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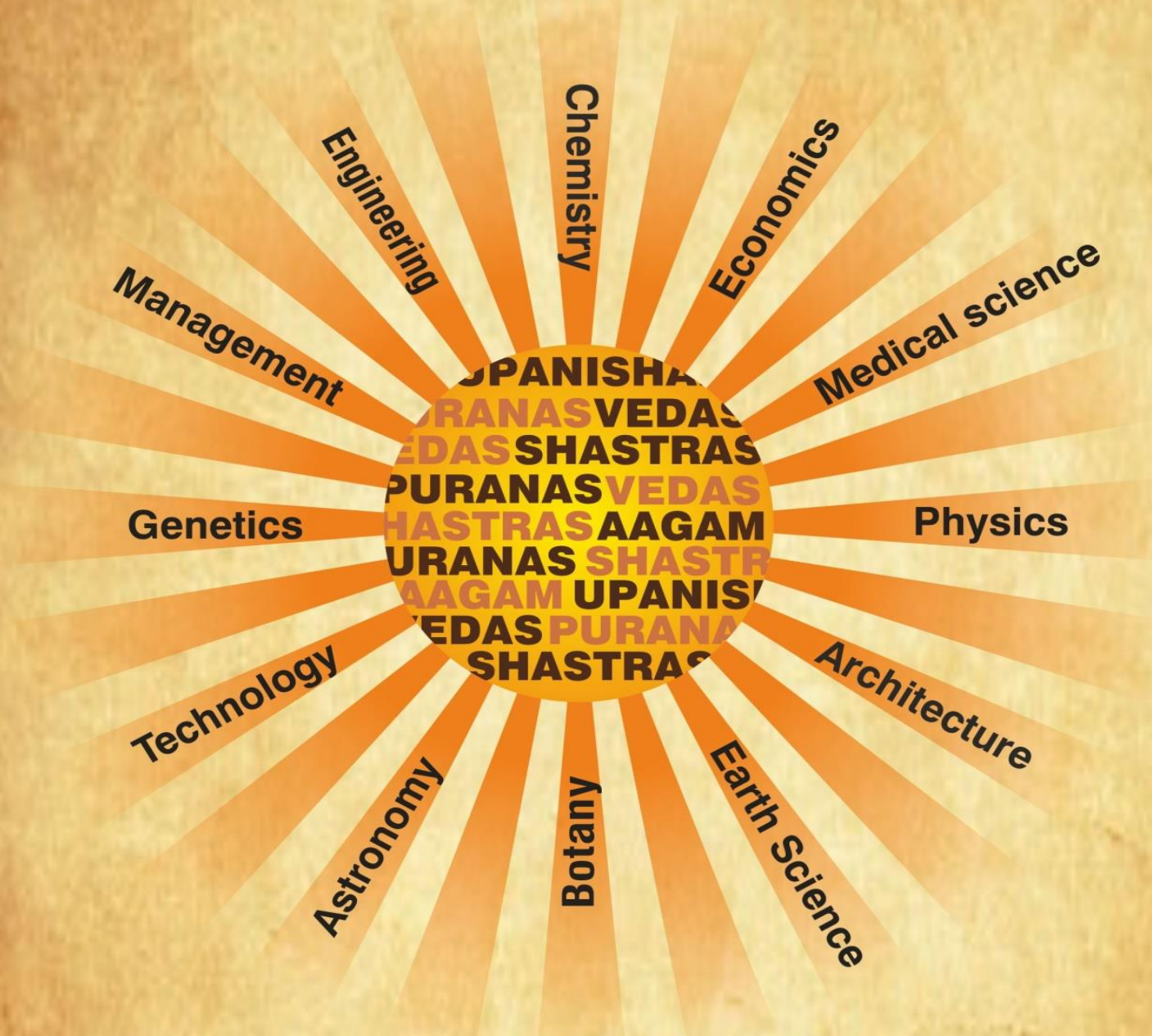
॥ ved vigyan vaibhav ॥

A Magazine on
SCIENCE IN ANCIENT INDIAN LITERATURE



By
JAGATGURU SHRI DEVNATH INSTITUTE OF VEDIC SCIENCE AND RESEARCH, NAGPUR
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Editor's Desk

JSDIVSR publishes the second issue of the first volume of "Ved Vigyan Vaibhav" a tri – monthly magazine for the month of August which is in great demand after its launch. The E- magazine received a tremendous response by various readers of our magazine who are the students in various field, professionals, engineers, doctors and most importantly the youth class which was unaware about this domain. The report given by analytics team of JSDIVSR says Ved Vigyan Vaibhav has reached about hundreds of people in India and outside India.

Articles in the previous issue focused on various concepts in the field of Biology, Mechanical Engineering and Alchemy in our Ancient Indian Literature. We will try to cover all the fields whose sources are found in our ancient India.

This issue contains one special article by our Board Member, Dr. A.S. Nene which is based on the historical decision recently taken by Government of India on Kashmir. It encompasses that history of Kashmir which is unknown to most of the people in India. I personally insist every reader to go through that article in this issue. You can give your valuable comments on our website www.jsdivsr.in

Engineers and Scientists of ancient India

Late G.G.Joshi Nagpur

Raosaheb K.V.Vaze , Nasik published a detailed list of texts on Science and Technology (Shilpashastra) of ancient India. It includes the names of authors of these texts. This article describes the name of few authors and their texts. The symbol * indicates printed books.

