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Pūrṇam

A Journal of Indian Knowledge Systems

Portraying the attempts of scholars and scientists……..

…….. to understand the contributions of Bharatiya Heritage -n- SAINTists

Pūrṇam Vol. 1 No. 1 January - June 2025 ISSN: 3049-3587 (Print)

Published Jointly by

RAJIV DIXIT VICHARA VEDIKE

&

BHARAT VIKAS SANGAM

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About the Journal

Pūrṇam is a peer reviewed, diamond access, multi-disciplinary, multi-lingual Journal on "Indian Knowledge Systems" with the following key features:

Title	Pūrṇam
Year of Start	2025
Periodicity	Two issues per year
Subject:	Multidisciplinary Subjects
Language/s	Multiple (English, Kannada, Hindi, Tamil, Telugu, Sanskrit, Assamese)
Format of publication	Print
ISSN	3049-3587 (Print)

Vision and Mission

- **Vision:** For a better world through *"Vasudaiva kutumbakam"*
- **Mission:** Promoting Indian Knowledge Systems by facilitating food for thought and motivation for proactive action

Objectives

- To publish papers on the contribution of Indian Knowledge Systems to the society.
- To provide publication oppurtunity to organizers conduting conferences on topics related to Indian Knowledge Systems.
- To bring the grass root level contributions to limelight by supporting their work through free professional writing assistance.
- To support the so called 'unorganized category' of individuals/groups, but in reality are learned / knowledgeable personalities; to publish their work.

Aim and scope

The journal aims at promoting and portraying the wide scope of Indian Knowledge Systems in various sectors towards the global-sustainable peace, progress and prosperity.

The journal accepts papers on the contribution of Indian Knowledge Systems to society in the following areas, but not limited to only these IKS areas:

- Social sciences including ethics, education and value system, skills-n-talents, sustainability management, law and administration, home science, family system and society.
- Engineering & technological sciences including indigenization and innovations
- Social and political systems including messages from economics in ancient India
- Rural development, rural economy, rural technologies and *Bharatiya arthashastra*
- Health sciences including AYUSH, naturopathy, complementary and integrated systems of medicines, ethno pharmacology and health sciences
- *Ganitha, Jyothisha* and *Jyothishya shastra*
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- Philosophy, Spiritual, Vedic, Bhakti, *Janapada* and *Vachana* sciences
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- IKS based solutions for modern day challenges

Journal contents / Types of papers:

- Editorial
- Letters to Editor
- Invited papers
- Original research papers
- Research based travelogues, reports & case studies
- Review papers
- Research questions
- Recommendations, Reviews & Opinions

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Contents

Editorial

It is heartening to bring out a novel journal in the area of Indian Knowledge Systems. The journal is novel in several aspects.

- Firstly the journal is multi-lingual with a vision to publish articles from any vernacular languages along with English. However, currently the Editorial Board is ready only for Tamil, Kannada, Hindi, Sanskrit, Telugu and English, and hence are accepting only these languages. However in due course, as the Editorial Team is expanded, we would consider other vernacular languages.
- The Journal accepts hand written copies from those learned people who are really unable to put the articles in soft form.
- Further, the journal accepts hand written copies which are written close to format of the journal and publish the scanned copies of the same. This has its own impact. Imagine the difference in publishing a letter written Gandhi in his own handwriting, and publishing the typed contents of the letter.
- Furthermore, the journal provides free writing assistance to highly knowledgeable or experienced persons who do not know reading and writing. The idea behind this is bringing 'their' knowledge to limelight.
- The journal hardly has any financial transactions between authors, readers and publishers, and is published only with a motive of promoting Indian Knowledge System, of course, objectively. However, there is an idea to support research scholars through a 'token of appreciation'; for those who have carried out 'original research', and offered for publication here. Hard copies are priced only considering the production cost.
- The review is by two categories of reviewers, one is by a team of domain experts, and the other by non-domain enthusiasts. At this point, it is worth noting that, without prejudice to IKS, the journal also accepts non-positive research results. However, the results and methodology should be well discussed.
- Many researchers will have research ideas, but due to several constraints would not be able to carry out research, and would be enthusiastic that somebody does the research on these ideas. In this context the journal also publishes "Research Questions". These research questions, to be published should provide explanation on the hypothesis and explanations on the possible way and facilities, methodology to carry out the research.
- Although journal reserves the copyright of the articles, it is only to avoid duplication of work in other media or a commercial publishing activity on the article. Authors are free to distribute 'in toto', the pdf of the articles which will be provided to the authors.
- The journal/articles can be downloaded free of cost from the journal website (purnam.vercel.app)

It is a nice experience in bringing out the journal, and a number of domain experts, the academicians from various premier institutes have joined hands for this socially relevant cause.

The journal solicits support of one and all for this cause by:

- providing service through identifying good researchers and motivating them to submit articles for the journal
- identifying 'unorganized' knowledgeable individuals whose knowledge is worth to be shared to the society
- providing paper writing assistance
- identifying team members for various vernacular languages in various domains
- introducing the journal to potential readers

and last but not the least……

- giving frank suggestions and feedback about the journal

The journal is free for writers and for readers. Looking forward for your support. Any suggestions and intellectual contributions are welcome. The journal acknowledges one and all who have supported in bringing out the journal.

In service of Profession, and Humanity at large…..
Sarvae bhavantu sukhinaha
(May all beings be happy)
-Editor

... ಪೂರ್ಣಮ್ പൂർണ പൂര്ണമ് ପୂର୍ଣମ୍ ପୂର୍ଣମ୍ ਪੂਰ੍ਣਮ੍ பூர்ணம் పూర్ణమ్ پوُرنم ...

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The first paper…..

Salutations to you! Oh Vakrathunda!!

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Abstract

This paper gives a scientific interpretation of the traditional shloka, "Vakrathunda Mahakaaya Kotisurya Samaprabha Nirvignam Kurumedeva Sarva Karyeshu Sarvada," transforming its philosophical essence into a framework of physical principles. The analysis identifies parallels between the imagery in the verse and key concepts in physics, particularly those related to light, energy, and the cosmos.

The paper further explains why Vakrathunda is invoked/remembered in the beginning of auspicious occasions, and thus why this journal also starts with salutations to Vakrathunda. Finally the paper concludes with a message highlighting the importance of learning shlokas.

Keywords: *Shlokas*, light, electromagnetic emissions, *Vakrathunda, Pratah smaraniya*

1. Introduction

Today, education is largely through information which is majorly in prose form. However, in the past most information/explanations were passed on in poetic form. One of the poetic forms of passing on the information/explanations is through "*shlokas*". Almost all sciences and technologies, traditionally were explained in the form of shlokas; may it be engineering, medical sciences, social sciences, chemical sciences, physical sciences etc.

This article is about the well-known *shloka*, which goes as follows:

"Vakrathunda mahakaaya kotisurya samaprabha |
Nirvignam kurumedeva sarva karyeshu sarvada ||"

The above *shloka* is widely known for its devotional significance, often recited as an invocation for auspicious beginnings. However, beyond its spiritual connotations, this verse can be interpreted as a profound metaphor encapsulating fundamental principles of physics. This reinterpretation highlights how shlokas can align with modern scientific understanding.

2. The Scientific Interpretation

An attempt for a scientific interpretation is given here.

Vakrathunda: Curved Motion of Particles

The term '*Vakra'* translates to 'curved,' and '*Thunda'* (or its phonetic equivalent in Kannada, 'Thundu') refers to a 'piece' or 'particle.' Together, '*Vakrathunda'* can be interpreted as 'particles moving along a curved/wavy path.'

In physics, this description is same as the behaviour of light. Light, though described as traveling in straight lines, comprises photons that exhibit wave-particle duality. The wave nature of light involves oscillatory (curved) motion. Thus, 'Vakrathunda' metaphorically describes the wavelike motion of light particles, encapsulating the duality of light as both particle and wave.

Mahakaaya: Vast Volume of Light

"Mahakaaya" translates to "huge body" or "large volume." This term can be associated with the vast spatial extent occupied by the sun's light in the solar system. The volume occupied by the sun's light is something which is the biggest volume in the entire solar system. Hence, the above shloka refers to "sun's light" which occupies huge volume, as Mahakaaya.

Kotisurya: Millions of Suns

'*Koti'* refers to 'crores' (tens of millions), and 'Surya' denotes 'sun.' Together, '*Kotisurya'* signifies 'millions of suns.' This phrase resonates with the astrophysical reality of our universe, where the Milky Way alone contains billions of stars. Each of these stars is akin to a sun, with many hosting their own planetary systems. The verse anticipates the vast scale and multitude of stellar systems in the cosmos.

Samaprabha: Similarity in Light Emissions of Stars

'*Prabha*' means 'light' or 'radiance,' and '*Sama*' signifies 'similar'. 'Samaprabha' can be interpreted as 'light emitted in a similar manner.' This means that the electromagnetic, in particular, here, the photonic emission is a phenomenon common to all of the millions of suns (stars) in the universe.

Nirvignam: Continuous Emission

The term '*Nirvignam'* means 'continuously', 'without interruption." In the context of the sun, it symbolizes the continuous emission of energy. The sun's nuclear fusion processes ensure a steady output of light and heat, which sustains life on Earth. Even during the night, sunlight continues to illuminate the opposite hemisphere of the planet. This uninterrupted energy flow underscores the sun's pivotal role as the solar system's primary energy source.

Kurumedeva: Panchabhutas and Energy Flow

"Deva' is often associated with the five classical elements (Panchabhutas): earth, water, fire, air, and ether. 'Kurumedeva' signifies the role of these elements in sustaining life and facilitating processes within the solar system.

Sarva Karyeshu Sarvada: Primary Energy Source for all works

The phrase '*Sarva karyeshu sarvada'* translates to '*all works at all times.'* In a scientific context, it emphasizes that sunlight is the primary source of energy for all activities within the solar system. The energy from sunlight drives the dynamics of these elements, from photosynthesis in plants to the water cycle and atmospheric movements. Sunlight is thus the fundamental force orchestrating the balance of the *panchabhutas*. Further, from fuelling biological processes to driving climatic and geological phenomena, solar energy underpins every aspect of existence on Earth. This universality highlights the centrality of the sun in sustaining the intricate web of life and planetary systems. Thus, the energy required to do any work is directly or indirectly given by the sun, since, sun is the primordial source of energy for all activities of the solar system; virtually all work being done by the sun (using sun's energy)

3. Summary

Overall, this *shloka* explains as follows: The sun's light which contains particles moving in the form of

wave is the primary source of energy of the solar system. The volume occupied by the sun's light is huge, and there being millions of stars, all of them give light to their solar system which is the primordial source of energy for all activities of the respective solar systems.

Thus this shloka serves as a poetic encapsulation of profound scientific truths. It describes light's wavelike nature, the vast influence of solar radiation, the multiplicity of stellar systems, and the sun's role as the ultimate energy source. By reinterpreting this ancient verse through the lens of modern physics, we uncover a harmonious convergence of traditional wisdom and scientific understanding.

4. Regards to you! Oh Vakrathunda!!

When individuals achieve extraordinary contributions to society, they are remembered and honoured. Even after their passing, their legacy often endures, and their birthdays serve as occasions for collective remembrance. On these days, people praise their achievements and express their gratitude for the impactful work they have accomplished. Further, some are regarded as *'pratah smaraniya';* meaning the person is worth to be remember everyday upon wakeup. That would have been the footprints left by such a person in the society.

In similar lines, the sun, as the ultimate source of energy and an indispensable element of nature, deserves such honour (1. Although sun doesn't expect; and 2. It is with an attitude of expression our thankfulness). Acknowledging the sun's significance as an essential and inexhaustible source of energy, it is fitting to convey our respects to this vital aspect of nature. Among learned circles, it is customary to invoke this recognition at the outset of many programs, often symbolized through the invocation of "Vakrathunda." This practice underscores the universal importance of the sun as a life-giving force.

What is more to be understood is that this *shloka* is not about Hinduism as it is believed to be, but some explanation of the phenomenon of the universe, and hence it is worth to be appreciated by one and all in the universe with no barricades of gender caste, creed, color, country, language or any other kind of discriminations, for that matter, and thus universal (*sarvadeshik*, *sarvakalik*, and *sarvatrik*) phenomenon.

Thus, in its first volume, Pūrṇam presents this as its first article, portraying the knowledge of an important phenomenon of the universe; and Indian Knowledge Systems is also to do something which is largely universal in nature and visualized by SAINTists.

5. Concluding with a message

Shlokas are not just words praising some deity. They could be praising too; but beyond that, traditionally, most information/knowledge were passed on through the poetic form. They are easy to be learnt by heart at young age; and as the intellect grows with the person, one day the science of the same could be understood which gives significant knowledge. Teaching children *shlokas* at very young age by making them learn by heart serves a greater purpose as against the current learning by heart of rhymes like that of "Pussy Cat Pussy Cat……", "Jack and Jill went up to the hill" etc.

Further, like Vakrathunda, even deities or puranic characters are personifications/representations/ explanations/allegory of some form of activity of universe or physiological activity or spiritual or principles of working of universe or some form of knowledge for that matter, which are scientific and universal in nature.

Attempts to understand *shlokas* or traditional texts keeping the above points in mind and conducting *shloka* learning classes are worth taking tasks to promote Indian Knowledge Systems.

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Patrons' opening message

Nurturing IKS

D.K.Hari, D.K.Hema Hari

[Founders, Bharath Gyan, Patrons: Pūrṇam]

Background

The term IKS for Indian Knowledge System is soon becoming a Buzz word in India in both academic circles as well as traditional circles. It is something that many who have an Indic interest have been aspiring for, since ages.

It is finally here, thanks to the push given by the Government of New India.

But what are the various facets associated with IKS?

How is it relevant in modern times?

How can it reach all?

This article is a probe into the world of IKS to discover and understand where we stand today with regards to IKS and what is required from all of us to get to where

"IKS becomes a part of Us."

IKS – Its Facets

The buzz word for this new India is IKS aka India Knowledge System. If, many millennia ago it was Veda, which stood for the compendium of knowledge, for the years to come, it is going to be IKS which encompasses knowledge of all forms, from all regions, in all formats and for all purposes, from across all over India, through the times.

This IKS has multiple facets to it ranging from being viewed as

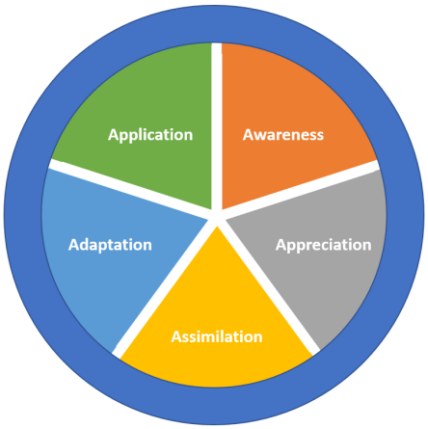
- the knowledge for an Individual's personal growth to
- the knowledge for a Nation / Civilization's development to

- the knowledge for Humanity for sustenance of mankind and the world around.

Stages of IKS

IKS could be divided into five stages, represented by a wheel from A to A. Standing where we are today, at the crossroads of Modernity and Tradition, if we look at IKS, we will see that it has to cross the following stages to evolve into a robust system.

1. Awareness to
2. Appreciation to
3. Assimilation to
4. Adaptation to
5. Application.



Wheel of IKS Showing 5 Dimensions And 5 Focus Areas for Nurturing IKS

The Dependencies and Evolution

It all starts with gaining awareness of IKS.

Unless one is aware of IKS, no one is going to take any step towards IKS.

From this Awareness, can grow Appreciation to spend time and effort on IKS.

It is Appreciation that will evoke respect and need for Assimilating IKS into one's knowledgebase and repertoire.

It is only after this stage can the mind start thinking about what to do with this new found but traditional knowledge. It will start finding ways to use it to meet current day situations and that is when Adaptation will start.

This Adaptation will have to then mature into a process and lifestyle, for it to become a wide spread Application for society and Mankind eventually.

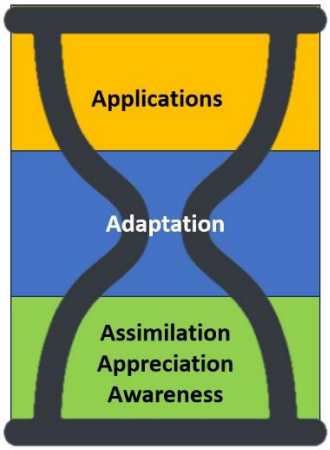
The Impacts on Society

The phenomenon of IKS which has transcended time to come this far, interestingly will also touch people in an hourglass manner.

1. Those dabbling in IKS at the levels of Awareness and Appreciation will be large.

2. Those using and enjoying benefits from Applications of IKS, will also be large.

3. Whereas, those working with IKS to invent, innovate, inspire will be fewer in number.



It will be for each of us to decide where we want to position ourselves with regards to IKS and hence what we want to do with IKS and with ourselves to be there.

Each of these dimensions will thus give rise to its own audiences, will develop its own needs and face its own set of challenges in meeting them. Hence, it cannot be a one size fits all solution or approach towards nurturing IKS.

Larger Goals of IKS

These may be depicted as the 5-fold path towards adoption of IKS as an innate and integrated way of doing things indigenously, not just by Indians but by mankind all over. For, if there is one message that stands out in IKS, it is that of

"Think Global, Act local"

Which manifests in the form of the maxim

Vasudaiva Kutumbakam,

where one lives with one's immediate family but considers the world as one's extended family.

The 5-Fold Pointers Driving The Bharath Gyan Endeavour Across Decades

Potential of IKS

Yoga – A Case In Point

The last few decades of 1900s saw exponential growth of Yoga, fundamentally a part of IKS. It has spread world over. It has entered the vocabulary of most world languages culminating in International Yoga Day being accepted by a record number of over 180 countries in the UN resolution.

From thereon, it has made further strides as an Indian Knowledge shared with the world for its beneficial values.

IKS – The Next Buzz Word

Similarly, IKS over the next few decades and more is poised for a similar exponential growth within India and the world over.

Indian Contributions Through Ages

IKS has shaped the world continuously for millennia in different forms, in the fields of

- Matter and Mind
- Hard and Soft
- Subtle and Gross.

Albeit the waning of the influence of IKS in the couple of centuries due to its repression in India, in Colonial times and post-colonial times, with the dawn of New India, IKS is all poised to rise again to share its benefits with the locals as well as globally for mankind at large.

Nurturing The IKS Wheel of Dependency

For this to happen however, India will have to ensure equal attention to all the different dimensions of IKS, as each feeds the other and supports the other. Attention to the entire chain will ensure that the wheel of IKS can rotate on an even keel and roll in the right direction.

The Knowledge Tree

India has always represented Knowledge in the form of a Big Banyan Tree with all its roots hanging down to represent transfer of knowledge from generation to generation.

But does such a vast Banyan tree stand alone, under the Sun?

Are not its branches home to various kinds of winged beings – allegorical to real, single to pairs, insects to bees?

Does not its wide spread foliage offer shade to various animals, from the innocuous frog to large quadrapeds?

Do not its roots go wide and deep underground in search of water pockets?

Is it any wonder than Man has also found this tree ideal to sit under, in bliss?

Each of these beings benefitting from the Big Banyan tree denotes a beautiful aspect of the traditional Indian Knowledge System which is what we chose to represent on the cover of our online book on IKS and development of such an associated ecosystem. Available for a more detailed read online at https://bharathgyan.com/mb-iks-atoa/ .

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Portraying the attempts of scholars and scientists……..

…….. to understand the contributions of Bharatiya Heritage and SAINTists

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Invited article

Vedic Analysis Of Photoelectric Effect

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Abstract

This paper is about light. The paper ponders around the theories of light and various aspects that are discussed about light with reference traditional literature, and modern works in the area. The paper starts with the discussion on definition of light, colour, radiations of a variety of bodies with parallel discussions on their explanation in traditional literature.

Keywords: Photons, magnetic field, colour, black bodies, radiation

What is light?

Light is NOT the same as the electromagnetic radiation, but is a small segment of the electromagnetic spectrum that is reflected from an object and reaches our eyes to make the object ocularly measurable (आलोकः - आङ् + लोक् - लोकृँ दर्शने). If an object is heated sufficiently and it becomes red hot, it doesn't emit LIGHT at the red end of the visible spectrum (thermal radiation). Photon is not the light quanta, but the tip of the locus of the intersection line of electric and magnetic fields.

The universe is electromagnetic in nature (अग्नीषोमात्मकं जगत्) – the hot electric part (अग्निम्) that flows from high to low concentration and the cool magnetic part (सोम) that confines everything to form structure (पिण्ड). All particles have this property. In solids, these are in a confined and compact state (निबिडावयव). In currents, it flows from high concentration to low concentration (तरलावयव). In space, it spreads out (विरलावयव). When the radiation spreads within a confined area, it makes the exterior parts of other particles facing the observer "visible" through transition of states (रजसा उद्घाटितम्). That is light (प्रकाश – प्र उत्कर्षे केन - क देहे - अश्यते व्याप्यतेऽत्र - अशूँ व्यांप्तौ सङ्घाते चं - आधारे घञ्). While the interior of a room looks lighted, space is dark (not visible), even though electromagnetic radiation is present there also.

What is colour?

Colour is neither a property of the object nor of radiation emitted by a body (तेजः - तेजयति तेज्यतेऽनेन वा । तिजँ निशाने - तीक्ष्णीकरणे -

शारीराग्निसम्भूतपदार्थविशेषः). It has no independent existence either, as it ceases to be emitted when the body emitting radiation ceases to exist (आश्रयविनाशादेव विनश्यतीति). What we see is not colour, but form (रूपम्). Some object to be visible, it must fulfil three conditions. The object must have a specific form (रूपवत्त्व). It must have spread (विस्तार - dimensions) beyond the mesons (महत्त्व – त्राणुक – hadron onwards). There must be multiple objects present (अनेकद्रव्यवत्त्व).

When the emitted radiation hits an object, some of it are absorbed or deflected. The wavelengths of such reflected radiation vary for different objects. The changes in these reflected radiations reaching our eyes,

appear different (सर्वकार्यद्रव्येषु कारणगुणपूर्वकम्) due to the obstruction or absorption or deflection (द्रव्याद्युपलम्भकम् - like X-rays produce visible fluorescence in crystals). The spread of different wavelengths is described as different colours (वर्णँ वर्णक्रियाविस्तारगुणवत्नेषुं). We can't describe an object fully solely based on the radiation emitted by it (अनवर्णे इमे भूमी). The object we hold is not the same as what we see. What we hold is the object's mass that reflects radiation. But what we see is the radiation emitted by the object in our direction only and not the object proper. Both are different.

