Items 7&8 are developed independent of Vimana Shastra).

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2. Mr RangaMadhavan,
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|-----|---|------------------------------|---|
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10. Conclusion

This investigation provides the basis for identifying the veracity of the description given in source of the Sanskrit texts dealing with materials and also machine design. While it is not clear how these texts originated or whether they are authentic, the experimental approach only attempted in finding out the validity of the description of preparation of some special materials such as alloys, glasses, ceramics, etc., and also one machine Vakra Prasarana Yantra. Even though some persons have hinted at the whole text being a modern work, composed by the oral deliverer himself, the experimental results uphold the veracity of the textual contents and also indicate lack of availability of these materials and machines in their exactness in modern times, thereby hinting at an ancient historical origin.