	ग्रंथकार	ग्रंथ
१	भृगु	भृगुशिल्पसंहिता,भृगुमत*
२	मानसार	मानसार
३	रुद्रयामल	रुद्रयामल वास्तु
४	विश्वंभर	विश्वंभर वास्तु
५	मनु	मनुतंत्र, मनुसार, मनुस्मृति, मानवसूत्र
६	नल	नलतंत्र , नलपाकदर्पण
७	त्वष्टृ	त्वष्टृतंत्र
८	सुखानंद	सुखानंद वास्तु
९	फेरुठक्कर	फेरुठक्कर वास्तु
१०	हनुमत्	हनुमत वास्तु
११	वसिष्ठ	वसिष्ठशिल्प
१२	अत्रि	अत्रिसंहिता*, आत्रेयशिल्प,आत्रेयतिलकम
१३	नारद	नारदशिल्प*, नारदीय, नारदनीतिशास्त्र *
१४	प्रजापति	प्रजापत्यशिल्प
१५	मार्कंडेय	मार्कंडेयशिल्प
१६	शौनक	शौनकशिल्प
१७	विश्व	विश्वशिल्प
१८	औषनस	औषनसशिल्प, औषनसधनुर्वेद*
१९	ईशान	ईशानशिल्प, ईशानशिवगुरुदेवपध्दति*
२०	नग्नजित	नग्नजितशिल्प, नग्नजित चित्रलक्षण*
२१	ब्रम्हा	ब्राह्मीयशिल्प, ब्राह्मीयकर्मशास्त्र
२२	वाल्मिक	वाल्मिकशिल्प
२३	वज्र	वज्रशिल्प
२४	विश्वकर्मा	विश्वकर्म प्रकाश* , विश्वकर्मावास्तुशास्त्र *
२५	प्रबोध	प्रबोधशिल्प
२६	प्रयोग	प्रयोगशिल्प
२७	भारद्वाज	भारद्वाजशिल्प, भारद्वाज धनुर्वेद, भारद्वाज अर्थशास्त्र
२८	यम	यम शिल्प
२९	विश्वामित्र	विश्वामित्र शिल्प,

		विश्वामित्र धनुर्वेद
३०	ऋषिमय	ऋषिमय शिल्प
३१	अनिरुध्द	अनिरुध्द शिल्प
३२	कुमार	कुमारशिल्प, कुमारागम,शिल्परत्न
३३	प्रशुध्द	प्रशुध्दशिल्प
३४	पाणिनी	पाणिनीशिल्प
३५	बृहस्पति	बृहस्पति अर्थशास्त्र*,ब्रार्हस्पत्य, बृहस्पति शास्त्र, बृहस्पतियम्
३६	वासुदेव	वासुदेवशिल्प
३७	चित्रकर्मा	चित्रकर्माशिल्प
३८	मुनिमय	मयमतम्*, मयशास्त्रम्*, मयसंग्रह, मयदिपिका, मयविद्याप्रकाश,मयमाया, मयरत्न
३९	सनतकुमार	सनतकुमार गृहशिल्प, सनतकुमार वास्तुशास्त्र
४०	सारस्वत	सारस्वतशिल्प, सारस्वतीय चित्रकर्मशास्त्र
४१	भास्कर	भास्करीयशिल्प
४२	शत्रुघ्न	शत्रुघ्नीयशिल्प
४३	राजा भोज	समरंगण सूत्रधार
४४	मंडन	कोदंडमंडन (वसुमति), वास्तुमंडण, वास्तुराजवल्लभ,प्रासादमंडन, रुपमंडन.
४५	कौटिल्य (चाणाक्य)	कौटिलीय अर्थशास्त्र
४६	कौणपदंत	कौणपदंत अर्थशास्त्र
४७	विशालाक्ष	विशालाक्ष अर्थशास्त्र
४८	वासुदेव	वासुदेव अर्थशास्त्र

The list may contain few guesses (2-4) about titles of books.

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Aircrafts in ancient India

This article is based on the article entitled "Aircrafts in ancient India" written by **P. H. Thatte** and published in Vedic Magazine *Gurukul Samachar,* Lahore, Vol.21, No.7,Dec.1923, and reprinted in magazine Shilpa Sansar Vol.20,23 April 1955,Pages 246 to 250.

Introduction:

1.0 The article mostly deals with information in *Agastya Samhita.* Positive and negative energies are two invisible energies produced in clean earthen pot and are well known amongst Gods (Rigved). Ref.SV1.

सम्राजा या घृतयोनि मित्रशोभा वरुणश्च ।
छेवा देवेषु प्रशस्ता: ॥ ऋग्वेद

SV1 - Positive and negative energies

2. The News paper, Times of India, Dated 3rd July 1922 mentioned that "Many people who have not remotest commercial interest in aero planes, just out of curiosity read hand-books on their construction and if they have a mechanical turn of mind, theoretically they become capable of constructing an aero plane. But of all kinds of practical education of aero planes, useless unless it is put to the least practical."