Measurement is a comparison between similars, one of which is the unit. Since our eyes emit radiation (तेजः), the different wavelengths received are measured only by our eyes that have this property (तेजस्त्वाभिसम्बन्धात्तेजः - नयनसहकारि) and the results appear as colours (शुक्लाद्यनेकप्रकारम्). Measurement returns scalar quantities, with fixed, but different values. Those values are the different colours. Depending upon the nature of radiation in our eyes, the capability of seeing different colours is determined for different species.

Black (कृष्ण) is not the same as dark (अन्धकारः or ध्वान्तम्). Total absence of any radiation is dark (अन्धकारः - अन्धमन्धकवत् करोति, अन्धँ दृष्ट्युपघाते – तेजःसामान्याभावः). Where there is no motion except sound, it is called dark (ध्वान्तम् - ध्वनँ शब्दें + ध्वान्तमस्त्यस्य अच् । ध्वनित). But the absence of the visible spectrum only is black (कृष्ण - कृषँ विलेखंने + नक् । कृषिर्भूवाचकः शब्दः णश्च निर्वृतिवाचकः । कर्षति आत्मसात् करोति अथवा कर्षति सर्व्वान् स्वकुक्षौ । कर्षणात् कृष्णः), just like the totality of the visible spectrum is white, which symbolizes purity (शुक्ल – शुच + लक्, कुत्वम्, शुच् पूतीभावे, पूयते स्म येनेति).
Heating a red-hot object further causes the colour to change from red to yellow, white, and blue, as it emits radiation at increasingly shorter wavelengths (higher frequencies). A perfect emitter is NOT a perfect absorber. The Sun is a perfect emitter that emits at all wave-lengths. A black hole (ऋक्षविल) is a perfect absorber, which absorbs all radiation. When an object is cold, it doesn't look black - ice is not black. Temperature is NOT directly related to colour, which is related to the wavelength of emitted radiation that reaches our eyes. If the eye is defective, colour may change. Incidentally, the interior of a black hole is NOT hot, but cold. Otherwise, it can't have a strong magnetic field that it has. A black body can be hot.

Classification of bodies based on emission pattern.

There are no separate laws for quantum physics. The macro and the micro worlds share the same set of physical laws (यद्ब्रह्माण्डे तत्पिण्डे). Every object in the universe is at motion (गच्छतीति जगत्). Rest is the mutual cancellation of different forces acting on a body. From a body at rest, if one force is removed, it will continue to be in motion. The magnitude of the forces acting on a body at quantum level is too small. Thus, they are perpetually in motion – within the confinement (like the quarks) or outside their confinement (like electrons). This is described as probabilistic nature of their position.

Electromagnetism is not uniquely quantum, but is a universal phenomenon. All matter at temperatures above absolute zero emit radiation, which represents a redistribution of its external energy like changing clothes (यथा वासः शरीरगम्) following the exclusion principle (स्थानावरोध), or a crystal getting the colour of a flower placed near it (उपाश्रित - यथा स्फटिके लालिमा). This way, we get electricity, when electrons are redistributed. At quantum scales, it is called the weak nuclear interaction (beta decay part). Objects float on water due to this principle (यथाप्सु नौस्तृणं काष्ठम्) – by acquiring buoyancy - a secondary base (उपाश्रित). Matters absorb electromagnetic radiation to some degree and become visible by their emitted radiation. Hence, we can see black bodies, but not black holes.

Object which absorbs ALL radiation falling on it, at ALL wavelengths, are called black holes (ऋक्षविल – literally, bear pits – that are surrounded by a high fence to prevent the inside bear to move out). Such a body doesn't emit any radiation. The so-called Hawking radiation is a myth and has never been detected. Only when black holes collapse (like a neutron transforms into proton etc.), they emit radiation. Neutron stars are detected from the emission of electromagnetic radiation as radio waves and other radiation. Those observed from their emitted pulses, are called pulsars. Since around 1900

AD, black holes were not known to the West, the scientists were confused.

There are five types of bodies based on emission pattern (ज्योतिः – emission - ज्युङ्ऽ गतौ, that lights up - द्युतँ दीप्तौ): The first categories are self-luminous bodies like stars and galaxies that reveal other objects by their emission (आदित्यज्योतिः or स्वज्योतिः). The second are bodies like Moon that reveal other bodies by their reflected emission (चन्द्रमाज्योतिः or परज्योतिः). The third are bodies like objects on Earth that reveal themselves by other emissions, but cannot reveal other bodies (अग्निज्योतिः or रूपज्योतिः). The fourth are bodies that do not emit at all like black holes (वाग् ज्योतिः or अज्योतिः) or space itself. The fifth are conscious functions (आत्मगुण) leading to revelation of objects through our senses (आत्मज्योतिः or ज्ञानज्योतिः) based on memory and recollection (स्मृतिप्रत्यभिज्ञानहेतुर्भवति).

The black-body radiation belongs to the third category – that are revealed by their emissions, but do not reveal other bodies by that emission (रूपज्योतिः). When the description of black-body itself is wrong, the Wien's displacement law, Stefan-Boltzmann law and the Rayleigh-Jeans law are wrong application of different principles.

Action theory.

Each action is momentary and discreet (भूतभावोद्भवकरो विसर्गः कर्मसंज्ञित – the discharge that reveals inherent properties of objects is called action - the duration of a moment may vary) and follows the sequence: -

• Action (क्रिया) starts due to weight, fluidity, application of force or contact with something (गुरुत्वद्रवत्वप्रयत्नसंयोगजत्वं).
• This leads to decoupling of the particle in which action starts from the space occupied by it or from other substances (क्रियातो विभागः).
• Such decoupling leads to cessation of its previous position or from other substances (विभागात् पूर्वसंयोगः नाशः).
• This leads to coupling with the adjacent space (ततो उत्तरसंयोगः) in a continuum of positions.

An action ends with work done (कार्यविरोधि कर्म). This makes it one quantum (पारिमाण्डल्य) – now known as Planck's constant h. Then the next action starts due to inertia (प्रथमक्रियानाशः → द्वितीयक्रियोत्पत्तिः). This sequence is treated as the universal characteristic of action or work done at one time. What is seen as continuous action is not one action, but a series of actions (hence hv). All motions are in waves only (तिरश्चीनो विततो रश्मिरेषाम्) because there is no void and everything moves ahead by shifting sideways like pushing through a crowd. The more energetic you are relative to the medium (frequency), the less will be your displacement (wave-length) while moving forward. Because of our inability to differentiate between the particle and its motion due to scale factor, we confuse it as wave-particle duality. Wave function has no physical meaning.

Propagation of energy.

Energy is ever mobile and generates inertia (पूर्वपूर्वसंस्कारमपेक्षमाणादुत्तरोत्तरस्मात् प्रत्ययात्) unless it is confined or absorbed. It always requires a medium (अधिष्ठानम्). While heat is energy that moves from a center outward, temperature is a measure of the average of such energy in circulation with reference to some standard value, expressed according to a comparative scale and measured by touch (स्पर्शाधिष्ठानभूतः). With the increase in a body's temperature, atoms or molecules vibrate increasingly depending upon the nature of the medium, transferring the motion from one part of the system to another due to inertia. The vibrational energy - its heat content - makes the medium relatively hotter or colder.

Heat flows through solids (compact - निबिडावयव), liquids (loose - तरलावयव) and gases (rare - विरलावयव) through conduction (ध्रुब), convection (धर्त्र) and radiation (धरुण). Thus, the nature of the medium through which heat is transferred becomes important. When the heat moves from its place (अङ्गति ऊर्द्ध्वं गच्छति) not to return (निर्भुज), it is called Agnim (अग्निम्). When heat moves from its place (प्रतृण) while not being separated from the source (न दीयते खण्ड्यते), it is called Aaditya (आदित्य). When it is in an in-between state (उभयमन्तरेण) – moves both ways (वाति) – it is called Vaayu (वायुः).

A so-called blackbody can be at a uniform temperature only under special conditions. A black body is said to absorbs all incident radiation regardless of wavelength or temperature, and re-emits the absorbed energy at the same rate. It is natural. Imagine a cup of tea. Once the cup is full, the amount of tea you pour in will equal the amount of tea going out irrespective of temperature or height from which the tea is being poured. All along the cup remains full and excess tea goes out. Since energy flows through a medium (उपाश्रित), it behaves like a fluid (schools refer to water pipes while explaining electricity).

Einstein's statement:

In his 1905 paper "On a Heuristic Point of View about the Creation and Conversion of Light",

Einstein said something unintelligible and senseless as follows:

"Electricity is the flow of electrons from high concentration to low concentration in the same or a conducive medium. But radiation is different. It doesn't require a specific medium to propagate. When a stone is exposed to summer sunlight, it gradually heats up, but not infinitely. Does the electric current (as different from conductors or its effect on other particles), behave similarly? No – it passes on the excess energy to less dense regions. Unlike conduction or radiation, current behaves like a fluid to redistribute itself both ways and requires a base.

Wien's displacement law gives a relationship between the wavelength of thermal radiation and the temperature at which a blackbody emits the radiation. Stefan-Boltzmann law states how much the amount of radiation is emitted by a black body per unit area. Rayleigh-Jeans law gives the intensity of radiation released by a black body. All these are related to radiation and not current, which flows differently through a suitable base. Hence, this is wrong application of the rule. Photoelectric effect is the ejection pattern of electrons from a metal plate when ultraviolet radiation shines on two metal electrodes with a voltage applied across them. In such cases, the relation between radiation and electricity (hence photoelectric) shows electrically charged "particles" are emitted from a metal surface. The emission pattern is affected not by the intensity of light, but by the frequency of light.

Separating facts from fiction:

When two fields intersect, the intersection is a straight line. When electric and magnetic fields intersect, the intersection is a straight line. If the fields move in a direction perpendicular to both, it forms the locus of this straight line. The tip of this line is called the photon. The speed of photon depends upon the density of the medium".

We have seen a blacksmith using a big hammer, while a goldsmith using small tools to deflate the metals. The hammer will deflate the soft gold too much to be useless. The small tools, even if used in large numbers (intensity), will not be effective for the relatively hard iron. The same principle applies in photo-electric effect. Earlier, it has been explained that action takes place in a discreet manner using some energy. The minimum time taken by the smallest possible particle to leave its position and move to the adjacent position is called a moment (क्षण). Time is the infinite sequence of such momenta (क्षण आनन्तर्यात्मा).

The quantity of energy used to move the smallest particle for one moment (time taken by a quark to leave its position and move to the adjacent position) is now known as the Planck's constant. Hence, the dimension of Planck's constant (h) is the product of energy multiplied by time – a quantity called action. It is called *Paarimandalya* (पारिमाण्डल्य) in Vedas, which is the extent of a quark (परमाणु). Thus, the Planck's constant is defined as the elementary quantum of action. At higher frequencies (more kinetic energy), the unit of action gets multiplied (hence hv). Also, increase in the density of the medium increases the resistance to the motion. This has to be deducted from the total work done - energy required for the electron to escape the metal ($Ek = hf - \phi$). This is the work function. The rest are fiction.

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Integrating Ancient Iron-Making Techniques with Modern Technologies: A Path Towards Sustainability

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Abstract

This study bridges the gap between traditional ancient iron-making techniques and modern technologies, uncovering the significant potential of this integration to enhance efficiency and resilience in contemporary metallurgical practices. The findings provide a framework for sustainable and innovative applications in modern society by revitalising the indigenous knowledge of ancient iron production. The rich heritage of ancient Indian iron production techniques, particularly Bloomery and Wootz steel production, offers invaluable insights into sustainable metallurgical practices. These methods demonstrate resource efficiency and environmental consciousness, aligning with modern sustainability goals. This paper emphasizes the importance of reviving and adapting these traditional techniques, highlighting their historical significance and relevance in today's world. The elemental composition of ancient iron was determined by incorporating analytical techniques, including metallography and chemical composition analysis. The sample contained C: 0.12- 0.14%, P: 0.065-0.08%, S: 0.06-0.07%, Ni: 0.02-0.03%, Cu: 0.02-0.025%, Si: 0.02-0.025%, and Mn: 0.0018-0.0022%. The microstructure consisted of about 70-75% Ferrite and 25-30% Perlite, with a VHN hardness of 153.7Hv achieved under testing conditions of a 2 kg iron burden and 3.0 hours of dwell time. The research suggests several strategies for educational initiatives and modern adaptations, like renewable energy use, are suggested to preserve and enhance these techniques for future generations. This paper highlights the transformative potential of combining ancient iron-making knowledge with emerging technologies to address modern challenges. This approach fosters innovation while preserving cultural heritage by leveraging the scientific and historical insights of ancient techniques. The integration of these methods offers a sustainable pathway for the metallurgical industry, ensuring their relevance and adaptability in the 21st century.

Keywords: Indigenous technologies, agriculture, sustainability, India, modern methods, Ancient Ironmaking, Ancient Metallurgical Practices, Bloomery Furnace, Low-grade Iron Ore, Sustainable practices

1. Introduction

Iron-making has been essential to human progress, shaping the tools, structures, and innovations that have defined civilizations. Among the many metallurgical traditions worldwide, ancient Indian iron-making stands out for its remarkable ingenuity and sustainability. Techniques like Bloomery and Wootz steel production are not just historical achievements—they are a testament to our ancestors' advanced knowledge and resourcefulness.

Today, as we face challenges like depleting resources, climate change, and the urgent need for sustainable industrial practices, these ancient methods hold valuable lessons. Their efficient use of resources and minimal environmental impact make them more relevant than ever. Reviving and adapting these traditional techniques could offer modern industries a sustainable and innovative way forward.

This study explores how we can blend past wisdom with today's technologies. Using advanced tools like metallography and chemical analysis, we've delved into the secrets of ancient Indian iron-making to uncover its unique properties and potential. The goal isn't just to preserve these techniques and reimagine them for modern applications—making them more efficient, resilient, and aligned with today's sustainability goals.

But this isn't just about science and technology. It's also about honouring our heritage and recognizing the ingenuity of the people who laid the foundations of metallurgical knowledge. By understanding their work and building upon it, we can create a bridge between the past and the future—one that's rooted in respect, collaboration, and innovation.
This paper shares our journey of discovery, highlights the findings that emerged from our investigations, and offers recommendations for bringing these time-tested methods into the modern era. It's a story of blending tradition with innovation and finding sustainable solutions by learning from those who came before us.

Ancient Indian iron production techniques are renowned for their ingenuity and effectiveness, having produced high-quality iron and steel products long before the advent of modern metallurgical processes[1]. The bloomery process and Wootz steel production are two prominent examples of these ancient methods. These techniques demonstrate advanced metallurgical knowledge and offer sustainable practices that are highly relevant in today's quest for eco-friendly industrial processes [2].

1.1 Research Objectives

This paper explores the historical significance of these techniques, proposes strategies for their revitalisation and adaptation, and highlights their potential contributions to modern sustainable practices. Through a comprehensive analysis of historical texts, archaeological findings, and experimental archaeology, this paper aims to shed light on the fascinating world of ancient Indian iron production. By understanding the intricate processes involved in bloomery iron smelting and the unique methods used to create Wootz steel, we can gain valuable insights into the innovative thinking of ancient metallurgists[3]. Furthermore, by drawing parallels between these traditional techniques and modern sustainable practices, we can explore ways to incorporate ancient wisdom into contemporary efforts to reduce our environmental impact. Ultimately, this research seeks to bridge the gap between the past and the present, offering a fresh perspective on how ancient Indian iron production techniques can inspire a more sustainable future [4]. The study's flow chart is given in Fig.1 showing the study's progress.

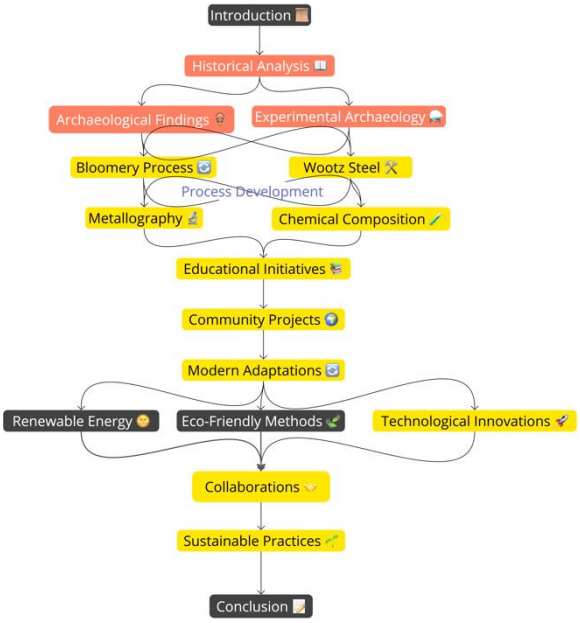

Fig. 1: The flowchart illustrating the sequential advancement of the study.

1.2 The Bloomery Process

The bloomery process, an ancient method for producing iron, directly reduced iron ore into a spongy mass known as a bloom. This bloom was then hammered to remove impurities and consolidate the iron, resulting in wrought iron. The bloomery process was significant for its simplicity and effectiveness in small-scale iron production. Ancient Indian blacksmiths mastered this technique, producing tools and weapons highly valued for their quality and craftsmanship. The bloomery process played a crucial role in ancient Indian metallurgy, showcasing the skill and innovation of Indian artisans in iron production [5,6].

1.3 Wootz Steel

Wootz steel, known for its high carbon content and distinctive patterns, marked a major advancement in ancient Indian metallurgy. The production process included melting iron with precise amounts of carbonaceous materials in a crucible, followed by controlled cooling to produce ingots. These ingots were then expertly forged into various items known for their exceptional strength and durability. The exceptional properties of Wootz steel resulted in high demand, especially in the Middle East and Europe [7].

2. Methods

This iron-making process involves several steps and relies on basic principles of reducing iron ore. A detailed technical diagram of the ancient iron-making procedure is shown in Fig. 2.

2.1 Materials Needed

• Limonite: It is a combination of minerals generally yellow-brown to black in colour and mostly in the form of hydrated iron oxide-hydroxides, such as goethite [FeO(OH)], lepidocrocite [γ-FeO(OH)], and hematite (Fe2O3). In this research, a low-grade ore (45 – 48% Fe) was used, which we obtained from the Netarhat region near the Bishunpur block in Lohardegga, near to Ranchi in Jharkhand.

• Chromite: With a chemical formula of FeCr2O4, it consists largely of iron and chromium oxides, with dark brown in colour.

• Charcoal: It acts as both fuel and reducing agent.

2.2 Charcoal Preparation

Traditionally, wood charcoal was produced in close proximity to a water supply by first being ignited in an open heap and then being quenched with water to finish the process. After that, it was covered with both sand and green leaves in order to keep air from getting in. It was the following day that the charcoal was collected.

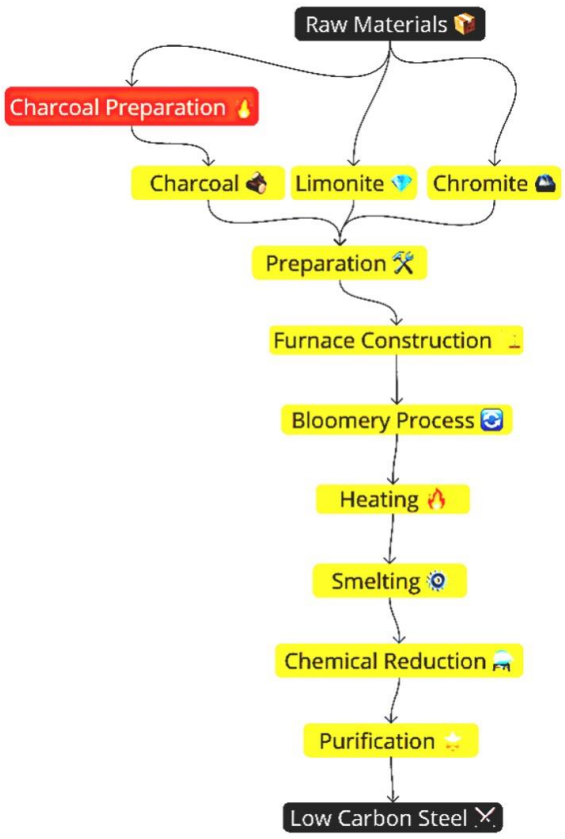

Fig. 2: A technical diagram showing the procedure for producing ancient low-carbon steel.

The group of people who were involved in the process of developing ancient iron is depicted in Fig. 3.

Fig. 3: Harup Village, Bishunpur Block, Lohardagga district, close to Ranchi, in the state of Jharkhand, is home to a team that is assisting the National Institute of Technology Jamshedpur in the development of an ancient iron process.

2.2 Structure of Bloomery Furnace

2.2.1 Furnace Shaft

Clay, stone, or a combination of the two materials used in its construction. It is often slightly conical and gradually narrows as it approaches the top. The diameter ranges from approximately half a metre to one metre, and the height can vary, although it is often between one and two metres. Clay was used to line the interior walls of the construction in order to provide insulation and shield it from a significant amount of heat. The replica of the furnace that was constructed at NIT Jamshedpur is depicted in Fig. 4.

2.2.2 Tuyere

In order to keep the temperature of the combustion process at a high level, a pipe or nozzle blows air into the boiler. In most cases, it is constructed out of clay, and in order to endure heat and corrosion, it is sometimes strengthened with metal. It is placed into the furnace at an angle, often between 15 and 30 centimetres above the base. Because of the tilt, the airflow is more effectively directed towards the mixture of charcoal and ore.

2.2.3 Air Blower

The blower makes maintaining the high temperatures required for iron smelting possible, which is an essential component. In order to ensure that there is a continuous flow of air entering the furnace through the tuyer, it is electronically operated. Because of this airflow, charcoal is
able to be burned effectively, which in turn transforms iron ore into a form of iron that can be used. Additionally, the smelting process is considerably improved in terms of quality and efficiency.

2.2.4 Slag Removal System

Slag is a glassy by-product of the smelting process, and there is a second opening near the base specifically designed to remove slag. By doing so, slag collection inside the furnace is prevented, which is beneficial because it might potentially hinder the reduction process.

The newly constructed bloomery furnace is depicted in Fig. 4. , which has dimensions of 80 centimetres in length, 12 centimetres in inner diameter, and 50 centimetres in outer diameter.

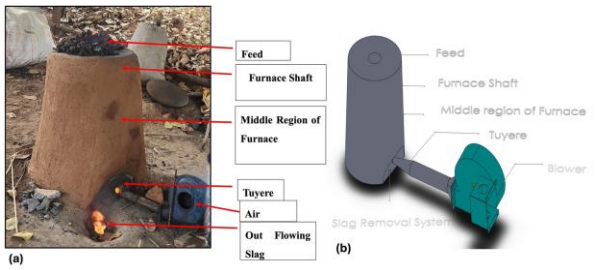

Fig. 4: An example of (a) a bloomery furnace that was recently built at NIT Jamshedpur and (b) Schematic diagram of the furnace.