3. History: The author had written an illustrated work in Marathi on the subject of ancient and modern *"Akasha-Yanas"* or Sky vehicles. (Note – The book remained unpublished and is now preserved by the Bhandarkar Oriental Research Institute, Pune, with the authors other unpublished books). In the supplement to that work, author had given, an evidence about the existence of the said vehicles in India., a description of the travels of our hero, Rama, from Shri Lanka to Ayodhya in the vanquished *Ravana's Pushpak Vimana* and alluded to *Shalvas* attacks through Vimanas in our philosopher king Krishna's capital *Dwaraka*- facts noted in our well-known epic *Ramayana and Hari Vansha.* But that evidence all points to their outward shape; author was not able to give an iota of evidence about their internal construction. To our great delight author's friend Raoshaheb K.V.Vaze, L.C.E. , from his collection of Sanskrit books on Engineering, gave an entirely new evidence as to their construction. This gave material to write a new supplement to the book. This evidence is from Agastya Samhita which was copied by Shri Vaze from old manuscripts obtained from Ujjain (M.P.). Ujjain was capital of King Vikramaditya.

The book is divided into two parts. The first part ***"Abdhiyan"*** deals with navigation and the second part "***Agniyan"*** deals with construction and management of aircrafts. The book also describes production of hydrogen gas, (produced by electricity), to fill up balloons. The author of the book is Agastya Muni (also known as *Kumbhodhwa* (meaning one who was born in earthen pot).

Agastya Muni was contemporary of Lord Rama (5000 B.C.). He killed demon brothers *Atapi* (kite like) and *Vatapa* (flag like), who had played havoc with their kite or flag like planes in Aryan colonies. There are some pages of Sage Bharadwaja book VimanadhikaraN in the well- known Gaikwad Sanskrit library at Vadodara (Gujarat). It is an oblong manuscript which contains references following Sanskrit books on this subject -

1. *Vimanchandrika* by Swami Narayana
2. *Vyomyanatantra* by Sage Shounaka
3. *Kalpayantra* by Sage Garga
4. *Yanbindu* by Vachaspati
5. *Khetyana pradeep* by Chakrayana
6. Vyomayanarkprakash by Dhundinath

Names – There are many names given to these *Vimanas* in *Agastya Samhita*. It therefore appears that the vehicles were common in *Agastya* period. Ref. SV2.

व्योमयानं विमानं स्यादग्नियानं तदेवहि । अगस्त संहिता

SV2 – Common names of aero planes

Wood-The wood used in the construction of these vehicles used to be top class with properties such as light in weight, flexible and easy to work (soft). The lighter it was better. Ref. SV3.

लघुयत्सुघटं काष्ठं कोमलंब्रम्हजाति तद ।
विमानो सर्वदाग्राह्यं लघुत्वादुत्तमं स्मृतं ॥

SV3 – Wood for construction

Cloth – The cloth used for it was silken. It was broad and soft. It was called "*Kousheya* (made from cells of silk worms). Ref. SV4.

कृमीकोषसमुद्भूत कौषेयमितिगद्यते ॥
सूक्ष्मासूक्ष्मौ मृदुस्थूलौ ओतप्रोतौ यथाक्रमं ।
वैतानत्व च लघुता च कौषेयस्य गुणसंग्रहः ॥

SV4- Cloth used for construction

Balloons: The balloon must have the following five properties like a ship. It must be; Divided; Flexible; Balanced; or Clean . .Ref. SV5.

विशीर्णता कोमलता उच्चता समता तथा ।
स्वच्छता चेति नौकेव विमाने गुणपंचकं ॥

SV5- Desired properties of Hot air Balloons

Seat: The seat of the aero naught was made of wood of certain trees.

1. *Palash* tree (Flame of forest) for good appearance.
2. *Chandan* tree (Sandal wood) for happiness
3. *Bakul* tree (Molesery tree)for good luck
4. *Panas* tree (Jack fruit tree) for smooth floating Ref. SV6.

पलाशो राजकः प्रोक्तचांदनः सुख उच्चते ।
बाकुलस्तया शुभः प्रोक्तः पानसस्तारकः स्मृतः ॥

SV6-Wood for seats of f Hot air Balloons

Umbrella: The umbrella in it was made of silk cloth. It was inflatable and conical in shape. It was fixed lengthwise and it was double in dimensions than those of the balloon. Ref. SV7.

कौषेयछत्रं कर्तव्यं सारणसकुचनात्मकं ।
छत्रं विमानाद्व्दिगुणं आयामादौप्रतिष्ठतं ॥

SV7- Umbrella for Balloons

Ropes: A *sutra* was made of nine threads; a *GuN* was made of nine sutras; a *pash* was made of 9 *Gunas*; a *Rashmi* was made of 9 *pashas;* a *Rajju* was made of 9, 8, 7 or 6 *Rashmis.* Such ropes were used in construction of Indian balloons Ref. SV8.

नवमिस्तंतुः सूत्रं सूत्रेस्तु नवमिर्गुणः ।
गुणैस्तुयभिः पाशो रश्मिस्तैर्नवमिर्भवेत ॥
नवाष्टसप्तषट संख्यै श्मि भिर्ज्जवः स्मृताः ।

SV8 – Making of Ropes

Air –Tight (Air proof) Cloth: In order to make the silk cloth air-proof, it was thrice soaked in the saps of certain trees (Fig, *Jack-fruit, Mango, Aksha, Kadamb*) and three Myrabolams and the decoction of Mash (black gram) and pressed down in water of Shell lime and sugar. Finally it was thrashed and dried.Ref. SV9.

क्षीरद्रुमकदंबाम्रा भयाक्षत्वग्जलैस्त्रिभी ।
त्रिफलोदैस्तस्त्रब्दंपाषयूषैस्ततस्ततः ॥
स्यंम्य शर्कराशुक्ति चूर्णमिश्रित वरिणा ।
सुरसं कुट्टनं क्रुत्वा वासांसि स्त्रवयेत्सुधो ॥
अगत्स्य संहिता

SV9- Air –Tight (Air proof) Cloth

Electro-plating: Gilding electricity covers copper with gold or silver when contact with acidulated water and solution of metal salts i.e. contains metal full of Yavakshara' copper covered with gold was called '*Shat Kumbha'.* This gilding by means of gold or silver is called electroplating. It is enumerated as an art as per *Shukraniti*. Ref.SV10

यवक्षारमयो धानौ सुशुक्तकजलसन्निधौ ।
आच्छदयति तत्तम्रं स्त्रृणेनरजते नवा ॥
स्वर्णलिप्तं तत्ताम्रं शातकुंभमिति स्मृतं । अगत्स्य संहिता
कृत्रिमस्वर्णरजतलेपः संस्कृतिरुच्चते ।
लिप्तस्वर्णपुतेन तम्ररजतं तत शातकुंभस्मृतं ॥ अगत्स्यमत
कृत्रिमस्वर्णरजतकलदिलेपादि सत्क्रिया । शुक्रनीति

SV10- Electro-plating

Note –Sage *Agastya* invented the art of gilding copper with either gold or silver by means of batteries and therefore his contemporaries honored him with the title of *'Kumbhaodbhava* (Battery borne).

Hydrogen –By the foregoing process of producing electricity and acidulated water was divided into its constituents, Oxygen and Hydrogen *(PraN and Udan)* gases. Earlier name of Hydrogen gas was *Udan Vayu*. It is interesting to know for what purpose it was used.

Flying: That hydrogen being light was poured up in the varnished silken cloth bound fast to the top of the vehicle which was thus floated up in the atmosphere. Ref. SV11

वायुबंधकवस्त्रेण सुबध्दोतानमस्तके ।
उदानस्यलघुत्वेण विभत्यार्काशयानकं ॥

SV11- Flying the balloons

Note: From these facts the conclusion is forced upon us that '*Udan Vayu* which was used for inflating our Indian balloons and the hydrogen which is now used for inflating modern ones, specially the German Zeppelins, is one and same.

Driving: The ballon was generally called*"Viman"*. People in those times used to yoke to it birds (Eagle,Swan, Vulures or others) for driving. The science of traing of birds is called *"ShakuntVidya".* Ref. SV12

गरुडत्महंसैः कंकालैरन्यैः पक्षिगणैरपि ।

आकाशे वाहयेद्यानं विमानमिति सज्ञितम॥ अग्नियान

SV12 -Driving: The ballon

Result: from this evidence any one will agree with the author in thinking that our forefathers knew the construction and management of air craft theoretically and practically, both from Rama's time (5000 B.C.) if not from Vedic time and as we do not now any trace of the indigenous art in India, we have forgotten it in the downfall of our nation and though it has disappeared from India, it has struck roots.

Germany and other European countries face Christianity. We can make it revive. We make an earnest attempts for its Indianization because the growth of things is subject to the principles understanding the following sentences:-

(1) Theories and dogmas are all very well in their own way but they will not carry you far if you reduce them to earth" –Times of India.

(2) The Science of Engineering grows by actual operating conditions, rather than from the four walls of the lecture room or the laboratories.

(3) Indians would not consent to have a navy or air service from which Indians were excluded.Otherwise, this aircraft trade will naturally be the monopoly of forigners like our shipping trade, as they are sure to be the first in the field-Mr.Shastri (Bombay cronicle dt.27-5-21).

Conclusion: Taking full advantage of these facilities, Author therefore ardently hopes that very soon in India, inflating type air-crafts would be constructed. These crafts would use helium instead of hydrogen. Following two principles should be kept in mind.

(1) "A state was made up of hearts and alters. Those men, when they crossed the seas, would found hearts, but would they found alter? Upon the answer to that, depended the greatness not only of the British Empire, but of humanity".

2." No risk no gain" and that too in numbers so great that some Divankas (Sky-abode of god) of us shall have occasions to declare with a proud air that they are born to live and die in the pure air of their aircrafts in the sky like boatmen, of another countries like China, Thailand or Myanmar, who are born and brought up to live and die on their ships with an eye on their historical truth in one of the following words in Amara's couplet. Ref. SV13

अमरा निर्जरा देवा त्रिदशा विबुधाः सुराः ।
सुपर्वाणः सुमनसः त्रिदिवेशा दिवौकसः ॥ अमरकोश

SV13 - Amara's couplet

Because everything visible or invisible like *Divowkus, Nawoukus is* cyclically found subject to the rule of evolution and involution or in other words birth, growth, death and rebirth etc.