2.3 Furnace Design

2.3.1 Upper Part of the Furnace

Charcoal and ore are fed into the furnace through the upper part of the furnace. The gas exits and burns through a large aperture at the top of the furnace. The top gas burning is a sign that the furnace is operating.

2.3.2 Middle Section of the Furnace

The middle section of the furnace, also known as the furnace shaft, becomes narrower for the solid expansion that occurs throughout the heating process. At around forty to fifty centimetres from the furnace top, it lies as an intermediate area. The ore and the charcoal are both heated at the same time in the central area of the furnace. In the lower region of the furnace, this results in the ore being more malleable and is followed by the formation of a solid mass consisting of iron and slag.

2.3.3 Bottom Part of the Furnace

A stone and clay wall that is able to withstand heat provides the foundation for this bloomery, which also features a chimney. At the bottom of the boiler, there is a vent for air intake, and two vents for slag removal. A tin pipe, which is also referred to as a tuyere in some circles, is used to connect the air blower to the air intake vent, as shown in Fig. 4. The hand-operated blower maintains a sufficient speed to enable air to reach the top of the furnace, which in turn ensures that the combustion process within the furnace is good. A larger surface area has been added to the lower section of the furnace to accommodate the feed weight.

Figure 5: Heating furnace used for forging operations.

In the ancient method of producing iron, the furnace design considerably impacts the material that is ultimately produced. The furnace design, including the shape and construction materials (clay, soil etc.), ensures that high temperatures necessary for smelting are maintained. The tuyere and air blower design regulate the airflow into the furnace, ensuring optimal combustion of charcoal and efficient reduction of iron ore. Proper airflow leads to higher temperatures and better-quality iron. Further, the furnace design also includes a slag removal system to extract impurities during smelting. Effective slag removal ensures that the iron is of higher purity and has better mechanical properties. The ancient furnace design promotes efficient chemical reactions between the iron ore and the charcoal. The reduction reaction is more complete, resulting in a higher yield of quality iron. Therefore, the design of the furnace plays a critical role in determining the quality and characteristics of the final iron product, and the ancient iron-making furnaces are the basis for selecting such furnace design.

2.4 Chemical Reduction

The furnace was heated, resulting in a bed of red-hot charcoal. The furnace was then replenished with iron ore and extra charcoal. A chemical reduction process occurred. The oxygen in the ore is mixed with the carbon in the charcoal to produce carbon monoxide. Carbon monoxide removed oxygen from the iron ore, leaving only iron.

Initial Reduction of Iron Ore:

$$Fe2O_3+3CO \rightarrow 2Fe+3CO_2$$

Combustion of Charcoal: $C + O_2 \rightarrow CO_2$

Formation of Carbon Monoxide: $CO_2 + C \rightarrow 2CO$

2.5 Purification

During the purifying process, the bloom is heated and hammered multiple times. The primary goal of this process is to remove pollutants from the bloom, particularly slag (Fig. 5). This procedure involves several steps.

2.5.1 Heating:

Forging requires a unique forge that uses two air blowers and charcoal generated from dried Saal

wood. In this process, the bloom is heated to a red-hot temperature. This heating phase is critical because it decarburizes the bloom by removing excess carbon and making it more flexible.

Decarburization Reaction:
$Fe(C) + CO_2 \rightarrow Fe + 2CO$

2.5.2 Hot Forging:

The bloom is hammered once it has achieved the desired temperature. Hammering can help separate the slag and sponge iron. Because slag is less dense than iron, it separates and is removed with the force of a hammer. The hot forging process also eliminates other impurities, such as carbon and phosphorus. Furthermore, certain slag particles are impinged during the forging process.

2.6 Final Product: Low Carbon Steel

During the heating and forging cycle, about 1.1 kg of slag was separated from 1.7 kg of bloom, which took approximately an hour. Low-iron steel is produced by continuously heating and forging the material, effectively reducing the slag content. The resulting product is both strong and flexible due to its high iron concentration and low carbon content. The low-carbon steel is then further processed through hammering to shape it into various products such as bars, sheets, or structural components. This versatile material is widely utilized in agriculture for its exceptional strength-to-weight ratio and durability. The production of low-carbon steel is a vital step in the ancient iron-making process, ensuring the creation of high-quality and reliable products with a wide range of applications.

3. Results and Discussion

The low-carbon steel developed from the ancient iron-making technique is shown in Fig. 6. The dimensions of the sample were 19.1 X 3.1 X 1.1 cm^3, with a weight of 500 gm and a density of 7.89g/cm^3. The optical microstructure of the low-carbon steel is shown in Fig. 7. The microstructure consists of ferrite (α) and perlite (P). Fine perlite in the microstructure can contribute to improved mechanical properties, such as increased strength and hardness, due to its refined structure. Additionally, fine perlite can enhance the toughness and ductility of the material, making it more resistant to fracture and deformation. The refined perlite microstructure exhibits enhanced resistance to coarsening when subjected to high temperatures or extended periods of use, hence guaranteeing the stability of the alloy's mechanical properties. Preserving this microstructural stability is essential for upholding the intended performance of the alloy in applications that include high temperatures or demanding conditions [8].

Fig. 6: The low-carbon steel sample produced from an ancient iron-making technique.

The microstructure of low carbon iron steel consisted of 70-75% ferrite and 25-30% perlite phase. The chemical composition of low carbon steel was found from spark emission spectroscopy and given in Table 1.

Table 1: Chemical composition of low carbon steel obtained from spark emission spectroscopy.

Elements	Carbon	Phosphorus	Sulphur	Nickel	Copper	Silicon	Manganese
Composition (%)	0.12 - 0.14	0.065 - 0.080	0.06 – 0.07	0.02 – 0.03	0.020 – 0.025	0.020 – 0.025	0.0018 – 0.0022

Phosphorus enhanced the strength of iron and steel in ancient times. The material gained strength and hardness but a drop in ductility and impact toughness. It was discovered that including phosphorus in the range of 0.04-0.12% enhances historical steels' resistance spot welding properties. Phosphorous enhances the ability of low-carbon steels to resist atmospheric corrosion, particularly when combined with copper (Cu). It is deliberately included in the steel to enhance its strength, machinability, and resistance to atmospheric corrosion.

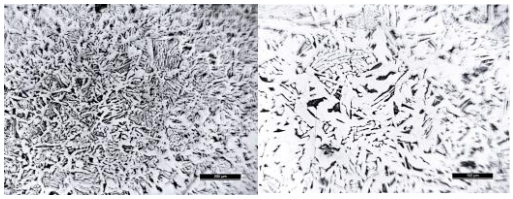

Fig. 7: Optical microstructures of low (on the left) and high magnification (on the right) of low-carbon steel obtained from the ancient iron-making technique. The microstructure consists of ferrite (a) and perlite (P). Both ferrite and perlite are marked on the left microstructure. Fine perlite islands are observed in the microstructure.

Ancient iron and steel commonly had substantial quantities of phosphorus due to the frequent use of phosphorus-rich "bog iron" and regular ores. Although ancient smiths lacked a complete understanding of the function of phosphorus, they acquired the ability to manipulate it and occasionally incorporated it intentionally [9]. The results of VHN hardness data are shown in Table 2. The parameters used in this test were a dwell time of 10 seconds at a load of 2Kgs.

The Vickers hardness of 0.14% carbon steel falls within the intermediate range compared to other carbon steel grades. It is harder than low-carbon steels but softer than high-carbon steels. The precise hardness value depends upon the steel's specific heat treatment and microstructure. Examination of ancient Indian iron and steel artefacts has uncovered

the existence of phosphorus in different forms, such as phosphate compounds. These compounds have the ability to improve resistance to corrosion by creating protective oxide layers. The phosphorus level significantly impacts the chemistry and microstructure of ancient Indian iron and steel. To summarise, phosphorus had a significant role as an alloying element in ancient iron and steel. Its impact varied depending on the application and the amount of phosphorus present, with both positive and negative effects. From ancient times, Smiths discovered methods to exploit the characteristics of steels containing phosphorus [10].

Strategies for Revitalization and Adaptation:

Preserving the traditional knowledge and techniques of ancient Indian iron and steel production is crucial for adapting them to modern applications. Updating the design of traditional furnaces can improve energy efficiency and economic viability, making these methods more relevant to current needs. Involving local communities, especially tribal and rural populations, in the revival process empowers them and helps safeguard cultural heritage. Furthermore, conducting research and development to understand ancient processes and explore innovative techniques is essential. These approaches can pave the way for sustainable iron and steel production methods. Skill development and training programs are instrumental in transferring traditional knowledge and skills to future generations, ensuring the preservation and continuity of these ancient techniques. In addition to reviving traditional iron and steel production methods, it is essential to integrate these practices with modern technology and scientific advancements. This fusion can lead to the development of hybrid approaches that combine the best of both worlds, ensuring efficiency, quality, and sustainability in the production processes. Collaboration between experts in metallurgy, archaeology, engineering, and other relevant fields can provide valuable insights and expertise for enhancing traditional techniques with innovative solutions.

Establishing partnerships between academia, industry, government agencies, and local communities can create a conducive environment for knowledge exchange, resource sharing, and capacity building. This collaborative effort can help address the challenges faced in reviving ancient iron and steel production methods, such as limited resources, environmental concerns, and market competitiveness. By leveraging collective expertise and resources, stakeholders can work together to develop holistic strategies for preserving, revitalizing, and promoting traditional iron and steel production practices for the benefit of present and future generations.

Integrating Ancient Techniques with Modern Technologies:

There is the potential for modern iron and steel production to incorporate renewable energy sources, such as bio char derived from sustainable forestry, as an alternative to the conventional use of charcoal. This reduces reliance on fossil fuels and carbon emissions, conforming to methods that have been around for centuries. It is possible to simulate the heat conditions obtained in ancient furnaces by using solar concentrators to deliver the high temperatures necessary for smelting. This provides a source of energy that is both sustainable and environmentally beneficial. In order to assist the development of improved alloys with desirable qualities, the utilisation of modern metallurgical analysis techniques such as scanning electron microscopy and energy-dispersive X-ray spectroscopy can be utilised to investigate the microstructure and composition of ancient iron. It is possible to optimise furnace designs based on ancient concepts through the use of computational fluid dynamics and thermodynamic simulations. This will increase efficiency and the ability to scale up production to meet modern demands. The utilisation of low-grade ores, reduced waste, and improved resource efficiency are all possible outcomes of modern technology that can combine old practices. Beneficiation and pelletizing are two examples of methods that can be coupled with bloomery processes to improve output and quality significantly. A path that leads to metallurgical practices that are sustainable, efficient, and innovative can be found by combining current technologies with old methods of producing iron. Enhancing performance, lowering environmental impact, and preserving cultural heritage are all goals that the iron and steel industry can accomplish by integrating the knowledge gained from old techniques with the accuracy and scalability of modern technology. Not only does this combination breathe new life into ancient expertise, but it also advances the sector towards a more environmentally friendly and technologically advanced future.

Potential Contribution to Modern Sustainable Practices:

Developing the eco-friendly and energy-efficient aspects of ancient Indian iron and steel production techniques offers valuable lessons for establishing sustainable industrial processes. By reviving and adapting these traditional methods, significant strides can be made in environmental conservation, thereby lowering the carbon footprint of the iron and steel industry. The harmonious integration of ancient wisdom with contemporary innovations holds the potential to foster inventive, sustainable, and culturally significant solutions for iron and steel production. Furthermore, advocating for the utilisation of ancient Indian iron and steel production

techniques not only aids in the preservation of cultural heritage but also serves as a means of empowering local communities. This dual benefit underscores the importance of embracing traditional practices in a modern context to concurrently achieve environmental sustainability, cultural preservation, and community empowerment. Embracing a holistic approach that values the knowledge and wisdom passed down through generations can lead to a renaissance in sustain-able industrial practices. By combining ancient techniques with modern technology and scientific advancements, a new paradigm for iron and steel production that is both environmentally friendly and culturally enriching can emerge.

Education and awareness are key in promoting the adoption of traditional Indian iron and steel production methods. By sharing these techniques' historical significance, environmental benefits, and community impacts, stakeholders can be inspired to explore and implement sustainable practices in the industry. Collaborative efforts among researchers, policymakers, industry leaders, and local communities can drive the transition towards a more sustainable iron and steel production future, preserving heritage while embracing innovation. It is possible to improve the quality and efficiency of steel by combining modern scientific methods and technology with these historical ways. This will allow steel to enter the present industrial and consumer markets with more applications, including agricultural tools, artistic value products, and cultural and historical artefacts.

Case Studies on successful integration of ancient techniques in contemporary settings:

In Europe, artisanal ironwork and bloomery iron are both common. It was common practice in Europe during the mediaeval period to employ the bloomery process, which was comparable to the techniques utilised in ancient India. In a number of European nations, there has been a rebound in the production of artisanal iron on a smaller scale through the use of bloomery furnaces. Bloomery furnaces have been restored by historical societies and blacksmiths in nations such as the United Kingdom and Sweden in order to produce iron using methods that have been used for centuries. By preserving cultural heritage and educating the general public about historical metallurgical techniques, these programmes hope to accomplish their goals [11]. Artisans utilise iron produced by bloomery furnaces in producing one-of-a-kind handcrafted products such as knives, tools, and components for ornamental purposes. The historical authenticity and the craftsmanship are highly valued in this specific market niche. The examples shown here demonstrate how historical knowledge may serve as a source of inspiration and boost contemporary iron and steel industry inventions. They establish a concrete connection between the past and the present. The Tatara, a historic Japanese furnace that is used for smelting iron and steel, is famous for generating Tamahagane steel, which is utilised in the production of Japanese swords. In terms of the use of charcoal and natural draft systems, the procedure is comparable to the indigenous Indian methods that were used in the past. In order to gain a better understanding of the qualities of Tamahagane steel, such as its purity and grain structure, researchers and steelmakers in Japan have researched the Tatara process. Applying these insights has improved contemporary steelmaking processes, particularly in creating speciality steels of superior quality that are utilised in producing tools and cutlery [12].

Contemporary steelmakers have been able to reduce carbon emissions and enhance energy efficiency by incorporating the use of charcoal and optimising furnace designs that the Tatara influenced.

4. Conclusion

This study highlights the potential of integrating indigenous knowledge systems with modern technologies in Indian agriculture. By adopting such approaches, policymakers and farmers can address critical food security and sustainability challenges. Future research should explore region-specific strategies to scale this model.

Revitalising and adapting ancient Indian iron production techniques leads to sustainable and innovative metallurgical practices and upholds cultural heritage. Incorporating scientific analysis, educational programs, and community projects helps preserve and improve these traditional methods for present-day applications. Supporting local artisans and integrating modern sustainable approaches ensures these techniques' longevity and economic feasibility. Through technological advancements and collaborations, the rich legacy of ancient Indian iron production is safeguarded, significantly contributing to sustainable industrial practices in the 21st century.

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Pūrṇam

A Journal of Indian Knowledge Systems

Portraying the attempts of scholars and scientists……..

…….. to understand the contributions of Bharatiya Heritage and SAINTists

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Preserving the Essence of Yoga in a Globalized World

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Abstract

Cultural misappropriation in modern Yoga arises when its deep spiritual and cultural roots are stripped away, reducing it to a mere fitness routine or commodity. This paper explores the distinction between misappropriation and appreciation, highlighting the importance of respecting Yoga's Samskrut terminology, sacred symbols, and traditional practices. True cultural appreciation involves sincere engagement, reverence for its origins, and acknowledgment of its Indian context. Misrepresentation and commodification dilute Yoga's essence, while authenticity lies in practicing and teaching with integrity and respect. By addressing these issues mindfully, the Yoga community can preserve its universal values while honouring its cultural heritage.

Keywords: Cultural misappropriation, Modern Yoga, Samskrut, Sanskrit terminology, Traditional practices, Global adaptation of Yoga

1. Introduction

"Cultural Appropriation" or "Cultural Mis-appropriation" in the field of Modern Yoga is a topic that keeps coming up and many write to me about it. When my Guru-Father came to Pondicherry in the late 1960s, he settled permanently, founding the Ananda Ashram initially in town, then at Lawspet and finally, at the Sri Kambaliswamy *Madam*[1]. Ammaji (Smt. Meenakshi Devi Bhavanani) joined him, and this marvellous team started an amazing journey for countless students from all over the world who joined our Yoga family. Growing up in the ashram, I had a lot of exposure to westerners from different parts of the world who stayed to study with my parents for six months, one year and some stayed two years. I saw students who had become teachers taking Yoga back to their parts of the world. They used to write back to Swamiji, to Ammaji and now to me as the present lineage holder and Ashram Acharya.

[1] *Madam*: Proof readers/reviewers of the work found the word Madam too strange here. However, a little research on the issue led us to know that here, the word Madam does not refer to English word Madam, the feminine version of Sir. In the local language of the author *Madam* refers to Mutt (for example, Shankar Mutt). The language does not have the *akshara* ta (ट) but use da (ड); hence the confusing word. Considering this the word is to be read as मठ (Hindi/Sanskrit) or ಮಠ (Kannada) or Mutt (English).
-Editor

Swamiji and Ammaji have talked about it. Now I am talking about it. Over the past five decades, the main common thread was the struggle to share Yoga in its wholistic, cultural context in other parts of the world where this cultural context doesn't exist or is seen as suspect and primitive. When trained, students go home and want to know how to replicate and bring traditional Yoga alive in their environment. Without exception, everybody struggles. They go back where value may not be put on what is valued here. And value may be put on what is not valued here. Students want to keep what they have learnt in the ashram alive when teaching in their own country but the culture and lifestyle is not the same.

In the ashram you get up in the morning, you do an *aarati* and you have deities like Ganesha, Muruga, Lakshmi and Saraswati. You have the Guru. You sit for morning meditation and contemplation. You do hatha Yoga, karma Yoga around the ashram, then Raja Yoga, relaxation and pranayama mid-noon. In the afternoon, there is Yoga Chikitsa, mantra or yantra. In the evening we have *satsanga*, music, *bhajans* and Samskrut. On Sundays at Sri Kambaliswamy *Madam*, students join ceremonies done for the Guru *Parampara*. We work with young children in Yoga, dance and cultural infusion.

Ananda Ashram is definitely not a cookie factory where all cookies come out the same size and shape. Each individual who comes out of the ashram, grows into who they can be, manifests who they are to the best of their ability, and then continues to grow on a trajectory that is the individuals' alone. You are on your own path. There is no comparison. We have seen people's struggles going back to different religious, local, cultural and societal perspectives. Over a long time, we have seen it, although this group has been very organic.

Another side is inorganic development. People come to India for a few weeks, get a Yoga certificate affiliated to some Yoga alliance type of organisation — and many will affiliate you. When they go back, suddenly they are an expert who says, "I studied in India." If you talk, interact and observe them, you wonder if they really were in India or just the body while the "rest of them" was not at all "here". These people take Yoga as a commodity and start selling it. Then they take one of two sides. Both create issues because they have gone to extremes. Yoga lies in balance.

2. Sinister Methodology of misappropriation

The first is when they **remove everything Indian or Sanskrit**. **Sanitized Yoga** is just a fitness regime, **ayoga Yoga**, viyoga Yoga, not Yoga. There is this **misrepresentation** of Yoga either without the Sanskrit or by creating unions. Up-donkey, down-donkey, why not when you have up-dog or down-dog? Sanskrit, the original sound, has a certain vibration that gets altered when you translate it. Take '*adho mukha*' — *adho* means downward + *mukha*, face + *shwana* is dog + *āsana*. In our tradition it's *meru* āsana, the mountain posture. Some call it parvatāsana. Not the dog. To put it in context to see how things have got mutated and mutilated, say the word adhomukhashwanāsana. It has a beautiful poetic melodious vibration and flow. Then it gets translated to downward facing dog. It's as if you are abusing someone. Adhomukhashwanāsana is as if you are blessing them. I have been in conferences and sessions where instructors yell at the top of their voice: "Down-Dog! Up-Dog! Down-Dog! Up-Dog!" Hundreds of participants, just like a dog, are going down and up. It is insulting to the core values of humanity itself.

Samskrut (Sanskrit/Samskruta) is not just a language. **Samskrut is a vibration**. When Yoga terms are used in the Sanskrit, that divine language, known as Samskrut *Bhasha*, has a certain vibration. When I say Yoga, Yoga has a certain vibration. If I just translate it as a union, that word union doesn't have the same vibration that the word Yoga has. When I say *asana*, it has a certain vibration that has, behind that vibration, **infinite meanings and associations**. When I say pose, it doesn't have that. When I say Nataraja, it has infinite connotations. When I say the dancer pose, it has none of those connotations.

The other side is they **glamourize and then use sacred symbols and sacred concepts without understanding** what they are or where they are appropriate. Without realising what the cultural symbolism is, it is put up as show pieces. Tattoos are one case. Or they start a studio decorated with colourful objects they bought in India, like bedsheets and blankets. Ganesha, Durga, Shiva everywhere but no idea what they are. It may be the Gayatri mantra written there.

Om bhurbhuvahswahah, tat saviturvarenyam,
bhargodevasyadhimahi, dhiyoyo nahpracodayate.

Deep, primordial, most important sacred Gayatri is put on the floor. Or a very beautiful image of Ganesha used as a tablecloth. Natarāja is not a statue to be put in your lobby, or just a nice statue picked up someplace for a thousand dollars. Don't think it is exclusive to only what is happening in the west. Cultural misappropriation happens in many Indian five star hotels. You go to any five star hotel in India and in the lobby, they'll have a huge Natarāja that should have been put in a temple and worshipped. Anybody who understands what Natarāja is will get

offended. Symbols that are sacred are being **misused and misrepresented** without an iota of understanding.

3. Importance of a living culture

Culture means a **living tradition** of a society developed so it can grow– culturing. With gardens it's horticulture. With crops, it's agriculture. Working with worms, it's sericulture. In microbiology we do cultures of your blood, semen, urine, or stools to see what microorganisms are growing. Culture means to grow. Every culture, especially ancient culture, has amazing teachings. Asia, India, South America, South Africa, I respect them greatly. India is a living culture. It confuses many Indologists who would like to put India in a box in a museum and study it. There is a **living culture** which is constantly evolving, transforming, and **Yoga is an integral part of this**. You won't see that if you go to five star hotels. People come to India, stay in hotels where they have a "keep fit" gym, have a smart Yoga instructor teach a few asanas in the morning and afternoon and spend the rest of the day sightseeing at the Taj Mahal, Qutub Minar and enjoy Mussoorie. **When you take Yoga out of the culture, you have the body but not the soul.**

4. Differences between cultural appropriation and appreciation

Let's change the way people debate this. **Cultural misappropriation** is when people wear Indian clothes as a trend, to fit into the Yoga scene, or wear a whole set of Rudraksha malas and embellishments like a fancy dress party just to look cool. These are not worn as ornaments in India. Rudraksha and other malas have special meanings, and are used for specific types of practices or effects, are worn or not worn, kept covered and hidden, or allowed to be visible, for different purposes. When something so very sacred, a symbol of renunciation is taken and misappropriated to serve your temporary fancy trend, you have just killed the whole spirit. Wearing a Rudraksha is a great responsibility, something you need to live up to in thought, word and deed.

On the other hand, there is **cultural appreciation**, adoration, love, and respect. A majority of our western students sincerely adore Indian culture and get deep into it. When a westerner loves Indian culture, they realise wearing a sari is an art. Many of our students have mastered it well. They love wearing saris because it feels good. They connect to the Universal Divine Feminine power through it. They are not doing it for Instagram followers.

We Indians here love such people who love our culture and understand it with depth. **Sir John Woodroffe** was one such westerner who came to India. He wrote one of the finest books on tantra, The Serpent Power under the name Arthur Avalon. He fell in love with India, learnt Samskrut and went into the depths of tantric texts. He was a Judge and wore Indian clothes even in the High Court, no matter what fellow judges thought. He became what those teachings were. He loved them so much and we respect it. Nobody in any sense would ever say there is cultural misappropriation by someone like that.

Taking the teachings without credit to the source is also **cultural misappropriation**. In an academic research paper, find out who has done what, collect this information and then write different statements of people who have worked before, put it together and cite them. In the references or bibliography their paper or the book or the chapter is appropriately cited and the context in which their work is used is given. This is academic integrity. Taking somebody's published work and pretending it is one's own without mentioning or citing the name or the reference is academic dishonesty and intellectual property theft. **Same thing with the culture.**

Appropriate means everything is as it should be. When you have respect for the culture, when you use the cultural symbols or cultural context and you give proper reference, you are respecting it, you are quoting it, you are appreciating it and you are using it as it is meant to be used. Then the term is **culturally appropriate Yoga**. **Culturally appropriate Yoga is what we need.** We need to understand it, not take something and then say this is mine and package it. That is the digestion of Yoga. Many people take practices, repackage it, and there's no reference to the source at all or there's a trademark, a copyright on it.

When many of the Yoga masters from India went to the west, instead of standing up for what Yoga is, they modified it to suit whatever agenda would get them an audience. It got diluted into something so far from Yoga that today we are struggling. If you retrace the roots of it, much of the blame rests on some of the great Yoga masters who went to the west. Even people who trained with legitimate masters ended up with this type of total mutation occurring in the name of adaptation.

Studying in India doesn't mean anything. People could have stayed in India for seven years smoking weed. I remember a singer at a festival in Milan who said he had stayed in Varanasi for seven years and studied in the traditional method. He announced he would sing for Shiva. And then he sang, "Sarva mangalamāngalye, Shive savārthasādhike." This is a mantra for Mother Goddess. This guy didn't even understand that the Shive in that stanza refers to the

consort of Shiva that is Shakti. That is misrepresentation and that is what hurts. This is not about someone with a pure heart, respect for the culture, wanting to know more about the culture of Yoga, understanding the fertile Indian culture from which Yoga has sprouted and which is sustaining, nourishing the growth and transformation of Yoga even these days. Someone who wishes to understand the culture, who has humility, love, adoration and appreciation for the culture is valued by anybody who has any brain cells working

5. Is being "Indian" enough?

Many people in the west think that just because they are Indian, or Indian origin, that they can do anything they want and it will be culturally appropriate. Indian five star hotels are doing cultural misappropriation by the way they misuse our sacred symbols. So, what is happening is there is a lot of **misrepresentation** and **misappropriation**. That has to be fought. That has to be pointed out. That has to be brought to the front. And that has to be worked on because it is wrong. It is wrong to take this thousands of years old culture, and just try to sell it as though you are the first one who has invented it. You are not the first one and you will not be the last one also. Because this is timeless, **Santana Dharma is timeless**.

Just because somebody is white doesn't mean cultural misappropriation of Yoga. We have to be very careful because there are huge smear campaigns against legitimate people who love the culture. There are people who love the culture, who adore the culture, who follow the culture, who live Yoga. It boils down to that **age-old duality — us versus them**. This is not a black versus white, or white versus brown or anything like that. This is about whether you are valuing, respecting, using it as it is meant to be used.

My father said that 'everything is there for your use, that Yoga is the science of right use-ness.' **Right-use-ness is righteousness — dharma**. Be in tune with dharma by doing the right thing in the proper context. Then it is culturally appropriate Yoga. When taken out of context, it becomes mis-appropriation. Never think this is about Indian versus non-Indian, white versus brown, white versus black, Hindu versus others. **Sanātana Dharma is a culture that blesses everyone. This is a culture that blesses the pure heart.**

6. Purity of intent is paramount

The most important component for Yoga is a pure heart. If purity, *sauca* is there, Mahārishi Patañjali so beautifully tells us "You stop getting caught up with the other person's body: svaṅgajugupsāparairasaṃsargaḥ." You are not worried whether the other person is white, black, green, blue, pink, tall, short. That doesn't matter because you have elevated yourself in sauca, or purity. You are witnessing the divine manifesting in the other. There is no duality. There is purity. He says: "You then manifest cheerfulness: saumanasya. You start to have one-pointedness: ekāgrya. You start to master the senses: *indriya jaya*; and you become fit to witness the Self: ātmadarśanayogyatvāni ca."

What beautiful teachings Mahārishi Patañjali has given us. It is based on sauca, purity. Are you a visuddhātma, a pure soul? Are you someone who can manifest purity and transcend bodily limitations, bodily hang-ups? By saying you are white, black, tall, skinny, you have six fingers, six toes, one leg, your pancreas, brain or heart doesn't work? When you have transcended the bodily limitations, gone into svaṅgajugupsāparairasaṃsargaḥ, then you connect with each person, each living being as a human being, respecting them for the divine manifest through them. The divine in you is bowing to the divine in them because you have got established in that purity.

So many people have come from other cultures who have understood and respect the Indian culture and context of Yoga. They try to practice, teach and share it with respect. This is **culturally appropriate Yoga**. If somebody is just trying to steal something it is **misappropriation. *Stena* is misappropriation**. You have not earned it and are not worthy for it. When you work on yourself, love it, respect it and value it, at that point you start to become worthy of it. You have the *yogyata*, the worthiness. Just because you are different to someone else, never let anybody say you are misappropriating Yoga. **Misappropriating Yoga comes when credit is not given** to the source, when it is not presented in the context and when the person is not living the teachings and is just showcasing something for the sake of packaging. When culture is used as a packaging tool to sell your body based practice, it is misappropriation

7. Some ideas on moving forward mindfully

I have students who are Indians and non-Indians and find people who love Yoga, who live Yoga, across the globe. **The teachings of Yoga are universal at the highest level.** When we start to come into that spirit of Yoga, let Yoga live with you. Every breath should be a breath of Yoga. Don't worry about barking dogs. As Swami Vivekananda used to say, "The elephant walking through the marketplace, doesn't bother with the barking dogs." Think about this because it is so important. There are always going

to people to criticise you. I have my own share of people who criticise me. They enable me to see a perspective I would not see otherwise. Whenever there is another perspective, acknowledge it. **Listen to it, contemplate it and see whether there is some truth.** Find that truth and try to reflect on it. If change has to come, let it come from within. But not if you are true to Yoga and somebody is criticising just for the sake of marketing or pulling you down because they are jealous. There's a lot of jealousy in Yoga land and the easiest way is point out what someone stands out for then to poke them about it. **Integrity, fidelity and commitment to Yoga is of prime importance**. When you have that and you have love and respect for the culture, it is totally **culturally appropriate Yoga**.

8. Conclusion

I hope that this will enable many of you to take a stand on this. When people are misappropriating it, let us call them out. Let them know. Let us try to help people change for the better. But just because you don't like somebody, if their Yoga studio is the competition down the street, don't misuse this cultural appropriation tag. It is like the #metoo tag being misused. Cultural appropriation is a big problem, but it is also being misused. We have to understand that. Let us get to the root. The root is Yoga. Yoga is universal. Yoga is thriving, nourished by the culture of Sanatana Dharma. Love the culture.

Love Yoga. Live Yoga. And let that manifest in every cell of your existence.

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पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते ||

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Portraying the attempts of scholars and scientists........

.... to understand the contributions of Bharatiya Heritage and SAINTists

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ವಚನ ಸಾಹಿತ್ಯದಲ್ಲಿ ಸಾಮಾಜಿಕ ಸಂವೇದನೆಗಳು

Social Sensations in *Vachana* Literature

ಕನ್ಯಾಕುಮಾರಿ. ಎಸ್ Kanyakumari S

[*ಮಾನವಿಕ ಮತ್ತು ಸಮಾಜ ವಿಜ್ಞಾನ ವಿಭಾಗ, ರಾಮಯ್ಯ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು*-560054
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ಪ್ರಬಂಧದ ಸಾರಲೇಖ:

ಅರಿತು ಮಾಡುವುದು ಕ್ರಿಯೆ, ಅರಿಯದೆ ಮಾಡುವುದು ಕರ್ಮ. "ಕ್ರಿಯೆಯಿಂದ ಸುಜ್ಞಾನ ಸ್ಫುರಿಸುತ್ತದೆ; ಸುಜ್ಞಾನದಿಂದ ವಿಜ್ಞಾನ ವಿಸ್ತರಿಸುತ್ತದೆ", ಎಂಬ ನುಡಿಯಂತೆ ಜ್ಞಾನ ಮತ್ತು ವಿಜ್ಞಾನಗಳು ಮಾನವನ, ಸಮಾಜದ ಅಭಿವೃದ್ಧಿಯ ಸಂಕೇತಗಳಾಗಿಯಷ್ಟೇ ಅಲ್ಲದೆ, ಜ್ಞಾನದಿಂದುದ್ಭವಿಸಿದ ಕ್ರಿಯೆ, ಆಚರಣೆ, ನಡೆ ನುಡಿಗಳು ಮೌಢ್ಯಗಳ ಅಳಿವಿಗೆ ಕಾರಣಗಳಗಿವೆ; ವಿಶ್ವದ ಪ್ರಗತಿಯ ದ್ಯೋತಕಗಳಾಗಿವೆ. ಮಾನವ ಸಮಾಜದ ಉಗಮವಾದಂದಿನಿಂದಲೂ ವಿವಿಧ ಹಂತಗಳಲ್ಲಿ ವಿಶ್ವ ಪ್ರಗತಿಯಲ್ಲಿ ಮುನ್ನಡೆಯುತ್ತಿರುವುದಕ್ಕೆ ಜ್ಞಾನ-ವಿಜ್ಞಾನಗಳು ಅಡಿಗಲ್ಲಾಗಿವೆ. ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಜ್ಞಾನಾಭಿವೃದ್ಧಿಗೆ ಪೂರಕವಾಗಿವೆ. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಸಾಹಿತ್ಯವು ಸಮಾಜಕ್ಕೆ ನೀಡಿರುವ ಕೊಡುಗೆ ಗಮನಾರ್ಹವಾಗಿದೆ.

ಸಾಮಾಜಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಆರ್ಥಿಕ ಅಸಮಾನತೆಗಳನ್ನು ಮಾನವ ಇತಿಹಾಸದುದ್ದಕ್ಕೂ ನೋಡುತ್ತಲೇ ಬಂದಿದ್ದೇವೆ. ಮೌಲ್ಯಗಳು ಕ್ಷೀಣಿಸಿ, ಮೌಢ್ಯ, ಅಸಮಾನತೆಗಳು ಅತಿರೇಕದ ಗತಿಯನ್ನು ತಲುಪಿದಾಗ ಸಾಮಾಜಿಕ ಕ್ರಾಂತಿಗೂ ಕಾರಣಗಳಾಗಿವೆ. ಇಂಥಹ ಒಂದು ಕ್ರಾಂತಿ ಹನ್ನೆರಡನೆ ಶತಮಾನದಲ್ಲಿ ಜನತೆಯನ್ನು ಕ್ರಿಯಾಶೀಲವಾಗಿಸುವ, ಒಗ್ಗೂಡಿಸುವ ಶಕ್ತಿಯಾಗಿ ಗೋಚರವಾಯಿತು. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ವಚನ ಸಾಹಿತ್ಯದ ಪಾತ್ರ ದೊಡ್ಡದು. ವಚನ ಸಾಹಿತ್ಯದ ಮೂಲಕ ಬಸವಾದಿ ಶರಣರ ನೇತೃತ್ವದಲ್ಲಿ ಮಾನವ ಚಿಂತನೆಗಳನ್ನು ವಿಸ್ತರಿಸಿ, ವಿಚಾರ ಪರರನ್ನಾಗಿಸಿ, ವೈಚಾರಿಕ ನಿಲುವುಗಳನ್ನು ರೂಢಿಸಿಕೊಳ್ಳಲು ಸಹಕಾರಿಯಾಯಿತು. "ಜ್ಞಾನದ ಬೆಳಕಿನಿಂದ ಅಜ್ಞಾನದ ಕೇಡು ನೋಡಯ್ಯ" ಎನ್ನುವ ವಚನದಂತೆ ಅರಿವಿನ ನೆಲೆಯಲ್ಲಿ ಸಾಮಾನ್ಯ ಜನರನ್ನು ಸುಜ್ಞಾನಿಗಳನ್ನಾಗಿ ಪರಿವರ್ತಿಸಲು ನಡೆಸಿದ ಅಂದಿನ ಸಂವೇದನಾತ್ಮಕ ಚಿಂತನೆಗಳು ಪ್ರಸ್ತುತ ಸಮಾಜಕ್ಕೆ ನಿದರ್ಶನಗಳಾಗಿವೆ. ವೈಚಾರಿಕ ಹಾಗೂ ವೈಜ್ಞಾನಿಕ ನೆಲೆಯಲ್ಲಿ ಚರ್ಚಿತವಾದ ಈ ಅಂಶಗಳ ಮೇಲೆ ಬೆಳಕು ಚೆಲ್ಲುವುದು ಈ ಲೇಖನದ ಆಶಯವಾಗಿದೆ.

Abstract:

Acting with awareness is action; acting without awareness is karma. As the saying goes, action leads to enlightenment, and enlightenment expands into science. Knowledge and science are not only indicators of human and societal progress but also the practices, rituals, and conduct born out of knowledge have contributed to the eradication of superstitions. They are symbols of global advancement. From the origin of human society, knowledge and science have been the foundation for the different stages of global progress. Literature and culture complement the growth of knowledge. In this context, literature's contribution to society is significant.

Throughout human history, we have witnessed social, cultural, and economic inequalities; and more so, in the current days. When values diminish and superstition and inequality reach extreme levels, they lead to social revolutions. One such revolution emerged in the 12th century as a unifying and mobilizing force for the people. Through the Vachana literature, led by Basavanna and others, human thoughts were expanded, individuals were inspired to become critical thinkers, and rational perspectives were fostered. As stated in the Vachana, "With the light of knowledge, see the harm of ignorance," the empathetic and reflective ideas of that era aimed to transform common people into enlightened individuals, serving as examples for the present society. This article aims to shed light on these aspects, discussed from both rational and scientific perspectives.

ಪೀಠಿಕೆ:

ಕನ್ನಡದ ಮಧ್ಯಕಾಲೀನ ಸಾಹಿತ್ಯವು ಸಾಹಿತ್ಯದ ಇತಿಹಾಸದಲ್ಲಿಯೇ ಕ್ರಾಂತಿಕಾರಕ ಬದಲಾವಣೆಗಳನ್ನು ಹುಟ್ಟು ಹಾಕಿದಂತಹ ಕಾಲ ಎಂದರೆ ತಪ್ಪಾಗಲಾರದು. ಹನ್ನೆರಡನೇ ಶಮಾನದಲ್ಲಿ ವಚನ ಸಾಹಿತ್ಯವು ವೈಚಾರಿಕ ಚಿಂತನೆಗಳ ಅಲೆಯನ್ನು ಹಬ್ಬಿಸಿ, ಸಮಾಜದಲ್ಲಿದ್ದ ಅಂಧಶ್ರದ್ಧೆ, ಅಸಮಾನತೆಗಳ ವಿರುದ್ಧ ಬಂಡೆದ್ದು ಮಾನವೀಯತೆ, ಸಾಮಾಜಿಕ ನ್ಯಾಯವನ್ನು ಸಾರಿದ್ದಲ್ಲದೆ ಅದನ್ನು ಕಾರ್ಯರೂಪಕ್ಕೆ ಇಳಿಸಿತು. ಶರಣರ ವಚನ ಚಳುವಳಿ ಮೂಲಕ ಸಾಮಾಜಿಕ ಜಾಗೃತಿ ಮೂಡಿಸಲು ಯತ್ನಿಸಲಾಯಿತು. ಈ ವಚನ ಚಳುವಳಿಯ ಶಿವಶರಣರ ನುಡಿಗಳೇ ಇಂದು 'ವಚನ ಸಾಹಿತ್ಯ' ಎನ್ನುವ ಪ್ರಕಾರದಲ್ಲಿ ನಮ್ಮ ಮುಂದಿವೆ. ಈ ವಚನಗಳು ಛಂದಸ್ಸು, ಪ್ರಾಸ, ವ್ಯಾಕರಣದ ನಿಯಮಗಳ ಚೌಕಟ್ಟಿಲ್ಲದೆ ಈ ನೆಲದ ಸಾಮಾನ್ಯ ಜನರ ಆಡುಭಾಷೆಯಲ್ಲಿ, ಸೀದಾ ಸಾದಾ ನೇರ ನುಡಿಗಳಲ್ಲಿ ರಚಿತಗೊಂಡು, ಜನಸಾಮಾನ್ಯರ ನಿತ್ಯ ಜೀವನದಲ್ಲಿ ಹಾಸು ಹೊಕ್ಕಾಗಿರುವ ಸೂಕ್ಷ್ಮ ಸಮಸ್ಯೆಗಳ ಎಳೆಗಳನ್ನು ಮಾರ್ಮಿಕವಾಗಿ ತಿಳಿಸಿವೆ.

ವಚನಗಳು ಹಾಗೂ ವಚನಕಾರರ ಬಗೆಗಿನ ನಮ್ಮ ಗ್ರಹಿಕೆಗಳು ಬಹುಪಾಲು ಸಾಹಿತ್ಯಕವಾಗಿವೆ, ಆರಾಧಕ ನಿಲುವುಗಳಿಂದ ಪ್ರೇರಿತವಾಗಿವೆ. "ವಚನ ಸಾಹಿತ್ಯವು ಭಕ್ತಿಮಾರ್ಗವನ್ನಾಗಿಸಿಕೊಂಡು ವೈಚಾರಿಕತೆಯನ್ನು ಹೊಂದಿ ಪ್ರತಿಭಟನೆ-ಪ್ರತಿಕ್ರಿಯೆಗಳು ವ್ಯಕ್ತಿ ಹಾಗೂ ಸಮಷ್ಠಿ ರೂಪದಲ್ಲಿ ಹೊರಬಂದು ಸಾಮಾಜಿಕ ಕಳಕಳಿಯನ್ನು ಧ್ವನಿಸಿತು. ಒಂದು ಕಾಲಘಟ್ಟದಲ್ಲಿ ಇದ್ದ ಅಸಮಾನತೆ-ಮೌಢ್ಯಗಳ ವಿರುದ್ಧ ಕ್ರಾಂತಿಯ ಕಹಳೆ ಮೊಳಗಿಸಿತು." (ಕನ್ನಡ ಸಾಹಿತ್ಯ-ಸಂಸ್ಕೃತಿ ಕೋಶ)

ಹೊಸಯುಗಕ್ಕೆ ನಾಂದಿ ಹಾಡಿದ ಮಧ್ಯಕಾಲೀನ ಸಾಹಿತ್ಯವು ಕಾಯಕದ ಮಹತ್ವ, ಮೌಢ್ಯಗಳ ನಿರ್ಮೂಲನ ಮೊದಲಾದವುಗಳನ್ನು ಕ್ರಾಂತಿಕಾರಕ ಸಾಧನೆಗಳಾಗಿ ಹೊರಗೆಡಹಿತು. ಆ ಸುಸಂದರ್ಭ ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿಯ ಒಂದು ಮಹತ್ತರ ಘಟ್ಟವೇ ಸರಿ. ಈ ವಚನಗಳದ್ದು ಬಹುಷಃ ಇನ್ನಾವ ಭಾರತೀಯ ಭಾಷೆಗೂ ಇಲ್ಲದ ಒಂದು ವಿಶಿಷ್ಟ ರೂಪ. ಅಂತೆಯೇ ವಚನ ಸಾಹಿತ್ಯವು ಹೊಸ ಯುಗದ ಧರ್ಮಪರಂಪರೆಯ ಮೇಲ್ಮೈಗೂ ಕಾರಣವಾಯಿತು. ಬಸವಣ್ಣನವರು ಅನುಸರಿಸಿದ ಕ್ರಾಂತಿಮಾರ್ಗದಲ್ಲಿ ವೈಚಾರಿಕತೆ, ಬೌದ್ಧಿಕತೆ, ವೈಜ್ಞಾನಿಕತೆಗಳು ನಾಸ್ತಿಕ ರೂಪದಲ್ಲಾಗಲಿ, ಸಾಮಾನ್ಯರಿಗೆ ಜಟಿಲವಾಗುವ ಶುದ್ಧಾಂಗ ಜ್ಞಾನರೂಪದಲ್ಲಾಗಲಿ ಅಭಿವ್ಯಕ್ತವಾಗಿರದೇ ಬಸವಣ್ಣನವರ ವಿಚಾರಗಳೆಲ್ಲವು ಪ್ರತಿಯೊಬ್ಬರಿಗೂ ಸಾಧ್ಯವಾಗುವ ಸಹಜ ಕನ್ನಡ ನುಡಿಯಲ್ಲಿ ವಚನಗಳಲ್ಲಿ ಅಭಿವ್ಯಕ್ತವಾದವು. ಇದರ ಪ್ರತಿರೂಪವಾಗಿ ಏಕಕಾಲಕ್ಕೆ ಸಮಾಜಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಸುಧಾರಣೆಗಳು ಸಂಭವಿತವಾದವು ಎಂಬುದು ಅತ್ಯಪೂರ್ವವಾದುದಾಗಿದೆ.