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Jalashastra-Water resource Engineering

(Source – Weekly Shilpasansar, Pune, February 1955, pp 130-135)

Introduction-"Indian Town planning and Indian Warfare" was briefly described in 15th and 21st January 1955 issues respectively, of the journal "*Shilpasansar*". Published work on Indian Hydraulics is described in this article.

Panchamahbhutas-Water (Aap) is one of the five basic elements (Panchamahabhoota). World's oldest encyclopedia, Vedas, mentions the origin of these elements. A Marathi magazine "Purushartha" in its August 1997 issue contains an article entitled "Origin of Water". Author mentions ancient terms "*Mitravayu* (Hydrogen) and *Varunvayu* (Oxygen). Combination of these two compounds results into formation of water. An ancient text Nighantu mentions 100 different Sanskrit names of water.

3. A conference by "International Association for Hydraulic Research" was held on 2nd January 1959 at Mumbai. Hon. B.G. Kher, state's Chief Minister in his inaugural address opined that "India is essentially an agricultural Country and Indians have always fully appreciated the beneficent use of water are evident from the Vedic prayers and especially from the famous hymn ***Apohishta.*** We have been using artificial irrigation as an aid to agriculture from tines immemorial starting from very ancient times, the science of Irrigation has developed in this country to its present state of advancement and for us the science of hydraulics is simonies with the science of Irrigation". The hymn **Apohishta** mentioned by Hon. Kher is very meaningful and is as below.

Prayer of Water - The hymn Apohishta.

आपोद्विष्ठा मयो भुवस्तानउर्जे दधातन ।
माहेरणाय चक्षसे ।।(ऋग्वेद १०. ९. १)

Meaning-"Water is mother of welfare. May our mother show the way to prosperity and impart its strength to us"

Shri Vaze (who did pioneering research on ancient Indian Engineering Sciences) quoted many Vedic mantras related to water. (Ref. Prachin Hindi Shilpashashtra chapter 9 pages 27-29).

Shri A.K.Yadnyanarayan Ayyar, Then Retired Director of Agriculture, Mysore State, in his book 'Agriculture and allied arts in Vedic India' has mentioned different topics related to water (Ref Chapter 9)

- Rain and water sources
- Prayers against too much rain.
- Irrigation and river water.
- Soil erosion by rivers, and its control.
- Wells
- Mud wells.
- Other water sources.
- The rains begin and bring unbounded joy.
- Ships and sea -voyages.

Shri Ayyar also quotes a mantra from Yajurveda, which praises gods residing different types of water sources (i.e. rivers, tanks, ponds, well s and oceans).

5. Many scholars consider "*Sthapatya-veda* as part of A*tharvaveda*.(History of Vedic Dates –a Marathi book by Parshram Hari Thatte).. But authentic references are not known. Veniprasad Sharma Goud in his Sanskrit book"*Vedvidyan Meemansa*" (Published by Ms Bhargava Pustakalaya, Banaras), indicates that there is chapter on Tanks (Tadagadi Vidhi page 69) in Atharvaveda.

In addition to Vedic references, one can find references in Puranas and Nitishashtras. Naradniti contains questions asked by Narada to King Dharmaraj.(Ref. Naradniti – Marathi book, Pub. Jagadishwar Press, Mumbai, page 69). One of the questions is as below;

"The rainwater which falls on earth flows into rivers, tanks and canals. O King, haveyou ensured that this water storage is not wasted? The water saves the mankind, trees and animals. Do you ensure that the water does not seep out of tanks? "

Narad Shilpashashtra contains following chapters related to hydraulics

I. Ponds & Tanks
II. Arch Bridges
III. Water Forts
IV. River Forts

According to Shri Vaze *Vashithsamhita* deals with navigation and hydraulics.(Refer to Vaze's article published in Marathi magazine Udyam June 1922). As the original text of Vashithsamhita is not available, more information has to be collected from Vedic mantras of sage Vashishtha in Yajurveda. Shri Vaze's compilation on this subject is unfortunately is not available. According to my notes such information was published by Shri Vaze in a magazine "Krishival" published in Pune under the title "Rain Measurement and ancient tanks". Thisarticle is not seen by this author. There is a separate chapter on navigation and hydraulics in the book by Shri Vaze (Prachin Hindi Shilpashashtra- Marathi).

According to *Bhrugushilpashastra*, Supply, Drainage and Storage are three branches of hydraulics. It is stated in these chapters that birth period of water is six and half months. Many surprising things are mentioned such as;

- Nineteen properties of flowing water (As per Sage Vashishta)
- Main 6 principles and estimation of water divining (As per Sage Parasara)

• Ten properties of stored water, as narrated by sage Bhrugu, are very important from ancient Indian wisdom

Shri Vaze was to write a book on this subject. But due to untimely death of Shri Vaze this information is not available.

Water divining was a science in ancient India. Varahmir in his book Bruhatsamhita,chapter 59 has given details of this science.. Following printed references are also available on this subject.

• Water divining – with Marathi interpretations by Vitthal Narayan Gore, Published by Nirnaysagar press Mumbai Price 75 paise.