ಈ ಪ್ರಬಂಧದ ಉದ್ದೇಶಗಳು:

ಸಾಮಾಜಿಕ ಸಮಾನತೆಯ ತತ್ವ, ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಚಿಂತನೆಗಳನ್ನು ಅವಲೋಕಿಸುವುದು.

ವಚನ ಸಾಹಿತ್ಯದಲ್ಲಿರುವ ಸಾಮಾಜಿಕ ಸಂವೇದನೆ ವಿಚಾರಗಳನ್ನು ಕುರಿತು ವಿಶ್ಲೇಷಿಸುವುದು.

ವಚನ ಸಾಹಿತ್ಯದ ಕಾಯಕತತ್ವ, ಕರ್ಮಸಿದ್ಧಾಂತಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವುದು.

ವಚನಗಳಲ್ಲಿ ಅಭಿವ್ಯಕ್ತವಾಗಿರುವ ವೈಚಾರಿಕತೆ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಚಿಂತನೆಗಳು ಮತ್ತು ಜೀವನ ಮೌಲ್ಯಗಳಿಗೆ ಮಹತ್ವ ನೀಡಿರುವ ಅಂಶಗಳನ್ನು ಗುರುತಿಸುವುದು.

ಸಮಾನತೆಯ ತತ್ವ, ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನಗೊಳಿಸುವ ಚಿಂತನೆಗಳು:

ಸಾಮಾಜಿಕ ಸಮಾನತೆ ಮತ್ತು ಆರ್ಥಿಕ ಸಮಾನತೆಗಳನ್ನು ಸಾರಿದ ಬಸವಾದಿ ಶರಣರು ಸಮಾಜದಲ್ಲಿದ್ದ ಉಚ್ಚ-ನೀಚ ಶ್ರೇಣಿಕರಣ ಸಂಪ್ರದಾಯಗಳ ವಿರುದ್ಧ ಸಮಾನ ಅವಕಾಶಗಳು ಸಾರ್ವತ್ರಿಕವಾಗುವಂತೆ ಪ್ರತಿಪಾದಿಸಿದರು. ಪ್ರತಿಯೊಬ್ಬರನ್ನು ಗೌರವಿಸುವ ಅಯ್ಯಾ-ಅವ್ವ-ಅಕ್ಕ-ಅಣ್ಣಾ ಎಂಬ ಪದಗಳನ್ನು ವಚನಗಳಲ್ಲಿ ಸಂಬೋಧಿಸಿ, ಜನರ ನಡುವೆ ಗೌರವ ಸಮಾನತೆಯನ್ನು ಹೆಚ್ಚಿಸಿ, "ಅಯ್ಯಾ ಎಂದರೆ ಸ್ವರ್ಗ, ಎಲವೋ ಎಂದರೆ ನರಕ" ಎಂಬ ಬೀಜ ಮಂತ್ರವನ್ನು ಸಾರಿದರು.

ಸಾಮಾಜಿಕ ಅಸಮಾನತೆ, ಸಂಪ್ರದಾಯಕ್ಕೆ ಪ್ರತಿಕ್ರಿಯೆಯಾಗಿ ಬಂದ ವಚನ ಸಾಹಿತ್ಯ ಉಂಟು ಮಾಡಿದ ಅರಿವು ಸಾರ್ವಕಾಲಿಕವಾದುದ್ದು. ಭಾರತೀಯ ಕೆಲ ವರ್ಗಗಳಲ್ಲಿ ಆಚರಣೆಯಲ್ಲಿದ್ದ ಅಂಧಶ್ರದ್ಧೆ, ಕಂದಾಚಾರಗಳ ಜೊತೆಗೆ ಕುಲ-ಜಾತಿ ಮೌಢ್ಯಗಳನ್ನು ಸಮಾಜದಿಂದ ಹೊರಹಾಕಿ ಭಾವೈಕ್ಯತೆಯಿಂದ ಬಾಳಬೇಕೆಂಬ ವಚನಗಳನ್ನು ಭಿತ್ತಿದರು. ಜನರಲ್ಲಿದ್ದ ಅಂಧಾನುಕರಣೆಗಳನ್ನು ಖಂಡಿಸುತ್ತಾ ವಚನಗಳ ಮೂಲಕ ಜಾಗೃತಿ ಮೂಡಿಸುವ ಕ್ರಿಯೆಯನ್ನು ಕಾರ್ಯರೂಪಕ್ಕೆ ತರಲಾಯಿತು. ಆರ್ಥಿಕ ಮೂಲವಾದ ವೃತ್ತಿಗಳಲ್ಲಿದ್ದ ತರತಮ್ಯ ಭಾವನೆಗಳನ್ನು ಕೀಳರಿಮೆಗಳನ್ನು ತೊಡೆದು ಹಾಕಲು ಪ್ರಯತ್ನಿಸಿದರು. ಅದಕ್ಕಾಗಿ ಅನುವಂಶಿಕವಾಗಿದ್ದ ವೃತ್ತಿಗಳನ್ನು ತಮ್ಮ ಹೆಸರಿನಲ್ಲಿ ಅಭಿಮಾನದಿಂದ ಸೇರಿಸಿಕೊಳ್ಳುವ ಪರಿಪಾಠ ಬೆಳೆಸಿದರು. ಎಲ್ಲ ವೃತ್ತಿಗಳು ಸಮಾನವಾದವು, ಮೌಲ್ಯಯುತವಾದವು ಎಂಬ ಭಾವನೆಗಳನ್ನು ಬೆಳೆಸಿದರು. ಕಾಯಕತತ್ವದ ಮೂಲಕ ದುಡಿಮೆಯ ತಾತ್ವಿಕತೆ, ಆರ್ಥಿಕ ಸಮಾನತೆಗಳನ್ನು ತರಲು ಪ್ರಯತ್ನಿಸಿದರು.

'ವ್ಯಕ್ತಿ' ಎಂದರೆ ಸಮಾಜ. ವ್ಯಕ್ತಿಯು ತನ್ನ ತಾನು ಅರಿತುಕೊಂಡರೆ, ಸಮಾಜ ತನಗೆ ತಾನೇ ಸಧೃಡವಾಗುತ್ತದೆ. ಎಂಬ ನಿಲುವುಗಳನ್ನು ತಳೆದಂತಹ ಶರಣರು ಮಾನವ ಕುಲಕ್ಕೆ ಹಿತೈಷಿಯಾದ ಚಿಂತನೆಗಳನ್ನು ಕೇವಲ ನುಡಿಯಲ್ಲಿ ತಾರದೆ ನಡೆದು ತೋರಿ, ಆದರ್ಶಪ್ರಾಯರಾದರು. ಪ್ರತಿಯೊಬ್ಬ ವ್ಯಕ್ತಿಗೂ ತನ್ನತನವೆಂಬುದಿದ್ದು ಆತನ ವಿಶಿಷ್ಟವಾದ ಆಂತರಿಕ ಶಕ್ತಿಯಿಂದ ಒದಗುವಂತಹದ್ದು, ಸಮಾಜದ ಸಕಲ ಜೀವಾತ್ಮರಿಗೂ ಲೇಸಬಯಸಬೇಕೆಂಬುದನ್ನು ಮನಗಂಡು ವ್ಯಕ್ತಿಯ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನಕ್ಕೆ ನಾಂದಿ ಹಾಡಿದರು. ವಚನ ಎಂದರೆ ಪ್ರಮಾಣ ಎಂಬ ಅರ್ಥದಂತೆ ಪ್ರಮಾಣೀಕರಿಸಿದ ಅವರ ಅನುಭವದ ಮಾತುಗಳನ್ನು ಅಭಿವ್ಯಕ್ತಗೊಳಿಸಿ, ಸಾಹಿತ್ಯವಾಗಿ ರೂಪುಗೊಳಿಸಿದರು.

'ಅಂತರಂಗದ ವಿಕಾಸವಾಗದ ಹೊರತು ಮನುಷ್ಯ ಜನ್ಮ ಸಫಲವಾಗದು' ಎಂಬ ಮಾತು ಅಕ್ಷರಷಃ ಸತ್ಯ. ಪ್ರಸ್ತುತ ಸಮಾಜದಲ್ಲಿ ನಾಗರೀಕತೆಯ ಪ್ರಭಾವ, ವಿಜ್ಞಾನ, ತಂತ್ರಜ್ಞಾನಗಳ ಪ್ರಭಾವದಿಂದ ವ್ಯಕ್ತಿಯ ಬಹಿರಂಗದ ಪ್ರಗತಿ ಆಧುನಿಕವಾಗಿದೆಯಾದರೂ ಮೌಲ್ಯಗಳು ನಶಿಸುತ್ತಿರುವುದು ದುರಂತವೇ ಸರಿ, ಆದ್ದರಿಂದ ಸಾರ್ವಕಾಲಿಕ ಮೌಲ್ಯಗಳನ್ನೊಳಗೊಂಡ ಸಾಹಿತ್ಯದ ಮುಖೇನ ಅಂತರಂಗದ ತತ್ವವನ್ನು ವಿಕಾಸಗೊಳಿಸಿಕೊಳ್ಳುವ ಸಂಸ್ಕೃತಿ ಇಂದಿನ ಸಮಾಜಕ್ಕಿದೆ. ಅಂತೆಯೇ ವ್ಯಕ್ತಿಯ ವ್ಯಕ್ತಿತ್ವ ವಿಕಸನದ ಪ್ರಕ್ರಿಯೆಗೆ ಈ ಅಂಶಗಳು ಅಗತ್ಯ ಎಂಬುದನ್ನ ನಮ್ಮ ಪಾರಂಪರಿಕ ವಿಜ್ಞಾನಗಳು ಸಹ ಹೇಳುತ್ತಿವೆ.

ಹುಟ್ಟಿ ಬೆಳೆಯುತ್ತಾ ಪರಾವಲಂಬಿಯಾಗುವ ಮಾನವ ಆಂತರ್ಯದ ಯೋಗ ಜ್ಞಾನದಿಂದ ಮಾನವ ಸ್ವಾವಲಂಬಿಯಾಗುವ ಪರಿಕಲ್ಪನೆ ಅನನ್ಯ. 'ನೀನೊಲಿದಡೆ ಕೊರಡು ಕೊನರುವುದಯ್ಯಾ, ನೀನೊಲಿದೊಡೆ ವಿಷವೆಲ್ಲಾ ಅಮೃತವಾವುದಯ್ಯಾ' ಎಂಬ ವಚನದಲ್ಲಿ ಸಾಂಕೇತಿಕವಾಗಿ ವ್ಯಕ್ತಿಯ ಆಂತರಿಕ ಬೆಳವಣಿಗೆಯ ಮಹತ್ವವನ್ನು ಸೂಚಿಸಲಾದೆ. ಸಾಮಾನ್ಯವಾಗಿ ಹುಟ್ಟಿನಿಂದಲೂ ದೇವರನ್ನು ಅವಲಂಬಿಸಿ ಬದುಕುವ ಮಾನವನಿಗೆ ಬಹಿರಂಗದ ದೇವರು ಕೊರಡನ್ನು ಕೊನರಿಸಬಹುದಾಗಿತ್ತು. ಆದರೆ ಕೊರಡಿನಂತಿರುವ ಕಾಯ ಕೊನರಬೇಕಾದರೆ ವ್ಯಕ್ತಿಯ ಆತ್ಮಸ್ಥೈರ್ಯದ ಅಂತರ್ಯದ ಜ್ಞಾನದ ಮುಖಾಂತರ ಸಾಧ್ಯ ಎಂಬ ತಿಳಿವು ಬರುತ್ತದೆ. ಅಂದರೆ ಅಂತರಂಗದ ಅರಿವಿನಿಂದ ಸ್ವಾವಲಂಬನೆಯನ್ನು ಸಾಧಿಸಬಹುದೆಂಬ ಆಶಯವನ್ನು ವಚನಗಳಲ್ಲಿ ಕಾಣ ಬಹುದಾಗಿದೆ.

ಪ್ರಸ್ತುತದ ವಿಜ್ಞಾನದ ಅವಿಷ್ಕಾರಗಳು (ದೂರವಾಣಿ, ದೂರದರ್ಶನ, ಗಣಕಯಂತ್ರ, ಮೊಬೈಲ್ ಇತ್ಯಾದಿ) ಆಧುನಿಕ ತಂತ್ರಜ್ಞಾನಗಳು ಸಾಧಾರಣ ವ್ಯಕ್ತಿಯ ಕಲ್ಪನೆಗೂ ನಿಲುಕದ ಅದ್ಭುತ ಸಾಧನೆಗಳು. ಆದರೆ ಬಹಿರಂಗದ ಬೆಳವಣಿಗೆಯೊಂದೆ ಮಾನವನ ಗುರಿ ಸಾಧನೆಯಾಗಲಾರದು. ಅಂತರಂಗದ ಬೆಳಣಿಗೆಯಾದಾಗ ಮಾತ್ರ ಪರಿಪೂರ್ಣತೆ ಸಾಧ್ಯ. ಯಾವುದೇ ವಿಚಾರ, ಸಾಹಿತ್ಯ ಧರ್ಮಗಳು ಮಾನವನನ್ನು ಮೌಢ್ಯತೆಯಿಂದ ವೈಚಾರಿಕತೆಯೆಡೆಗೆ, ಅಜ್ಞಾನದಿಂದ ಸುಜ್ಞಾನದೆಡೆಗೆ, ಅಪಕ್ವತೆಯಿಂದ ಪರಿಪಕ್ವತೆಯೆಡೆಗೆ ಕೊಂಡೊಯ್ಯಬೇಕು. ಅಪಕ್ವವಾದ ಚಿಂತನೆಗಳನ್ನು ಮನಸ್ಸು ಸತ್ವಗೊಳಿಸುವಂತಾಗಬೇಕು. ಆಗ ಮನುಷ್ಯ ಪರಿಪೂರ್ಣನಾಗಲು ಸಾಧ್ಯ. ವಚನ ಸಾಹಿತ್ಯವು ಈ ಪರಿಪೂರ್ಣತೆಯೆಡೆಗೆ ಕೊಂಡೊಯ್ಯುವ ವೈಚಾರಿಕತೆಯ ಹೊಸ ಅರ್ಥವನ್ನು ನೀಡುತ್ತದೆ.

ವಚನ ಸಾಹಿತ್ಯದಲ್ಲಿ ಸಾಮಾಜಿಕ ಸಂವೇದನೆಗಳು:

"ಸಾಮಾಜಿಕ ಅರಿವು- ಸಮಾಜದ ಅಭಿವೃದ್ಧಿಯ ಚಿಂತನೆಗೆ ಸಮಾನಾಗಿದೆ" ಆದ್ದರಿಂದಲೇ ವಚನಕಾರರು ಸಮಾಜವನ್ನು, ಪರಿಸರವನ್ನು ತೆರೆದ ಕಣ್ಣಿನಿಂದ ನೋಡಿ ಸಮಾಜದಲ್ಲಿ ಬೇರುಬಿಟ್ಟಿದ್ದ ಕೊಳೆಯನ್ನು ತೊಳೆದು ಆರೋಗ್ಯವಂತ ಸಮಾಜಕ್ಕಾಗಿ ದುಡಿದು, ಇಡೀ ಮಾನವ ಸಮುದಾಯವನ್ನು ಅರಿವಿನ ಚಿಂತನೆಗೆ ತೊಡಗಿಸಿ, ಸಮಾಜದಲ್ಲಿ ತಾಂಡವವಾಡುತ್ತಿದ್ದ ಅಸಮಾನತೆ, ಜಾತಿವ್ಯವಸ್ಥೆ ಡಂಭ, ವರ್ಗಭೇದ ಅನ್ಯಾಯಗಳನ್ನು ನಿರ್ಭೆಡೆಯಿಂದ ಎತ್ತಿ ತೋರಿ ಸಾಮಾಜಿಕ ಅರಿವನ್ನು ಸ್ಥಾಪಿಸುವ ಪ್ರಯತ್ನ ನಡೆಸಿ ಯಶಸ್ವಿಯಾದರು. ಸಾಮಾಜಿಕ ಬದಲಾವಣೆಯ ಅಪಾರವಾದ ಕಾಳಜಿಯೊಂದಿಗೆ ಹೊಸ ಅಲೋಚನೆ ಉತ್ಸಾಹಗಳಿಂದ ಸುಭದ್ರ ಸಮಾಜ ನಿರ್ಮಾಣದ ಕನಸನ್ನು ಕಂಡು ಕಾಯಕದಿಂದಲೇ ಕೈಲಾಸವನ್ನು ಕಂಡುಕೊಂಡಿದ್ದು, ದೇಹವನ್ನೇ ದೇಗುಲವಾಗಿಸಿ, ಅಭಿವ್ಯಕ್ತಿಗಳನ್ನೇ ಅನುಭವ ಮಂಟಪವಾಗಿಸಿ, ಹೆಣ್ಣು-ಗಂಡು ಭೇದಭಾವವಿಲ್ಲದೆ, ಕುಲದ ತಾರತಮ್ಯ ಮಾಡದೆ, 'ಮೌಢ್ಯತೆ'ಗಳನ್ನು ಹೊರಹಾಕಿ, ಹೊಸ ಚಿಂತನೆಗಳನ್ನು ರೂಪಿಸಿ, ಸಮಾಜಕ್ಕೊಂದು 'ಅರಿವಿನ' ಸ್ವರೂಪವನ್ನಿತ್ತ ಆ ಸಂಧರ್ಭ ಇತಿಹಾಸದಲ್ಲಿಯೇ ಮಹತ್ವಪೂರ್ಣವಾದ ಕಾಲ.

"ವ್ಯಕ್ತಿ ಶುದ್ಧನಾಗದೆ ಸಮಾಜ ಶುದ್ಧವಾಗದು" ಎಂದು ನಂಬಿದ್ದ ಬಸವಣ್ಣನವರು ಅಂತರಂಗ ಬಹಿರಂಗ ಶುದ್ಧಿಗಳನ್ನೇ ತಮ್ಮ ಧರ್ಮದ ಜೀವಾಳವನ್ನಾಗಿ ಮಾಡಿಕೊಂಡು ವಚನಗಳನ್ನು ರಚಿಸಿದರು. 'ಕಳಬೇಡ, ಕೊಲಬೇಡ: ಹುಸಿಯನುಡಿಯಲು ಬೇಡ ತನ್ನ ಬಣ್ಣಿಸಬೇಡ, ಇದಿರ ಹಳಿಯಲು ಬೇಡ ಇದೇ ಅಂತರಂಗ ಶುದ್ಧಿ, ಇದೇ ಬಹಿರಂಗ ಶುದ್ಧಿ" (ವಚನ ಸಾರ) ಎನ್ನುವ ಸರಳ ನಡೆಗಳನ್ನು ವ್ಯಕ್ತಿಗತಗೊಳಿಸಿಕೊಳ್ಳುವ ಮಾರ್ಗಗಳನ್ನು ತೋರಿಸಿಕೊಟ್ಟರು.

ಸಮಸಮಾಜದ ನಿರ್ಮಾಣಕ್ಕೆ ನಿಜಶತ್ರುಗಳೆಂದರೆ ಮಾನವನ ನೈತಿಕತೆಗಳ ಅಧಃಪತನ ಹಾಗೂ ಸಾಮಾಜಿಕ ಅಸಮಾನತೆ, ಮೌಢ್ಯಗಳು. ಹಾಗಾಗಿ ಸಾಮಾಜಿಕ ಮೌಢ್ಯ ಹಾಗೂ ದ್ವಂದ್ವಗಳನ್ನು ತೊಡೆದುಹಾಕಲು ಒಂದು ಹೊಸ ಅರಿವಿನ ನೆಲೆಯನ್ನು ವಚನ ಸಾಹಿತ್ಯವು ಸೂಚಿಸುತ್ತದೆ. ಧಾರ್ಮಿಕ ಪ್ರಜ್ಞೆಯ ನೆಲೆಯಿಂದ ನೈತಿಕ ಪ್ರಜ್ಞೆಯ ನೆಲೆಗೆ ವಿವರಣೆಗಳನ್ನು ಪಲ್ಲಟಗೊಳಿಸಿ, ನೈತಿಕ ನಡವಳಿಕೆ ಮೂಲಕ ದೇವರನ್ನು ಸೇರಬಹುದು" ಎಂಬ ಬಸವಣ್ಣನವರ ನುಡಿ-ನಂಬಿಕೆ ಅವರ ವಚನಗಳ ಜೊತೆಗೆ ಆಚರಣೆಗಳಲ್ಲಿ ಅಭಿವ್ಯಕ್ತವಾಗುತ್ತವೆ. "ಆಚಾರವೇ ಸ್ವರ್ಗ, ಅನಾಚಾರವೇ ನರಕ; ಮರ್ತ್ಯ ಲೋಕ, ದೇವಲೋಕ ಬೇರಿಲ್ಲ ಕಾಣಿರೋ;" ಎಂಬ ಸರಳ

ನೀತಿಗಳು ವಚನಗಳ ರೂಪದಲ್ಲಿ ಪ್ರತಿಬಿಂಬಿಸಿ, ಸಾಮಾಜಿಕ ಅರಿವನ್ನು ಮೂಡಿಸುತ್ತವೆ.

ವಚನಕಾರರು ಅಂದಿನ ಸಮಾಜದಲ್ಲಿದ್ದ, **ಸಮಸ್ಯೆಗಳ ಪರಿಹಾರದ** ಕನಸು ಕಂಡಿದ್ದವರು ಸಾಂಸ್ಕೃತಿಕ ಅಂಶಗಳನ್ನೂ ಆಲೋಚಿಸಿದ್ದವರು. ಅವರ ಆಲೋಚನೆಯು ಕೇವಲ ವಿಚಾರ ಸೀಮಿತವಾಗಿರದೆ ಅನುಷ್ಠಾನ ಮುಖಿಯಾಗಿದ್ದವು. ಒಂದೆಡೆವೈಯುಕ್ತಿಕ ತುರ್ತಿನ ಅಭಿವ್ಯಕ್ತಿ, ಮತ್ತೊಂದೆಡೆ ಸಾಮೂಹಿಕ ಜರೂರಿನ ಬಗೆಗಿನ ಚರ್ಚೆ, ಈ ರೀತಿಯಾಗಿ ಸಾಮಾಜಿಕ ಬದಲಾವಣೆಯ ಮಹತ್ವದ ಗುರಿಯನ್ನಿರಿಸಿಕೊಂಡು ರಚಿತವಾದ ವಚನ ಸಾಹಿತ್ಯದ ಚಿಂತನೆಯು ಉತ್ತಮ ಸಮಾಜಿಕ ವ್ಯವಸ್ಥೆಯ ಪರಿಕಲ್ಪನೆಯದ್ದಾಗಿತ್ತು. "ಸಾಮಾಜಿಕ ಬದುಕು ನಂಬಿದ್ದ ಧಾರ್ಮಿಕ ಮೌಲ್ಯಗಳಿಗಿಂತ ಬೇರೆ ರೀತಿಯಲ್ಲಿ ಕಂಡು ಬಂದಂತ ಆಚರಣೆ-ಪದ್ಧತಿಗಳು ಹಾಗೂ ಸಮಾಜದ ದಿಕ್ಕನ್ನು ತಪ್ಪಿಸುವಂತ ಸಮಾಜವನ್ನು ಎಚ್ಚರಿಸುವ, ಬುದ್ಧಿ ಹೇಳುವ ಹೊಸ ಪ್ರಜ್ಞೆ ಮೂಡಿಸುವ, ಮತ್ತು ವಿಮರ್ಶಿಸುವ ಬದಲಾವಣೆಗಳನ್ನು ವಚನಕಾರರು ಪ್ರದರ್ಶಿಸಿದರು.