• Water divining – with Telgu interpretations Published by Ram swami Shashtralu, Chennai

• Well – Ancient and Modern practices by Parshuram Hari Thatte, Published in Marathi Magazine Udyam during February 1922 to December 1926.

• Water-Divining – Ancient and Modern by K. Venkarrarnan [paper – Central Board of Irrigation Journal March 1950]

• Water Divining by Major C.A. Pognon. Paper by LXXXII. Read before Bombay Engineering Congress 1923.

Prof. Haridas Mitra has given list of books related to hydraulics in his book "Contribution to a Bibliography of Indian Art and Aesthetics ".

i. Water Diving
ii. Water Diving Instruments
iii. Irrigation Sources
iv. Irrigation Principles
v. Irrigation Methods
vi. Irrigation Standards
vii. Irrigation Experiments
viii. Irrigation Procedure
ix. Irrigation Procedure

x. Irrigation Procedure
xi. Foundation of Tanks
xii. Tank Outlets

• Vasuratnakar- Published by Choukhaba press, Banaras (This book contains a separate chapter on hydraulics
• Kupadijalalaksthan Lakshana
• Vasturajvallabh – Hindi Edition- Published by Bhargava Pustakalaya, Banaras
• Mu Thau- Gujarati- Published by Jaguste booksellers, Ahmadabad.

Almost each book on Vaastushastra contains information on construction of wells, tanks etc.

Central Board of Irrigation, Government of India, has a big reference library which publishes books related to hydraulics. Following books are available in this library.

- Lectures on the ancient system of irrigation in Bengal and its application to modern problems by Sings William Will cocks. Calcutta University 1930,(Bookseller - Chattopadhyaya Brothers 1-1-1-A, Bamkim Chattarji Street,Calcutta 12.)
- Water transport in India C.W. & P.C. New Delhi, This book is translated into Hindi under the title" Bharatme Jalayatayat.
- Irrigation in India through ages. Popular Series Leaflet No. 7 (Central Board of Irrigation) 1951.
- Irrigation Works in India and Egypt by R.B. Buckiey 1893 (E.P.N. Spence London)
- Triennial review of irrigation in India 1918-21 (P.W.D. Government of India 1922 P. 23-184)
- Irrigation in the Punjab a historical review by A.M.E. Montague (C.B.I. Journal April 1946 P. 100)

- Irrigation in India – An Australian view India & Ceylon's their irrigation and agriculture by A. Deakin (W. Thacker & Co. London 1893)
- Irrigation in Indian water supply and Irrigation Paper No. 87 by H.M. Wilson 1983 (Department of Interior U.S. Geological Survey)
- Report of the Indian Irrigation Commission 1901-1903 4 parts.
- Aina – Aktari of Abal Fazl I by Allan 5 Vols. (Asiatic Society of Bengal) Calcutta.
- Report of the Regal Commission on agriculture in India 1928 P. 28
- A guide to the buildings and gardens of Delhi Fort. This describes a 45 km long canal constructed by King ShahJahan to supply water to the fort. This book contains two additional references (page 61-63)

• History and description of Government canals in the Punjab by J.J. Haten, Punjab Govt. Press).

• Memoranda on the western Jamuna Canal North Western Provinces by Major W.E. Baker. Superintendent of Canals, North Western Provinces London 1849.

This book may be available in the library of C.B.I. New Delhi. The book by Mr.Baker contains pictures of aqueducts of Mogul period. Roorkee Treatise on Civil Engineering Irrigation Works in India. (1901) page 9 mentions that "It is well known that the Egyptian Irrigation System is founded in Indian practice"

From the various references it can be seen that Irrigation Engineering was first developed in India and then it spread to Egypt, Babylonia Peru in south America (which was ancient Hindu colony Refer to pre-historical and historical excavations mentioned in Capital towns of Spanish South America 1889)

The world renowned authority on Irrigation, Sir William Wilcox delivered four lectures on "Ancient Irrigation" at Kolkata University. The topics of the lectures were;

• The "overflow Irrigation" of Bengal.

• The restoration of the Ancient Irrigation of Bengal, theoretically considered.

• The restoration of the Ancient Irrigation of Bengal practically considered.

• The restoration of the Ancient Irrigation of Bengal in our day.

In 1990 these lectures were compiled into a book. The speaker claimed that ancient irrigation practice will be beneficial to west Bengal. The knowledge of Sir Wilcox about hydraulics and ancient irrigation practices is reflected in his book "Irrigation in Egypt & Sudan, the Tigris & Euphrates Basin & India and
Pakistan", Publisher the British Council 1950

Very few engineers are aware that king Bhagirath was an ancient Indian irrigation engineer. Shri Kalelkar used a term Bhagirath Vidya for irrigation engineering, in his book "Lokmata" on Indian rivers. Sir Wilcox has praised Bhagirath and Indians in following words;

"Following the genius of your country, your ancient writers (Vyas in Mahabharata) described the physical facts they were writing about in spiritual language, but the facts were there all the same. Every Canal which went southward, whether it has become a river like the Bhagirathi, or remained a canal like the Mahabharata was originally a Canal. They were lined out and dug fairly parallel to each other. They were spaced apart that Canals should be placed. I remember quite well when I began to line out a system of Canals for the irrigation of the country, I was astonished to find everywhere that a so called"dead river" on the map was just where a canal should be place ……"

Bhagirath brought river Ganges down from Himalaya to plains. This is not the only wonder of Indian hydraulics. There is another astonishing work of ancient Indian engineers. There is an ancient story about a big ocean of sweet water in central India, Sage Agasthi drank the whole water and made

the land suitable for habitation. The technical meaning of this story is that sage Agasthi dewatered the land. Sage Agasthi was also an authority on aeronautics. His book Vimansamhita is partially available. (Ref articles by Shri Dattatraya Vinayak Gadgil published in a Marathi magazine Divya Jeevan, November and December 1919.