ಸಮಾಜದಲ್ಲಿ ಅಂದು ವ್ಯಾಪಿಸಿದ್ದ ಕಟ್ಟು ನಿಟ್ಟಾದ ಸಾಮಾಜಿಕ ವ್ಯವಸ್ಥೆಗಳನ್ನು, ಅದನ್ನನುಸರಿಸಿದ ಅಂಧಾಭಿಮಾನಗಳನ್ನು ಶಿಥಿಲಗೊಳಿಸಲು ಬಸವಣ್ಣನವರಂತಹ ವಚನಕಾರರು ಕರ್ಮಸಿದ್ಧಾಂತ ಹಾಗು ಕಾಯಕ ತತ್ವಗಳನ್ನು ಭಿತ್ತಿದರು, 'ಕಾಯಕವೇ ಕೈಲಾಸ' ಎಂಬ ಜೀವನಾದರ್ಶದ ನುಡಿಗಳು ವಚನಗಳಲ್ಲಿ ಪ್ರತಿಬಿಂಬಿಸಿ, ಕಾರ್ಯರೂಪಕ್ಕೆ ತಂದರು. ಅಂದಿನ ಸಮಾಜದಲ್ಲಿ ಕುಲಕಸುಬು ಜಾತಿಯಾಧಾರಿತ ಉದ್ಯೋಗ ವ್ಯವಸ್ಥೆ ಪ್ರಧಾನವಾಗಿದ್ದು, ವೃತ್ತಿ ತಾರತಮ್ಯವಿದ್ದ ಅಸಮಾನತೆಗಳು ಆವರಿಸಿದ್ದವು. ವ್ಯಕ್ತಿ ಸಮಾನತೆಯನ್ನು ಹಾಗೂ ಎಲ್ಲ ವೃತ್ತಿಗಳ ಮಹತ್ವವನ್ನು ಸಮಾಜಕ್ಕೆ ಎತ್ತಿ ತೋರಿಸುವ ಉದ್ದೇಶದಿಂದ 'ಕಾಯಕ' ತತ್ವವನ್ನು ರೂಪಿಸಿ, ಕಾಯಕಮಾಡುವುದು ಕೈಲಾಸಕ್ಕೆ ಸಮಾನವೆಂದು ಹೇಳಲಾಯಿತು. "ಜೀವನಾವಶ್ಯಕ ವೃತ್ತಿಗೆ ಅಧ್ಯಾತ್ಮಿಕ ಲೇಪನವನ್ನು ಮಾಡಿ, ಅದನ್ನೇ 'ಕಾಯಕ' ಎಂಬ ಪರಿಕಲ್ಪನೆಯಾಗಿ ಜನರ ಮುಂದಿಟ್ಟರು" ಅಲ್ಲದೆ ಸಮಾಜದ ಒಳಿತಿಗಾಗಿ ವೈಯುಕ್ತಿಕ ಹಿತಾಸಕ್ತಿಗಳನ್ನು ತೊರೆದು ವರ್ಗಗಳ ಯೋಗಕ್ಷೇಮ ನೋಡಿಕೊಳ್ಳುವ ಜವಾಬ್ದಾರಿ ಸಮಾಜದ್ದೆಂದು ಪರಿಗಣಿಸಿ ಕಾಯಕ ತತ್ವಕ್ಕೆ ಪೂರಕವಾದ 'ದಾಸೋಹ' ಪರಿಕಲ್ಪನೆ ಮುಂದಿಟ್ಟರು.

ವಚನಕಾರರು ಜನಸಾಮಾನ್ಯರಿಗೆ ಕೇವಲ ಆದರ್ಶವಾಗಿ ಉಳಿಯುವ ಮಾತನ್ನು ಹೇಳಲಿಲ್ಲ. ದೈನಂದಿನ ಜೀವನಕ್ಕೆ ಅಗತ್ಯವಾದ ದುಡಿಮೆ ಮತ್ತು ದುಡಿದುದನ್ನು ಹಂಚಿ ತಿನ್ನುವ, ಅಹಂಕಾರವನ್ನು ಕಳೆದುಕೊಂಡು ದಾಸೋಹ ಭಾವದಿಂದ ಸಮಾಜಕ್ಕೆ ಅರ್ಪಿಸುವ ತತ್ವಗಳನ್ನು ಹಾಗು ಇಂದಿನ ಯುಗದಲ್ಲೂ ಸಾಧಿಸಬಹುದಾದ ಮಾರ್ಗಗಳನ್ನು ತಿಳಿಸಿಕೊಟ್ಟರು. ಶ್ರೇಣಿಕೃತ ಸಮಾಜವನ್ನು ಪೋಷಿಸಿದ್ದ 'ಕರ್ಮಸಿದ್ಧಾಂತವನ್ನು ವಿರೋಧಿಸಿ ಕಾಯಕ ಸಿದ್ಧಾಂತವನ್ನು ಪರಿಚಯಿಸಿದರು. ಹುಟ್ಟಿನ ಆಧಾರದ ಮೇಲೆ ನಿಂತಿದ್ದ ಕುಲಕಸುಬು, ಜಾತಿ-ವರ್ಣ ಭೇದ ನಿಯಮಗಳನ್ನು ನಿರಾಕರಿಸಿ, ವ್ಯಕ್ತಿ ಯಾವುದೇ ವೃತ್ತಿಯನ್ನು ಜೀವನ ನಿರ್ವಹಣೆಗಾಗಿ ಆಯ್ದುಕೊಳ್ಳುವ ಕಾಯಕ ತತ್ವವನ್ನು ಅನುಕರಣೆಗೆ ತರಲಾಯಿತು.

ವೈಚಾರಿಕತೆ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಚಿಂತನೆಗಳು:

ವೈಜ್ಞಾನಿಕ ಚಿಂತನೆಗಳನ್ನು ನೆಲೆಗೊಳಿಸಿ ಅವೈಜ್ಞಾನಿಕ ಆಚರಣೆಗಳನ್ನು ಸಮಾಜದಿಂದ ಹೊರಹಾಕುವಲ್ಲಿ ವಚನಕಾರರು ಕೈಗೊಂಡ ಅವಿರತ ಪ್ರಯತ್ನಗಳು ಅವಿಸ್ಮರಣೀಯವಾಗಿವೆ. ಚಲನಶೀಲ ಬದುಕಿನಲ್ಲಿ ಬದಲಾವಣೆ ನಿರಂತರವಾದುದು, ಅದು ಜೀವಂತಿಕೆಯ ಲಕ್ಷಣವು ಹೌದು. ಅಂತೆಯೇ ಸಾಹಿತ್ಯದಲ್ಲಿಯೂ ಕಾಲಕಾಲಕ್ಕೆ ಬದಲಾವಣೆ ನಡೆಯುತ್ತಿರುತ್ತದೆ. ವಚನ ಮಾರ್ಗ ಆರಂಭವಾದಂದಿನಿಂದ ಜನಸಾಮಾನ್ಯರ ಬದುಕಿನ ಬದಲಾವಣೆಗಾಗಿ ಅನೇಕ ದೃಷ್ಟಿಕೋನದಿಂದ ಬದುಕಿನತ್ತ ಮುಖ ಮಾಡಿತು. ಸಮಾಜದಲ್ಲಿ ಕಂಡುಬರುವ ಅವೈಜ್ಞಾನಿಕ ನಂಬಿಕೆಗಳನ್ನು ಗುರುತಿಸಿ ಅವುಗಳನ್ನು ವಚನಗಳಲ್ಲಿ ವೈಜ್ಞಾನಿಕ/ವೈಚಾರಿಕ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ವಿಶ್ಲೇಷಣೆ ಮಾಡಲಾಯಿತು. ಬಸವಾದಿ ಶರಣರು ಸಮಾಜದ ಶೋಧನೆಗೆ ಮುಂದಾಗಿ'ಮೌಢ್ಯತೆ'ಗಳನ್ನು ಹೊರಹಾಕಿ, ಹೊಸ ಚಿಂತನೆಗಳನ್ನು ರೂಪಿಸಿ, ವೈಜ್ಞಾನಿಕವಾಗಿ ವಿಚಾರಮಾಡುವಂತೆ ವಿಚಿಕಿತ್ಸಕ ಬುದ್ಧಿಯನ್ನು ರೂಢಿಸಿಕೊಳುವಂತೆ ಜನರನ್ನು ಪ್ರೇರೆಪಿಸಿದರು. ಮೂಢನಂಬಿಕೆಗಳಿಗೆ ದಾಸರಾಗಿ ತಮ್ಮ ನೆರಳಿಗೇ ತಾವು ಹೆದರುತ್ತಿದ್ದಂತ ಜನರನ್ನು ಕಂಡು ವಚನಕಾರರು- ಅರ್ಥಹೀನ ವಿಚಾರಗಳಿಂದ ಹೊರಬಂದು ವೈಚಾರಿಕತೆ ಬೆಳೆಸಿಕೊಳ್ಳುವಂತೆ ವೈಜ್ಞಾನಿಕವಾಗಿ ವಿಚಾರಮಾಡುವಂತೆ ವಿಚಿಕಿತ್ಸಕ ಬುದ್ಧಿಯನ್ನು ಜನರಲ್ಲಿ ಪ್ರೇರೆಪಿಸಿದರು.

ಪ್ರಸ್ತುತದಲ್ಲಿ ಆಧುನಿಕ ವಿಚಾರಗಳನ್ನಿಟ್ಟುಕೊಂಡು ಮಾಡಿದ ಅವಿಷ್ಕಾರಗಳಿಂದಾದಂತ ನಿಯಮಗಳನ್ನು ಜೀವನದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲಾಗುತ್ತಿದೆ. ನಿತ್ಯ ಜೀವನಕ್ಕೆ ಅಗತ್ಯವಾದ ವೈಜ್ಞಾನಿಕ ವೈಚಾರಿಕ ತುರ್ತು ನಮ್ಮ ಮುಂದಿದೆ. ಎಲ್ಲಾ ವೈಜ್ಞಾನಿಕತೆಗೂ ಪಾಶ್ಚಾತ್ಯ ಪ್ರಭಾವವೆಂದೇ ಅನುಸರಿಸುತ್ತಿರುವ ನಮಗೆ ನಮ್ಮ ಪೂರ್ವಜರ ಜ್ಞಾನದ ಅರಿವೇ ಇರುವುದಿಲ್ಲ. ಸಾಹಿತ್ಯದ ಮೂಲಕ ಒರೆಹಚ್ಚಿದಾಗ ಇಂತಹ ಎಷ್ಟೋ ವೈಜ್ಞಾನಿಕ ಅಂಶಗಳು ಅನುಷ್ಠಾನವಾಗಿ ಅನುಕರಣೆಗಳಾಗಿರುವುದನ್ನು ಕಂಡುಕೊಳ್ಳಬಹುದು. ಅಂತೆಯೇ ಶರಣರು ಆಚರಣೆಗೆ ತಂದಿದ್ದ, ಅನುಕರಿಸಿದ್ದದ್ದ ಎಷ್ಟೋ ವೈಜ್ಞಾನಿಕತೆಯ ಅಂಶಗಳನ್ನು ತಿಳಿಯುವ ಪ್ರಯತ್ನ ಮಾಡಿದಾಗ ಪರಿಸರದ ಅಗತ್ಯತೆ ಅನಿವಾರ್ಯಗಳನ್ನು ಪ್ರಿಯವಾಗುವಂತೆ ವಚನಗಳ ಧಾಟಿಯಲ್ಲಿ ರಚಿಸಿ, ಜನಸಾಮಾನ್ಯರನ್ನು ಎಚ್ಚರಗೊಳಿಸಲು ಮಾಡಿದ ಪ್ರಯತ್ನಗಳು ಗಮನಸೆಳೆಯುತ್ತವೆ. ಕಾಲಮಾನಕ್ಕೆ ತಕ್ಕಂತೆ ಹಲವಾರು ಬದಲಾವಣೆಗಳನ್ನು ಯಾವುದೇ ತೋರಿಕೆಯ ಆರ್ಭಟಗಳಿಲ್ಲದೆ ವಾಸ್ತವಿಕ ನೈಜ ಜೀವನದಲ್ಲಿ ಸಮಾಜದ ಪ್ರಯೋಗಾಲಯದಲ್ಲಿ ಜನಸಾಮಾನ್ಯರಿಗೆ ಕಟ್ಟಿಕೊಟ್ಟಿರುವುದು ಇಲ್ಲಿನ ವಿಶೇಷ.

ವಚನಕಾಲದಲ್ಲಿ ವೈದ್ಯ ಸಂಗಣ್ಣನೆಂಬ ಆಯುರ್ವೇದ ವಿಜ್ಞಾನ ತಿಳಿದಿದ್ದನೆಂಬುದು ಅಲ್ಲದೆ ಅವರ ಮಾತಿನಲ್ಲಿ ವೈದ್ಯ ಎಷ್ಟೇ ಪರಿಣಿತನಾದರು ರೋಗಕ್ಕೆ ಚಿಕಿತ್ಸೆ ಮಾಡುವುದಷ್ಟೇ, ಮರಣಕ್ಕೆ ಔಷದಿ ಕೊಡಲಾರದೆಂಬ ವಿಚಾರಗಳು ವಿಜ್ಞಾನ ಹಾಗೂ ಮನೋವಿಜ್ಞಾನಗಳ ಪ್ರಾಮುಖ್ಯತೆಯನ್ನು ತಿಳಿಸುತ್ತವೆ. ಇವರ ಆಲೋಚನೆಗಳಲ್ಲಿ ಮನೋಬಲಕ್ಕೆ ವೈಚಾರಿಕತೆಯ ಮಾರ್ಗವನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಸೂಚಿಸಿದ್ದಾರೆ. ವಚನಕಾರ ಸಿದ್ಧರಾಮನ ನುಡಿಯಲ್ಲಿರುವಂತೆ "ವ್ಯಾಧಿಗೆ ಔಷಧವ ಕೊಡರಲ್ಲದೆ, ಮರಣಕ್ಕೆ ಔಷಧಿ ಕೊಡುವರಾರು ಇಲ್ಲ" ಎನ್ನುವುದು ಸಾಂಕೇತಿಕವಾಗಿ ವಿಚಾರವಂತಿಕೆಯನ್ನು ಸ್ವ ಪ್ರಯತ್ನದಿಂದ ರೂಢಿಸಿಕೊಳ್ಳಬೇಕು ಎನ್ನುವ ಸಾರ್ವತ್ರಿಕ ಸತ್ಯವಾಗಿದೆ.

"ಸಾಮಾಜಿಕ ಬದುಕು ನಂಬಿದ್ದ ಮೌಲ್ಯಗಳಿಗಿಂತ ಬೇರೆ ರೀತಿಯಲ್ಲಿ ಕಂಡು ಬಂದಂತ ಆಚರಣೆ-ಪದ್ಧತಿಗಳು ಹಾಗೂ ಸಮಾಜದ ದಿಕ್ಕನ್ನು ತಪ್ಪಿಸುವಂತ 'ಮಾಧ್ಯತೆ'ಗಳ ವಿರುದ್ಧ ಸಮಾಜವನ್ನು ಎಚ್ಚರಿಸುವ, ಬುದ್ಧಿ ಹೇಳುವ ಹೊಸ ಪ್ರಜ್ಞೆ ಮೂಡಿಸುವ, ವೈಜ್ಞಾನಿಕ ಚಿಂತನೆಗಳನ್ನು ಹುಟ್ಟುಹಾಕುವಂತಹ ಕಾರ್ಯಗಳು ವಚನ ಸಾಹಿತ್ಯದ ಕಾಲದಲ್ಲಿ ಪ್ರಚಲಿತವಾದವು. ವಿಜ್ಞಾನದೊಂದಿಗೆ ವೈಚಾರಿಕತೆಯನ್ನು ರೂಢಿಸಿಕೊಳ್ಳಲು ಮೌಢ್ಯತೆಗಳನ್ನು ಟೀಕಿಸಿ ಅಲ್ಲಗಳೆದು, ವೈಜ್ಞಾನಿಕತೆ ನೆಲೆಯಲ್ಲಿ ವಿಚಾರವಂತ ಸಮಾಜವನ್ನಾಗಿ ಪರಿವರ್ತಿಸಲು ಕೈಗೊಂಡ ಮಾರ್ಗ ತೋರಿಕೆಯದ್ದಾಗಿರದೇ ನೈಜರೂಪದ್ದಲ್ಲಿದ್ದು ಕ್ರಾಂತಿಯಾಗಿ ರೂಪಗೊಂಡಿದ್ದು ಅವಿಸ್ಮರಣೀಯವಾದದ್ದು. ವಿಜ್ಞಾನದ ಪ್ರಾಯೋಗಿಕ ಬೆಳವಣಿಗೆ ಹೊಸ ಚಿಂತನೆಗಳಿಗೆ, ಅವಿಷ್ಕಾರಗಳಿಗೆ ಹೇಗೆ ಪ್ರೋತ್ಸಾಹ ನೀಡುತ್ತದೆಯೋ ಹಾಗೆಯೇ, ಮಾನವ ಚಂತನೆಗಳನ್ನು ವಿಸ್ತರಿಸಿ ವಿಚಾರಪರರನ್ನಾಗಿ ವೈಚಾರಿಕ ನಿಲುವುಗಳನ್ನು ರೂಢಿಸಿಕೊಳ್ಳಲು, ಕ್ರಿಯಾಶೀಲರನ್ನಾಗಿಸಲು ಸಮಾಜವನ್ನು ಪ್ರಯೋಗಾಲಯವಾಗಿಸಿಕೊಂಡು ರಚಿಸಿದ ವಚನ ಸಾಹಿತ್ಯದ ಸಾರ ಅದ್ಭುತವಾದದ್ದಾಗಿದೆ.

ಫಲಿತಗಳು:

ಆಧುನಿಕತೆ ಎನ್ನುವುದು ಪ್ರಸ್ತುತ ಸ್ಥಿತಿಯಲ್ಲಿ ಕೇವಲ ತಂತ್ರಜ್ಞಾನ ವಿಜ್ಞಾನ ಕ್ಷೇತ್ರಗಳಿಗೆ ಸೀಮಿತವಾಗಿರದೆ ಜನ ಜೀವನದಲ್ಲೂ ಸಾಕಷ್ಟು ಬದಲಾವಣೆಗಳು ಘಟಿಸುವುದಕ್ಕೆ ಕಾರಣವಾಗಿದೆ. ಆಧುನಿಕತೆ ಪ್ರಗತಿಯ ಧ್ಯೋತಕವಾಗಿದೆ ಎನ್ನುವುದು ಸತ್ಯವಾದರೂ, ಪ್ರಗತಿಯ ಹೆಜ್ಜೆಯೆಡೆಗೆ ದಾಪುಗಾಲು ಹಾಕುತ್ತಿರುವ ಪ್ರಸ್ತುತ ಜಗತ್ತಿನಲ್ಲಿ ವೈಜ್ಞಾನಿಕ ಅವಿಷ್ಕಾರಗಳು ಹೊಸ ಹೊಸ ಪ್ರಯೋಗಗಳ ಬರದಲ್ಲಿ ನೈಜತೆ, ನೈತಿಕತೆ, ಸಾಮಾಜಿಕ ಮೌಲ್ಯಗಳು ಗೌಣವಾಗುತ್ತಿರುವ ಚಿತ್ರಗಳು ಗೋಚರಿಸುತ್ತವೆ. ವೈಯುಕ್ತಿಕ ಪ್ರಗತಿಯತ್ತ ಮುಖಮಾಡಿರುವ ವ್ಯಕ್ತಿಯ ಚಂತನೆಗಳ ನಡುವೆ ಸಮಾಜಮುಖಿ ಚಿಂತನೆಗಳು ಕ್ಷೀಣಿಸುತ್ತಿರುವುದನ್ನು ಕಾಣುತ್ತಿದ್ದೇವೆ.

ಈ ಪರಿಣಾಮವಾಗಿ ಅಸೂಯೆ, ದ್ವೇಷ, ಕ್ರೌರ್ಯಗಳು ಸಮಾಜದಲ್ಲಿ ಹೆಚ್ಚುತ್ತಿರುವ ಉದಾಹರಣೆಗಳನ್ನು ಪ್ರತಿನಿತ್ಯವು ಕಾಣುತ್ತಿದ್ದೇವೆ. ಜಾತಿ. ಧರ್ಮಗಳಂತಹ ಅಸಮಧಾನಗಳು ಪುನರುತ್ತರಿಸುತ್ತಿವೆ. ಇಂತಹ ಪ್ರಕ್ಷುಬ್ಧ ಸ್ಥಿತಿಯಲ್ಲಿ ಮಾನವೀಯ ಮೌಲ್ಯಗಳು, ವೈಚಾರಿಕ ಚಿಂತನೆಗಳನ್ನು, ಸಮಾಜಮುಖಿ ಆಲೋಚನೆಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವಂತಹ ವಚನಗಳ ಸಾಹಿತ್ಯದ ಮಾರ್ಗದರ್ಶನ ಪ್ರಸ್ತುತ ಸಮಾಜಕ್ಕೆ ಅತ್ಯಗತ್ಯವಾಗಿದೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ವಚನ ಸಾಹಿತ್ಯದ ಆಶಯವನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವ ಪ್ರಯತ್ನ ಈ ಲೇಖನದಲ್ಲಿ ಮಾಡಲಾಗಿದೆ.