Another hydraulic work, construction of Sea Bridge is mentioned in the epic Ramayana. The bridge was not constructed by Hanuman with the help of tribal of Nala tribe and not monkeys. The bridge in shallow water between coasts of India and Ceylon was constructed in five days using huge stones and trunks of trees. Well versed readers of Ramayana know that Hanuman was not a monkey but man residing in forests; one can refer an article by Shri Tofkhane published in a Marathi magazine "Purushartha" 1919 and another article published in a Marathi magazine "Manoranjan 1915. King Nala was an engineer and water distribution through pipes was his invention. Interlocking cylindrical earthen tiles were used to transport water. Such pipelines still exist in old Ceylon. A copyof second article is available with the author.

Keeping aside the myths about ancient hydraulics, one can still witness the expertise of Indian hydraulic Engineers. In 1900 East India Company sent Dr Francis Buchanan to North and South India to economical and agricultural conditions. His report was published as Buchanan's journey from Madras etc.(London 1805) Vol. I, II & III .Buchanan has quoted that;

(i) At Condutur I was one of these Hindu Irrigation Works for which South India was always formed. It was a large reservoir formed by shutting up with an artificial bank an opening between two natural ridges of ground. The sheet of water was even or eight miles in length and three in width, and was let out in numerous small Canals to irrigate fields in the dry season. In the mains it was replenished from the Cheir Nadi there were sluices at different places twenty or thirty feet wide and these sluices were fortified by stones,

placed in a sloping direction, to let out the superfluous water. The reservoir could irrigate the lands of thirty two villages during a Drought Of Eighteen Months. In a country liable to famine from want of rain a reservoir such as this is of inestimable value."

Buchanan mentions about a reservoir in Karnataka as below;

"On my way to Arcot I saw another splendid old Hindu reservoir, called the Kaveri Pak. The reservoir is about eight miles long and three miles broad, and fertilizes a considerable extent of country. I never viewed a public work with more satisfaction, a work that supplies a great body of people with every "comfort which their normal situation will permit them to enjoy." (P. 197 to 199 of the Economic History of India under Early British Rule by Remesh Dutt C.I.E. 3rd edition). My fifth standard book had a lesson on importance of canal. The above information confirms its truth ness. Shri Rajgopalcharji, in his inaugural address at First Congress on Irrigation and Drainage 1951 Delhi, described special features of ancient Indian tanks and canals. (Ref. Transactions Vol 1 page 130-131). In the same conference Shri Malhotra and Shri Ahuja present a paper on ancient irrigation (Ref. Transactions Vol 1 page 23- 26).

Government of India published a book "5000 Years of Indian Architecture". Page 6 of this book shows isometric projection of great Bath at Mohenjodaro. This clearly indicates progress of Indian hydraulics.. Dr. Prasannakumar Acharya, in his book "Elements of Hindu culture and civilization ", pages 71-79,has described ancient hot sitting baths.

Many readers may question "Whether there were water works in ancient period?. Answer to this question is "Yes". The water works constructed at Burahanpur and Aurangabad during the period of Aurangzeb, are comparable to modern water works. Big closed Intake wells were constructed near Aurangabad. The water under the force of gravity was taken through canals to residential areas. Siphon principle was also used.

One curious person Shri P.V.Gogte of Akola had the privilege to inspect these canals in intact condition. He published his experience in an article "Ancient water works" in a Marathi journal Udyam, July 1922.

Shri T.V. Mahalingum has described the irrigation practices of well-known Vijayanagara dynasty in an article entitled "Irrigation under the Vijayanagara Kings". This article is published in1996, in a book to felicitate Dr. S. Krushnaswami Ayyangar. Page 160.

Hydraulics machines were fabricated in ancient India to utilize hydro power. One can refer to;

1. Aryashilpa Hindi Yantrashashtra by Shri Vaze, chapter II
2. Studies of mechanics from Irrigation Engineering Books (Series of Articles).
3. Yantras or Mechanical Contrivances in ancient India, by Dr. V.Raghavan and published by Institute of Culture, Bangalore

Hydraulics is taught in engineering colleges of India but Hydraulic Engineering in Ancient India is very rarely mentioned. It is satisfactory to find that following nation loving professors have briefly mentioned about Hydraulic Engineering in Ancient India in their introductory chapters.

i. Hydro Electric Practice in India Vol. I by Prof. Bhimchandra Chatterji
ii. Indian Water works Practice by Prof. K.C. Banerjee. Chap. I – Early development of the Art of purification, Indian Sanitary laws in regard to water.
iii. The fundamental principles of Irrigation Engineering by Prof. V.B. Priyan Anand.