ವಚನಕಾರರು ಸಮಾಜದ ಸ್ವರೂಪದ ಬಗ್ಗೆ ಚಿಂತಿಸಿ, ಸಮಾಜದ ಸರ್ವತೋಮುಖ ಬೆಳವಣಿಗೆಗೆ ಮಾರ್ಗದರ್ಶನಗಳನ್ನು ಹಾಕಿ ಕೊಟ್ಟಿದ್ದಾರೆ. ವಚನ ಸಾಹಿತ್ಯದ ವಿಶಿಷ್ಟತೆ ಎಂದರೆ ಜನಸಾಮಾನ್ಯರನ್ನು ಚಿಂತನಶೀಲರನ್ನಾಗಿ, ವಿಚಾರವಂತರನ್ನಾಗಿಸುವಂತಹದ್ದು, ಇಂಥಹ ಚಿಂತನೆ - ವಿಚಾರಗಳನ್ನೊಳಗೊಂಡ ವಚನ ಸಾಹಿತ್ಯ -ಒಂದು ಧರ್ಮ-ಸಮಾಜ-ಕಾಲ ಅಥವಾ ಶತಮಾನಕ್ಕೆ ಸೀಮಿತವಾದ ಸಾಹಿತ್ಯವಾಗಿರದೆ, ಇಡೀ ಮಾನವ ಕುಲದ ಉದ್ಧಾರ ಬಯಸುವ ಸಾಹಿತ್ಯದ ಕೃಷಿಯಾಗಿದೆ. ಜ್ಞಾನ ದೀವಿಗೆಯಂತೆ ಪ್ರಸ್ತುತಕ್ಕೂ ಮಾದರಿಯಾಗಬಲ್ಲದೆಂಬುದನ್ನು ಅಚನಗಳ ಅಧ್ಯಯನದಲ್ಲಿ ಕಂಡುಕೊಳ್ಳಬಹುದು.

ಸಮಾರೋಪ:

ಓಟ್ಟಾರೆ ಹೇಳುವುದಾದರೆ ಸಮಾಜದ ಸರ್ವತೋಮುಖ ಅಭಿವೃದ್ಧಿಗೆ 'ಜ್ಞಾನ ಮತ್ತು ವಿಜ್ಞಾನ'ಗಳ ತಿಳುವಳಿಕೆ ನಿರಂತರವಾದದ್ದು, ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಆಯಾ ಕಾಲಘಟ್ಟದ ಸಾಹಿತ್ಯದ ಚಿಂತನೆಗಳು ಮತ್ತು ಅನುಭವ ಜ್ಞಾನಗಳು ತಮ್ಮದೆ ಆದ ವಿಶಷ್ಟ ಕೊಡುಗೆಗಳಾಗಿವೆ. ಎಂದರೆ ತಪ್ಪಾಗಲಾರದು. ಆಧುನಿಕ ವಿಜ್ಞಾನ-ತಂತ್ರಜ್ಞಾನ-ಜ್ಞಾನಗಳ ಜೊತೆಗೆ ಸಾಹಿತ್ಯ ಮೂಲವಾದ ಜ್ಞಾನವನ್ನು ಸೇರ್ಪಡಿಸಿಕೊಂಡು ಸಾಮಾಜಿಕ ಪರಿವರ್ತನೆಯ ಮಂತ್ರವನ್ನು ನೆಲೆಯಾಗಿಸಿಕೊಂಡು ವೈಚಾರಿಕತೆಯ ದೃಷ್ಠಿಯಲ್ಲಿ ವಿವೇಚಿಸಿ ಮೌಢ್ಯರಹಿತ ಆಧುನಿಕ ಸಮಾಜವನ್ನು ರೂಪಿಸುವ ಅಂಶಗಳನ್ನು-ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಅವಶ್ಯಕವಾದ ಚಿಂತನೆಗಳನ್ನು ವಚನ ಸಾಹಿತ್ಯವು ನೀಡಿರುವ ಅನುಭವ ಜ್ಞಾನದಿಂದ ಆಯ್ದ ಕೆಲವು ವಿಚಾರಗಳ ಮೂಲಕ ಈ ಲೇಖನದಲ್ಲಿ ಪ್ರಸ್ತುತ ಪಡಿಸಲಾಗಿದೆ.

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

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೨. ನಾರಾಯಣ ಪಿ.ವಿ. ವಚನ ಸಮುಗ. ವಸಂತಪ್ರಕಾಶನ. ೨೦೦೫

೩ ಅನ್ನಧಾನಯ್ಯ ಪುರಾಣಿಕ. ಚನ್ನಬಸವಣ್ಣನು ನಿರೂಪಿಸಿರುವ ಆಚಾರಗಳು. ಬಸವಪಥ. ಬೆಳ್ಳಿಬೆಳಗು. ಬಸವ ಸಮಿತಿ. ೨೦೦೩

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೫. ತಿಪ್ಪೆರುದ್ರಸ್ವಾಮಿ.ಎಚ್. ವಚನ ಸಾಹಿತ್ಯ ವೈಚಾರಿಕ ಅಧ್ಯಯನ. ಪ್ರಸಾರಂಗ. ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ.ಧಾರವಾಡ. ೧೯೮೩

... ಪೂರ್ಣಮ್ પૂર્ણમ പൂർണമ് पूर्णम् ପୂର୍ଣମ୍ পূর্ণম্ பூர்ணம் పూర్ణమ్ ਪੂਰ੍ਣਮ ...

पूर्णमदः पूर्णमिदं पूर्णात् पूर्णमुदच्यते
पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते

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Portraying the attempts of scholars and scientists……..

…….. to understand the contributions of Bharatiya Heritage and SAINTists

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Views of Mahatma Gandhi on Sustainable Development in the Perspective of Indian Knowledge Systems

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Abstract

Since last five decades, there is a growing emphasis on sustainability. In a conference held at New York in 2015, United Nations defined 17 sustainable development goals (SDGs) to be achieved by 2030. Indian Knowledge System encompassed these goals from times immemorial. Mahatma Gandhi attempted to lead his life as per the tenets of Indian Knowledge System, particularly according to Vaishnavite philosophy. A one-line gist on sustainable development is best given by his famous quote: "The Earth has enough resources to meet the needs of all but not enough to satisfy the greed of even one person". This quote, in fact, conveys what the first verse of Ishavasyopanishad says, "All that is in this world is covered by the almighty God; enjoy it with a feeling of sacrifice but do not covet other's wealth".

Through various speeches and actions of Mahatma Gandhi, one can get the clue how one can put into practice the ancient wisdom in modern age. Gandhi was not against technology and using technological gadgets; in fact, he used to always keep a mechanical watch with him. He was also not against industrialization, but his focus was towards industries that we call Micro, Small and Medium Enterprises (MSME) in modern terms. Apart from social, economic and environmental aspects, cultural aspect is also very important in a sustainable development; Mahatma Gandhi used to provide a great importance to culture. The protection of cow and other cattle was an important agenda for him. If Gandhi is studied by filtering his political compulsions, it will be apparent that his concept of sustainable development was a part of Vedic civilization.

Keywords: Gandhian philosophy, Sustainable Development, Vedic civilization, Vaishnavite philosophy.

1. Introduction

The philosophy of sustainable development is deeply rooted in the Indian Knowledge Systems (IKS). A popular mantra in Bruhadaranyaka Upanishad prays to God:

"सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः ।
सर्वे भद्राणि पश्यन्तु मा कश्चिद्दुःखभाग्भवेत् । "

(May all be happy; may all be healthy. May everyone see the good things; no one should suffer.)

Here the rishi prays for the welfare of all, which includes the happiness of all living as well as non-living being. In the Indian concept non-living being things are personified. We treat Earth and rivers as our mothers. A Vedic rishi prays for the peace of living beings as well as environment:

"ॐ द्यौः शांतिरन्तरिक्षं शान्तिः
पृथिवी शान्तिरापः शान्तिरोषधयः शान्तिः ।
वनस्पतयः शांतिर्विश्वेदेवः शांतिर्ब्रह्म शांतिः
सर्वं शांतिः शांतिरेव शांतिः सा मा शांतिरेधि ॥"

(Yajurveda, 36.17)

(O Almighty! May there be peace in the heavens; may there be peace in the space; may there be peace on Earth; may the waters be peaceful; may the plants and herbs be peaceful; may all the vegetation be peaceful; may all the celestial beings bring peace; may the Supreme Being bring peace; may everything in the universe be at peace. Peace alone, peace alone, peace alone. May that supreme peace come to me.)

However, the wishes of Indian rishis could always not be fulfilled due to various reasons in the different part of worlds. Quest to improve standards of living of individuals and societies started the First Industrial Revolution in Europe circa 1750 with the development of steam engines (Dixit et al., 2017). However, the Industrial Revolution brought unsustainable development to the world. Even today the world is facing environmental, social and economic problems. In 1970s, western world faced energy crisis. In 1973, Organization of Arab Petroleum Exporting Countries (OAPEC) led by Saudi Arabia imposed the ban on export of oil to Canada, Japan, Netherlands, United Kingdom and United States (Tache, 2024). The ban was later extended to Portugal, Rhodesia and South Africa. The second oil crisis came in 1979 because of a drop in oil production due to Iranian Revolution. This prompted developed nation to pay attention to sustainable energy source. In 1983, United Nations set up the World Commission on Environment and Development under the Chairpersonship of Gro Harlem Brundtland, former Prime Minister of Norway. In 1987, a report entitled *Our Common Future* was published, which stressed on the necessity of sustainable development (Dixit et al., 2012). It also defined sustainable development as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Several non-governmental organizations started putting their efforts for conserving the flora and fauna of Earth such as The World Wide Fund for Nature (WWF) set up in 1961 (Anyango-van, et al., 2019). The Human Development Report 2007-08 (UNDP, 2007) on the theme "Fighting Climate Change: Human Solidarity in a Divided World" critically examined modern development and argued, "Climate change calls into question the enlightenment principle that human progress will make the future look better than the past." This sentiment underscores a reality that became increasingly apparent in the latter half of the 20th century, when the Industrial Revolution—while driving economic progress—had devastating environmental consequences. The Industrial Revolution, often regarded as a boon for humanity, revealed its darker side as it relentlessly exploited natural resources. In parallel, colonial powers exacerbated the environmental degradation and social disarray by exploiting their colonies without regard to long-term consequences. When these colonial regimes finally withdrew, they left many nations, including India, in a state of severe economic, social, and environmental disrepair (Guha, 2007). The British colonial rule, in particular, drained India's resources and economy, leaving behind a legacy of poverty and systemic challenges, a figurative cold-blooded murder of India's potential for self-sustaining development.

Many apologists would like to comment that the British first introduced the Indians with the world of technology. However, India was already far ahead in technology before the British invasion. History stands as a clear testimony that this land called Bharat was once very rich in economy and ecosystem. Indian economy shared 27% of world gross domestic product (GDP) in 1750 but at the time British left India, the GDP of India decreased to 3%. British Industrial Revolution was built on the destruction of India's thriving manufacturing industries (Tharoor, 2016). British rule was responsible for the stagnation of India's industrial development as India was already able to achieve remarkable achievement in industry, agriculture; arts, science and technology. Wootz steel, a high-carbon crucible steel, was produced in India from around 400 BCE to 1800 AD (Srinivasan and Ranganathan, 2014). Until around 1750, India and China together were producing 70 percent of world's industrial output. British initially disrupted India's thriving textile industry, followed by the steel industry, which was renowned for its superior quality compared to British steel. Thus, several of India's sustainable technologies became extinct. Ultimately, British left India, ending the era of colonialism. However, Western World continued their eco-colonialism or ecological imperialism by imposing their environmental policies on other nations.

Contrary to Western Word, India has been a practicing "sustainable development" since times immemorial. The people of this land have been preserving nature since ages and our culture and tradition also largely advocate for worshipping (in a sense conserving) the nature. Nature was never considered as a separate entity from human beings in Indian culture and traditions. That is why, we always personify nature as 'mother', which means a nurturer:

माता भूमिः पुत्रो अहं पृथिव्याः पर्जन्यः पिता स उ नः पिपर्तु॥"

(Atharva Veda 12.1.12)

(Earth is my mother, and I am her son. The rain is the father; may he nourish us.)

Mahatma Gandhi was a stern advocate of Indian culture and traditions and his fight against the British colonial power had many symbolic implications (Gandhi, 2022). Mahatma Gandhi saw the catastrophic depletion of natural resources resulting in unsustainability due to the imitation of Western pattern of production and consumption. He warned India about the danger inherent in imitating Western model of development. Gandhian environmentalism is largely woven with the philosophy of *Ahimsa*, i.e., non-violence. Gandhi realized the conflict between economy and ecology in the modern era. He was aware about the limitless exploitation of nature brought by

the Industrial Revolution. Therefore, he criticized the western Industrial upsurge. He was sceptical about the modern technologies brought by the British. According to him, Railway brought by British was a colonial scam because they used it as weapon to loot the resources from the remote places of India (Gandhi, 1997). However, it has to be admitted that ultimately railways helped in the task of freedom movement and national integration by providing good connectivity. What Gandhi meant was that technology should be used for masses and in a frugal manner. Long before the 3R principle i.e. reduce, reuse and recycle became popular, Gandhi had been implementing those in his ashram (Iyengar, 2022).

2. What is sustainable development?

Scientific discoveries and inventions have brought some radical changes to human civilization. The growth of a civilization is always dependent on the scientific advancement and because of the growth in science; there have been lots of transitions in social structure, economy, technology, demography, production and attitude of people. The traditional agrarian society has changed into urban industrial society; technology got changed from manual to artificial intelligence. As a result, production increased and demography changed with the rapid expansion of industrialization. When people were fully agrarian, they used manual tools to run them without the depletion of fuel energy. Then the production was also limited. However, the First Industrial Revolution had changed the global scenario through the expansion of speedy production by the use of technology. As a result of the advancement of technology, there were rapid growth in the production and manual technology got replaced by fuel based technology. Thus, there grew an imbalance between natural resources and need. In 1970 the world faced a gradual crisis of oil at the international level (Ortiz, 2023). In the following year, an Earth day (April 22) was launched to attract attention of the people to make them aware about the degradation of natural resources. The Club of Rome at the Stockholm Conference published a report entitled "Limits of Growth", which cautioned against unsustainable development (Meadows et al., 1972). The Brandt Commission, dealing with the question of ecology and environment, raised a very important question – "Are we to leave our successors a scorched planet of advancing deserts, impoverished landscapes and ailing environment?" (Palkhivala, 2008). In 1978, Mr. Lester R Brown in his thoughtful book **The Global Economic Prospect** mentioned earth's four principle biological systems – fisheries, forests, grasslands and croplands which also provide all the raw materials for the economy except minerals and petroleum (Brown,1978). In the year 1980, while the two superpowers were busy mapping the world into two political divisions, the Brandt commission published a report entitled "North-South: A Program for Survival", strongly emphasizing on the importance of leading self-fulfilment and creative partnership in the use of nation's productive forces and its full human potential (Kim, 1999). Therefore, in 1987, the Brundtland Commission published a report titled as "Our Common Future" and the term 'Sustainable Development' was coined first in that report.

The concept of "sustainable development" has evolved over time and is now widely understood to encompass three key dimensions—environmental, social, and economic—which collectively form the pillars of sustainability (Elkington, 1994; Rogers et al., 2012). Elkington's (1994) "Triple Bottom Line" framework highlights the interconnected nature of these pillars in achieving the overarching objective of sustainable development.

In 2015, the United Nations revisited the challenges surrounding sustainable development during the UN Conference on Sustainable Development in New York. This effort led to the adoption of a resolution titled *Transforming Our World: The 2030 Agenda for Sustainable Development*, which introduced 17 Sustainable Development Goals (SDGs) to be accomplished by 2030 (UN, 2015; UNDP, 2015). These SDGs include: "No poverty; Zero hunger; Good health and well-being; Quality education; Gender equality; Clean water and sanitation; Affordable and clean energy; Decent work and economic growth; Industry, innovation, and infrastructure; Reducing inequality; Sustainable cities and communities; Responsible consumption and production; Climate action; Life below water; Life on land; Peace, justice, and strong institutions; and Partnership for the goals." When comparing the Millennium Development Goals (MDGs) from 2000 with the 2030 Agenda, it becomes evident that several objectives from the MDGs were redefined and incorporated into the new framework due to their partial achievement (UN, 2015).

Technology is an inherent part of modernism. Without technology, modernism and globalization would not have been possible. Thus, technology and development are symbiotically related to each other. It is pertinent that with the advancement of technology, natural resources will unquestionably get decimated and the environment and ecology will, of course, be harmed. Technology has always worked for reducing human labour and we have been habitual using technology. A single glimpse of thought is unimaginable without technology. So eliminating the technology is impossible whereas saving natural resources is also equally important. The salient factors responsible for an alternative thought in technology are— i)A rising consumption of natural resources ii) the dramatic increase in world population iii) environmental impacts such as limited natural resources iv) global communication networks based on standards v) unstoppable worldwide globalization" (Westkamper et al., 2000). Thus, these factors compelled many scientists to be introspect. Scientists coined the term 'Green Engineering' with the aim of continuing the engineering activities with minimal hazards to natural resources as well as to the environment. Here the word 'green' symbolizes the plants and vegetables whose colour is green and which are primarily responsible for converting CO_2 to O_2 which is needed for the survival of human being. In short, Green engineering indicates environmental concern in engineering. It also includes Green Manufacturing. Sustainable Manufacturing is an extension of Green Manufacturing, which basically focuses on the economic and social sustainability in addition to environmental concern. More than 65 engineers and scientists formulated nine principles for sustainable development, in the

conference "Green Engineering: Defining the principles" held in Sandestin, Florida, in May 2003 (Nguyen and Abraham, 2003).

3. Gandhi on sustainable development

The world commemorated Gandhi on his 150th birth anniversary from October 2, 2018 to October 2, 2020. The United Nations declared his birthday as the "International Day of Non-Violence" in 2007. This iconic persona is frequently called as political prophet and he demonstrated how a victory can be won without gun and sword. He did not beg for independence bowing before the violent colonial power rather he wanted his freedom with dignity. Thus, Gandhi's unique way of fighting against the colonial power influenced many people around the world. Indeed, Gandhi's civil disobedience movement left a strong impact on many such people who were striving to get justice in their own lands.

In the bygone years, history witnessed how following the philosophy of Gandhi, a battle can be fought and won without violence, yet some people still believe that Gandhian teachings are antiquate and cannot be utilized in the modern era. Gandhian ethics can be inculcated through his thoughts encapsulated in Satyagraha.

As has been mentioned already, there are 17 Sustainable Development Goals (SDGs) initiated in 2015. To understand the legacy of Gandhi and his viewpoint, it will be interesting to analyse thoroughly how his developmental thoughts resemble the dream of harmonious, well-balanced, sustainable society with all round developments. Interestingly, the sustainable development goals planned by UN also desire to materialize the same dreams which Gandhi had dreamt long ago.

According to Gandhi, "Progress of a society should be determined by the state of the most vulnerable and the weakest ones." It reflects the aspiration of 2030 agenda of sustainable development which is captured by tagline "Leave No One Behind." Gandhi observing closely the causes of poverty culminated that poverty cannot solely stem from low income as the factors such as life cycle issue, social stigma, class distinction, and gender disparity also contribute towards poverty.

"Poverty is the worst form of violence." Gandhi proclaimed it much before the sustainable development concept was materialized. It is in line with the concept

"विद्या ददाति विनयं विनयाद् याति पात्रताम्।
पात्रत्वात् धनमाप्नोति धनाद्धर्मं ततः सुखम्॥"

(Hitopadesha)

(Education gives humility. Humility provides worthiness. With worthiness, one gets wealth. From wealth, righteousness comes; and from righteousness one gets happiness.)

Gandhi argued that the objective of any development should not be to build the island of prosperity in the ocean of poverty. Hence, Gandhi suggested the philosophy of Sarvodaya or the development of all. In fact, Indian scriptures provide a lot of importance to donations. A one-line gist on sustainable development is best given by Gandhi's famous quote: "The Earth has enough resources to meet the needs of all but not enough to satisfy the greed of even one person". This quote, in fact, conveys what the first verse of Ishavasyopanishad says, "All that is in this world is covered by the almighty God; enjoy it with a feeling of sacrifice but do not covet other's wealth".

"ईशावास्यमिदं सर्वं यत्किञ्च जगत्यां जगत्।
तेन त्यक्तेन भुञ्जीथा मा गृधः कस्यस्विद्धनम् ॥"

The new SDGs also promote for the economic sustainability through the welfare of all which considerably reflects what Gandhi dreamt much before. Fighting against the poverty is one of the most important global agendas as recognized in the SDGs.

Gandhi mentioned once that we should use everything judiciously so that our next generation may have the access of every natural resources. Emphasizing on sustainability, Gandhi once said, "The future depends on what we do in present". He also said, "We should not look upon the natural resources—water, air, land—as inheritance from our forefathers." He considered them to be the "loan given by our next generation" (Das, 2021).

The 2030 Agenda is basically considered as "transformative" change that includes the changes in livelihood, production and consumption. Gandhi always advocated for the personal practice of sustainable consumption and production. He believed that it is the responsibility of every individual to make the world sustainable for living which is also echoed in the Sustainable Development Goals. He wanted that every human being should play pivotal role to make the world a better place for living harmoniously. Gandhi in his unique way mentioned, "Be the change you wish to see in the world" as per the famous Hindi proverb "आप भला तो जग भला" or as Saint Kabir Das (1398–1518 CE) said,

"बुरा जो देखन मैं चला, बुरा न मिलिया कोय।
जो दिल खोजा आपना, मुझसे बुरा न कोय।"

(When I set out to find the flawed,
not a soul seemed ill or awed.
But when I searched my heart within,
I found myself steeped deep in sin.)

Gandhi viewed sustainability as all round development of all. He believed in *Sarvodaya* i.e. the welfare of all and he reckoned health as one's "biggest wealth, not the gold and silver". This is as per the following verse of Charak Samhita:

"धर्मार्थ काम मोक्षाणां आरोग्यं मूलमुतमम्।
रोगास्तस्यापहर्तारः श्रेयशो जीवितस्य च।।"

(For Dharma, wealth, desires, and peace,
Health is the root that grants release.
But ailments steal both joy and grace,
They dim life's glow and slow its pace.)

Nowadays, gender equality is one of the most important part in our development discourse in general and in the SDGs in particular. The concern for gender equality was also prevalent in Gandhian perspective. In his freedom movement, both men and women participated. Gandhi did not impose his will on his wife Kasturba Gandhi. Some prominent female personalities, like Sarojini Naidu,

Kamala Devi Chattopadhyay, Mirabehn, Rajkumari Amrit Kaur and Aruna Asaf Ali, played leading role with him. In Indian culture, females are considered the manifestation of Shakti (power). Manusmriti proclaims

"यत्र नार्यस्तु पूज्यन्ते रमन्ते तत्र देवताः ।
यत्रैतास्तु न पूज्यन्ते सर्वास्तत्राफलाः क्रियाः ।"

(Verse 3/56)

It means, "where women are worshiped, gods live there. Wherever they are not worshiped, all actions result in failure".