These three professors have given very useful information in brief.

Water management is very important aspect of town planning. . One may refer to author's article on ancient town planning to understand about water management.

Lastly I hope that above and other information related to Indian hydraulics would be compiled as history of Indian hydraulics and made available to inspire our next generations.

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Unknown History of ancient Kashmir

Dr. A. S. Nene
Board Member, JSDIVSR
(Professor of Civil Engineering (Retd),VNIT Nagpur)
prof.ashok.nene@gmail.com

Introduction: On 5th August 2019 government of India cancelled the article 370 and bifurcated Jammu and Kashmir State into two union territories namely Laddakh and Jammu and Kashmir respectively. Since then Kashmir issue has become topic of discussion. Common people have very little information about these two territories. Very few know that this region has a rich heritage of 2500 years.

1 Mythology: Rig-Veda contains a hymn known as Nadee Stutee (hymn of praise of rivers) in which names of 10 rivers of North India are mentioned. These are Ganga ,Yamuna, Sarasvati, Sutudri(Sutlej), Parusni, Asikni, Marudvrdha, Vitasta (Zelam), Arjikiya and Susoma

इमं मे गङ्गे यमुने सरस्वति शुतुद्रि सतेमं सचता परुष्ण्या |
असिक्न्या मरुद्वृधे वितस्तयार्जीकीये शर्णुह्यासुषोमया || ऋ.१०.७५.५

Shrimad Bhagwat also has a mention about Zhelam river.

The oldest available reference on Kashmir is Neelamat PuraaN, which was composed during 4th to 6th century B.C. The land was ruled by a king Neel but was killed in a war by Lord Krishna against Jarasandh. Queen Sati, wife of King Neel ruled the country till her son prince Gonand was grownup. According to this text the entire land was a big lake known as 'Sataisaar'. A demon 'Jaladbhav' was residing in this lake and used to kill sages and other persons from nearby area. He had a boon, from Lord Shankara , that he would not be killed till he remains in water. People approached Sage Kashyapa for help. The sage made an outlet through adjacent mountains and drained out all water and then killed the demon. The submerged land was made habitable. Hence the land was called kashyap Mir or Kashmir. The same text mentions about a lake 'Mahapadmasaar or today's Wover lake.

2 Geography: The most important geographical reference is a text 'Rajataragini (Rivers of King) composed by a poet 'KalhaN in 6th century B.C. He was a state poet of Rulling king 'Harsh' who himself was a dramatist. Rajataragini gives a detailed information about the lakes, rivers, mountains, flora and fauna , places of pilgrimage in the region. The great grammarian PaNini (5th century B.C.) composed a text ' Astaddhyee'. His text mentions the name of Kashmir and names of various tribes(Abhisaar, Dard, Khashaa etc) residing in the area. Many upanishadas and BramhaN granthas mentions the name of local tribes such as Gandharv, Kaikeya or Ambhash . 'kshemendra' ,the ancient dramatics composed a drama ' Samyamaatrika'. It contains detailed geographical account of Kashir as seen by the heroine of the drama. Similar description can be found in a famous novel ' Katha sarit Sagar' authored by Somendra. It contains description of places of pilgrimages such as Nandee, Vijay and Varah Kshetra. These are now known as Nadkol, Vijbror and Baramulla respectively. Another state poet BilhaN composed a texts Vikramdev Charitra, which mentions name of capital city

Khonomusha(Khanmoh village today).Dramatist 'Harsh' mentions that Saffron of Kashmir is unique in the world due to its color and aroma.

3 Cultural Heritage: Sanskrit was official language of the state till 6th century A.D. Kashmiri language is originated from Sanskrit but it has its own script known as Sharada script. Kashmir was abode of many Sanskrit writers, poets, grammarians. Their important contributions are,

- Yoga Sutras of Patanjali
- Natyashastra of Abhinav Gupta
- Astang Rhidy of Vagbhatta
- VyakaraN of PaNini .

Many texts were composed on River Zhelam but most important one is Vitasta Mahatmya(Importance of Zhelam). It contains mythological stories, names of places of pilgrimage along the banks of river, religious rituals to be performed etc. In nut shale the contemporary cultural history of Kashmir. Neelamat PuraaN contains description of 57 important ritual/ festval days of lunar calendar of Kashir. Many of these rituals cum festival, which are followed in other parts of India are listed below.

Pitrupaksha, Parwatee Puja ,Ganesh Chaurthee, Jamashtamee,Buddhaa Jayantee, Akshyay Trutiya , Vastupujan, Shiv Ratree, Maghee PurNima, Makar Sankranti .

Conclusion: With this knowledge one should visit Kashmir not only as tourist spot but as a place of glorious heritage of our undivided Nation.

Ancient References:

- Astadhyaayee of PaNini
- Nadee Stuti –Rig-Veda
- Natya shastra of Abhinav Gupta.
- Neelamat PuraaN
- RajatarangiNi of KalhaN

- Shrimad Bhagwat
- Vitasta Mahatmya
- Yogasutras of Patajali

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