Gandhi said that, "I do not want employment for few, I want employment for the masses." He propagated a right-based approach, which is very much in line with the SDGs, when he said that, "We need to give people a square meal based on a good work, not necessarily based on charity". These thoughts are also as per Indian tradition, in which providing an employment is considered a noble activity. The "bold new world", according to Mahatma, should give up "politics without principles" and "commerce without morality." (Bhattacharya, 2019).

4. Gandhi on environmental issues

Gandhi is often considered as the precursor of the concept called Sustainable Development as he was very vocal against the injustice towards natural resources. His legacy on the Green movement is often discussed and his absence is frequently felt in almost all environment related conferences. Gandhi's non-violent approach to save nature can be best exemplified by the Chipko movement in Uttarakhand in 1970 where the women came out for the conservation of the forest (Rawat, 2004). This incident happened much before when the other parts of the world had yet to be aware of the concept called Sustainable Development. This is the legacy of Gandhi, as an environmentalist, but is inspired by Indian thoughts where the trees are also worshipped. Thus, it proves that though Gandhi did not provide directly any structured model on solving the environmental issue, yet his deep concern on saving nature undoubtedly elevates him as an environmentalist. In Hind Swaraj 1909, Gandhi talked about the dangers of unplanned and reckless industrialization. He was against the Nehruvian model of development who wanted to develop an economy based on big industries (Misra, 2005). That is why, in 1928, he wrote "God forbid that India should even take to industrialization after the manner of the West. If the entire nation of 300 million took similar economic exploitation, it would strip the world bare like locusts". This statement clearly shows that Gandhi was never against the wave of industrialization but he very importantly mentioned that India should never take up the industrial movement like the 'West'. As Gandhi was a radical egalitarian, he knew if India focused on establishing the big industries like the West then it would monopolize the natural resources to a certain section of people. Besides, this trend of industrialization, as he realized, would exploit the natural resources leading to unprecedented global warming and climate change. Thus, he was a critic of unequal share of resources and his non-possession philosophy is based on making everyone fit to survive as the people of this planet are endowed with enough resources for everyone's needs and not for anybody's greed. He opposed "survival of the fittest" motto; our scriptures often mention God as *Deenabandhu*, friend of downtrodden. Instead, Gandhi stressed on the judicious use of natural resources and said "one should not attempt to possess more than what he/she really requires". This is in line with the Jain philosophy of *Aparigrah*; do not store more than what is essential. Defining his non-possession philosophy, Gandhi further said "nature produces enough for our wants from day to day, and if only everybody took enough for himself and nothing more there would be no pauperism in this world, there would be no man dying of starvation in this world" (Jena, 2022). Gandhi's view on sustainable development can be looked through the lens of Sarvodaya philosophy, which too is based on a holistic paradigm.

5. Gandhi on social issues

5.1 Religion

In Hind Swaraj, Gandhi said "Religion is dear to me". By the word religion, Gandhi did not particularly name any particular belief system. His version of God is the incarnation of truth i.e. where truth prevails, there exists God. In that sense, Gandhi's idea of God and Religion can be equated, in a sense, with science because the ultimate purpose of science is also to attain the truth. But his religious philosophy emphasizes both on truth and morality. Thus, Gandhi said "I reject any religious doctrine that does not appeal to reason and is in conflict with morality" (Gandhi, 1920).

Gandhi's concept of *satyagraha* can be synthesized with three components i.e. religion, science and social change. Though many modern thinkers pretend to discard the religious values in the light of science, but ironically both science and religion are symbiotically related to each other. How they are related to each other? Gandhi answered that the mission of both science and religion is to endeavour the truth. Though he was a devout Hindu yet he had equal respect to all other religions. Thus, all religions, according to Gandhi, have the same purpose that is to achieve the ultimate truth without losing morality. His religious belief had its roots in ancient Hinduism, but it grew and developed in the light of other religions. In Hind Swaraj, Gandhi further stressed that the people of India are embracing modern civilization, discarding the religious values (Gandhi, 1997). Gandhi wanted to create a society which would be based on religious values. He opined that all religions teach us to pursuit godly things. Some authors and occasionally Mahatma Gandhi himself asserted that Gandhian philosophy is influenced by all the religion of the land. His Non-violence philosophy is attributed to the influence of Jainism and Buddhism; his social service is indebted to the influence of the Christian priest; his pacifism was from Sikhism, and he also told once that his satyagraha which means Dharma-Yuddha has been influenced by Islam where Jihad means dharma-Yuddha. Though he called Satyagraha as Dharma-Yuddha yet he was more likely to mean it as the fight of the righteousness. In Islam also, Jihad has two different connotations—Grater Jihad or Jihad-e-Akbar and Lesser Jihad Jihad-e-Asghar. Gandhi found similarity between Grater Jihad and his satyagraha, because Greater Jihad fights against the

inner evils. However, this concept is already in Gita. Gita says,

बन्धुरात्मात्मनस्तस्य येनात्मैवात्मना जितः |
अनात्मनस्तु शत्रुत्वे वर्ते तात्मैव शत्रुवत् || 6.6||

(For those who have conquered the mind, it is their friend. For those who have failed to do so, the mind works like an enemy.)

Hence, one needs to control his mind. In fact, all good concepts followed by Gandhi are part of Indian tradition, but being also a politician, he used to give reference of other religions for a larger appeal.

5.2 Education

Gandhi emphasized the importance of education. He believed that education is a significant driver of change. However, "doing away with illiteracy is not necessarily full education according to Gandhi. He said education is a "life-time phenomenon". Revealing amount of inner goodness or potentials of a person is the real education as Gandhi believed. Gandhi considered every individual as a spiritual being and that is why, he regarded morality, an important part of education. For example, if he had been asked about the present scenario of the education of India today, then he would have probably, with a sigh, replied introspectively whether the students from the esteemed institutes of India are educated enough. Are they morally virtuous human beings? Has their education taught them to be selfless and treat all equally? Gandhi would have surely been disappointed seeing so much immorality and selfishness among Indians today. Gandhi's idea of education was very clear and he gave much importance to the ethical education. According to him, Modern education is mis-education as it has taught people to be immoral, violent, and selfish. According to Gandhi, the basic objective of education is to generate the potential in children and to create a new world order. Therefore, he suggested to involve everyone for the welfare of the humankind. He believed that education is the harmonious development of body, mind and soul and he named this idea as "nayee-taalim" (new education).

5.3 Population

It may raise the eyebrows of many of us knowing the opinion of Gandhi on population policy as he was against the artificial birth control. Gandhi said, "It is contended that birth control is necessary for the nation because of overpopulation, I dispute the proposition. It has never been proved. In my opinion by a proper land system, better agriculture and a supplementary industry, this country is capable of supporting twice as many people as there are in it today."

5.4 Sanitation

Gandhi's 150th birth anniversary was celebrated in 2nd October 2019. The government of India announced the myriad achievement of 100% Open Defecation Free (ODF) India on the same day laying indebtedness to the revered "Father of the Nation". It was planned by Modi Government when they came to power in 2014 to fulfil Gandhi's dream of making India Open Defecation Free. During his stay in South Africa, Gandhi used to do the scavenger job and conducted scientific experiments in sanitation. Returning from there, Gandhi realized that sanitation and social hygiene were two insurmountable problems of India. While penning down the book Hind Swaraj in 1909, in his scheme of gram swaraj and hind swaraj, he postulated that swaraj or self-rule does not stand alone for the political fight for freedom. He exhorted that if we do not keep our backyards clean, our swaraj will have a foul stench. Self-improvement is the action to this much aspired dream. To materialize his dream of self-improvement, Gandhi organized Ashram Observance and Constructive Work, where he emphasized two most fundamental issues i.e. hygiene and sanitation. The Champaran episode started as a political battle to give justice to the sharecroppers but ended up in Gandhi's understanding of many core issues related to the people of India. Gandhi knew that making the people free from British was not enough. There were many other core issues to be solved in order to make the society free and independent. Hence, the Champaran episode stands as an epoch making testimony where he first initiated his dream of combating the hygiene and sanitation issues through proper practice of orientation, education and training. For Gandhi, Swaraj can be fulfilled if these two concomitant aspects i.e. sanitation and hygiene are met by the Indians. Gandhi started his experimentation of sanitation and hygiene through the ashram rules where he clearly instructed the inmates to take care of the roads and paths not to be polluted by spitting. In the nearby areas of the ashram Gandhi put a close vigilance so that the people do not defecate openly by the side of the road. Gandhi advised the inmates to frequently visit those places and to clean the roads so that people may be adapted with a behavioural change by observing the culture of the ashram. Further, in the 'Rules of Sewagram Ashram' it was clearly mentioned "…water must not be wasted and boiled water is used for drinking purposes… we should not spit and clean the nose on the road, but only in an out of the way place where no one is likely to walk." In almost every Congress major convention Gandhi used to bring the issue of sanitation and health and hygiene. Gandhi's approach towards sustainable health and environment can be scaled out from one of his speech where he clearly touched down all the multidimensional aspects of sustainable development. He said "… there is a Trinity of Evil— in insanitation, poverty and idleness– that will have to be faced with and you will fight them with broom-sticks, quinine and castor oil and, if you will believe me, with the spinning wheel." Gandhi was a sanitary scientist whose motive behind the campaign for sanitation had twin social objectives— eradication of untouchability and promotion of the dignity of labour.

5.5 Food and vegetarianism

Gandhi was a passionate food reformer who believed that eating right was central to living right and a good diet was very much important. However, Gandhi was Vaishnavite by birth and his religious ideologies sanctioned him to strictly follow the vegetarian diet. While leaving for London, Gandhi had to vow to his mother that he would keep distance from meat, women and wine. Though he tried veganism but his later experiences proved "…in order to keep perfectly fit, a vegetarian diet must include milk and milk products such as curds, butter, ghee, etc." (Gandhi and Prabhu, 1959). Gandhi basically divided food

in three types— vegetarian, flesh and mix. Interestingly, though his dietary plan can be much prescribed with today's dietary principles, yet his diet was much more concerned with politics and ethics rather than nutritional values. For Gandhi, eating ethically meant more than avoiding certain foods. Gandhi related the practice of vegetarianism to the practice of ahimsa. As Gandhi said, "I want to bring to your notice is that vegetarians need to be tolerant if they want to convert others to vegetarianism". Vegetarianism is a symbol of tolerance and it may be a sense of dignity to live. That is why, his motif behind the call of a dietary plan has deeper implications. However, that does not mean that Gandhi provoked anyone to enforce the vegetarianism to any non-vegetarian eaters. Neither he was of the opinion to put a mask of hatred on those who consumes meat. His opinion rests on the ideology of ahimsa. He classified living beings into two categories i.e. higher animal referring to human beings and lower animal indicating the animals. He said both are for the sake of each other. Gandhi's advocacy towards vegetarianism and animal care is immersed in his ethics of non-violence. He was strongly against cow-slaughter.

Gandhi was against modern anthropocentric idea, which places human being as the highest being on Earth. As Bhiku Parekh observes, Gandhi's favourite metaphor is that "the cosmos was not a pyramid of which the so-called nature or material world was the basis and man the apex, but a series of ever-widening circles."(Bhikhu, 1989). He believed that such a hierarchical arrangement would legitimize and encourage man's exploitation of the rest of the world and nature. He believed that animal sacrifice is a sinful act (Gandhi, 1933). In his Ashram the killing of any creature, even poisonous one, was completely forbidden. His view on this issue enlightens us with a profound insight in environmental ethics. He said, "I do believe that all God's creatures have the right to live as much as we have. Instead of prescribing the killing of the so-called injurious fellow-creatures of ours as a duty, if men of knowledge had devoted their gift to discovering ways of dealing with them otherwise than by killing them, we would be living in a world befitting our status as men— animals endowed with reason and the power of choosing between good and evil, right and wrong, violence and non-violence, truth and untruth" (Gandhi, 1933).

5.6 Women empowerment

In Sustainable Development Goals, reducing the discrimination to women was one of those millennium development goals. The 21st century has brought many advancements to the human civilization yet the women are still deprived from their rights. Till today, girl child is considered as a curse to the parents and before the attainment of their marital age they are got married. Thus, the world may be advancing, yet the gender related discriminations are still prevalent.

Gandhi believed in the equal human relationships where both man and woman enjoys the equal rights. In his scheme of Satyagraha, he gave equal importance to the empowerment of women. He said that the women should understand their dignity and innate nature. He accepted the guilt that once he himself used to consider women as a slave of man, but later Kasturba made him realize by proving an unwilling slave and thus opened his eyes to his mission. It was Kasturba Gandhi who taught him lesson on domestic Satyagraha by defying Gandhi's unjust and unreasonable diktats. Elevating the importance of women in bringing Satyagraha Gandhi wrote, "Women strengthen my belief in swadeshi and Satyagraha. If I could inspire in men devotion as pure as I find in the women, within a year, India would be raised to a height impossible to imagine" (Joshi, 1988). Gandhi emphasized the importance of khadi primarily intending to target the rural, unprivileged women who need to be made self- sufficient and independent. Hence, the economic sustenance to women is the best way to break the barriers of discrimination and this goal of economic sustainability was also realized in the sustainable development goals initiated in 2015.

5.7 Untouchability

Gandhi was against untouchability. He appealed to the people to clean their own lavatories. He started the initiative from his Ashram; those who desired to join the Ashram must be able to pass the test of cleaning the toilet bucket. Gandhi opposed the idea of labelling a particular section of people of the society as scavenger and compelling them to do only scavenging works. Opposing the discrimination of a particular section of people regarding them as untouchable, Gandhi stated "God, who is the embodiment of truth and right and justice, can never have sanctioned a religion or practice which regards one-fifth of our vast population as untouchables" (Tendulkar, 1957). In fact, our Puranas never indicate that in ancient Indian civilization, there was any job of cleaning other's lavatories. On the other hand, some Puranas describe in detail how should a person go to forest, dig a pit and defecate without strain and then cover the pit with soil. In 1932, Gandhi founded the Harijan Sevak Sangh and advocated for the eradication of untouchability in Hindu society. Gandhi called them Harijan or the Children of God. In 1933, Gandhi founded a journal named as Harijan and it became the vehicle to voice against the discrimination on the people belonging to the lower strata of society. Besides, Gandhi wholeheartedly supported the entry of the untouchables into the Hindu temples which was opposed by some upper-caste people. Gandhi opposed to Ambedkar's views of separate electorate and strongly protested against the Communal Award announced by the British. Gandhi's approach was that of a reformist. Gandhi narrated a story how he experienced the untouchability. A scavenger named Uka who was from the untouchable community, used to attend their house for cleaning latrines and Gandhi used to ask his mother why it was wrong to touch him. He asked it because whenever he accidently touched Uka, he was ordered to perform the ablutions. Gandhi said that though he obeyed yet he remained confused.

6. Gandhi on economic issues

Gandhi was an economist of masses. Being a radical egalitarian, Gandhi was critical of unequal hierarchical structures of domination and advocated for creating non-violent, non-exploitative socio-economic relations and development model. His economic philosophy of

Sarvodaya or "the wellbeing of all" focused on addressing the needs of those with the least freedom and greatest needs. He himself proclaimed "if I accumulate great wealth, while others live under desperate economic and social conditions of poverty and great suffering, I am living an unjust life of theft. If I benefit from or remain silent in a community, in India and world of such inequality, I am responsible for this economic structural violence." Thus, stressing on the values of egalitarianism, Gandhi said without moral, social and economic values, truthful living is impossible.

Gandhi could well realize the consequences that may be brought by this giant expansion of modern economic growth which by and large divides people in regard to their haves and have-nots with little concern to their socio-economic development. Later on, Gandhi started advocating distributive justice or equity, and improvement in the overall quality of life of the masses. Therefore, Gandhi's ideology of economic growth is not only based on the poverty reduction but also for meeting human needs and aspirations for better life. He vehemently criticized the modern economic development which is usually West-centric. Many people thus blamed Gandhi's thought in Hind Swaraj on technology and development as antiquated. However, behind the garb of this "half naked fakir" there laid a very modern man in his thoughts and approaches. Eventually, Gandhi's relevance is felt in the 21st century too. In Hind Swaraj, Gandhi expressed openly about his displeasure on modern technology like railway. He reasoned that this modern locomotive had worked as tool of exploitation during British regime in India. Through the example of railway, Gandhi critiqued all those modern technologies which the consumerist's countries had adopted and are still producing to use as weapons for economic exploitation. His views were that science and technology must promote all round progress of the entire humanity, and also it should stand as a means to achieve cultural and spiritual ascent. Gandhi was not against any sustainable technology that masses could afford. He himself used to keep a small "watch" with him. Once someone asked why he remained half-naked. He replied, "As long as a single person of India is without proper clothe, I do not want to spend money on my clothes."

In Hind Swaraj, defining the word Swaraj, Gandhi pointed out that his version of democracy was different from what has been happening today. He did not want to attain democracy by driving away the British colonizers for welcoming new band British colonizers in the guise of Indian. His vision of Swaraj was much broader, deeper and qualitative from our dominant, modern versions of democracy. Gandhi believed that there is no political democracy without economic democracy and without a non-egoistic commitment to our interconnected relations of concern for the welfare of all beings, real democracy is unachievable. Gandhi opines that economically, Poorna Swaraj means full economic freedom for the toiling millions.

In order to achieve the wellbeing of all, he proposed the concept called Swadeshi according to which the economy can be decentralized making everyone self-sufficient. To achieve the desired goal of Swadeshi, Gandhi proposed the weapon "Charkha" or spinning wheel. He had firm belief that Khadi and the Spinning wheel are able to set up a non-violent, non-exploitative and harmony promoting economic development. In his own words, "Khadi must be taken with all its implications. It means a wholesale Swadeshi mentality, a determination to find all the necessaries of life in India and that too through the labour and intellect of the villagers. That means a reversal of the existing process. That is to say that, instead of half a dozen cities of India and Great Britain living on the exploitation and the ruin of the 7,00,000 villages of India, the latter will be largely self-contained, and will voluntarily serve the cities of India and even the outside world in so far as it benefits both the parties" (Ravi, 2015). For Gandhi, the adoption of Khadi by the common people marked the protest against industrialism and materialism (Nanda, 1958).

Gandhi supported those small scale industries in villages that did not require help from outside the village and could be run with little capital. He was against the railway brought by the British as he regarded railway as a weapon of economic exploitation because with its arrival in India the rogues have started visiting to the remote villages in order to practice their roguery. In Hind Swaraj, Gandhi being dissatisfied with railway stated clearly "...Railway can become a distributing agency for the evil one only." Gandhi was aware about the fact that with the imbalance of the economy there will be oligarchy and the poor man will forever be the victims of exploitation and the rich man will be richer day by day. That's why, Gandhi hoped that small industries in the villages would generate employment and purchasing power in the villages and would also break the economic barriers between rich and poor by giving equal opportunity to all. This is where his ideology stands hand in hand with sustainable development goals.

7. Gandhi on preservation of culture

Mahatma Gandhi wanted to bring a radical change in the living condition of the people of India. During the freedom struggle, Gandhi noticed that merely attaining the physical independence from the British colonialism is not what independence in reality means. He did not desire to bring back a new set of British people in the guise of Indian. According to him, freedom is not merely physical but also psychological and cultural. He therefore appealed the people to use khadi that promotes indigenousness. For him, khadi and Charkha were also the symbols of culture.

8. How would have Gandhi reacted to modern technology?

Was Gandhi really against science and technology? How would he have reacted to the modern technology such as internet and mobile phones if he had been alive today? Was his intention to take back India to the "dark medieval age"? Many of his contemporaries blamed Gandhi, of having a utopian ideology. It is true that Gandhi termed material progress achieved through modern machinery as evil and satanic. In Hind Swaraj, Gandhi vehemently criticized the Railways in India. He said, "Railways have impoverished the country… and they propagate evil."

Does it mean that he was against the modern machinery? The answer is "no". If we closely understand Gandhi's ideology, it will be very clear that Gandhi was against the modern machinery in terms of its incontrovertible contribution to the pauperization of India and to the enrichment of Britain. He repeatedly quoted the words of the celebrated British biologist and anthropologist Alfred Russell Wallace who once wrote that the advance of science had not reduced hatred and injustice, and added 'not an inch to the moral stature of Europe' (Casolari, 2022). Gandhi basically wanted to bring scientific development that would be non- violent, non-exploitative and promoting harmony. Gandhi would have been a core supporter of the pioneering scientists like Gershenfeld who worked at the grassroots for the promotion of the digital technologies in all over the world including India because digital technologies, to some extent, have treaded through the sarvodaya dreams of Gandhi. Digital technologies have also endeavoured the spiritual liberation as dreamt by Gandhi himself. This also has decentralized the power from a few to many, from singular individual to plural cooperation. In this sense Gandhi's vision towards the modern technologies was very clear as he himself said once that if a better substitute comes which will fulfil the dreams of Charkha, he advised to accept those technologies. These evidences are enough to prove that Gandhi was never against the modern technologies but his only condition was that the modern technologies must stand his dreams of a well-balanced, harmonious and non-exploitative society. The eminent scientist Dr. R.A. Mashelkar, former Director General of the Council of Scientific and Industrial Research used the term "Gandhian Engineering" to refer Gandhi's approach to find engineering solution that can lift the "iceberg above the surface so that everyone can have the quality of life they deserve". He also suggested for the engineering solution that uses less resources and benefits to more people. Mahatma Gandhi supported for the use of human energy as current energy in manufacturing instead of fossil energy. Khadi proved fruitful to serve his purpose because it employs human labour and is also eco-friendly in nature. His faith on khadi proved fruitful from various socio-economic as well as environment point of view. Gandhi's suggestion for the use of the Charkha was really thought-provoking and it definitely elevated him to a forerunner of engineering thought. Green engineering proposes for environment friendly machining that reduces the environmental degradation and also serves the engineering purpose. Gandhi could anticipate the present day scenario long before. Therefore, he emphasized more on the manual technology and his campaign for the use of the Charkha can be observed as very beneficial from environmental as well as engineering perspectives. Many scholars believe that British colonial regime is solely responsible for bringing a scientific temperament into India. However, history states clearly how India has been developing the scientific temper since ages. Technology of India was far ahead of the time. Even before the European Industrial Revolution, India was producing finest cotton and until around 1750, India along with China was producing 73% of world's total industrial output. Even till 1830, these two countries were dominating 60% of the world's industrial output. Moreover, Indian manufactured steel was far better than the British steel. The cotton produced in India was the finest in quality. Most importantly, the industries during the pre- colonial era were village centric involving the local people, whereas post-colonial era brought drastic changes in the industrial growth. The British colonial power emphasized more on the centralization of production with the inclusion of the heavy mills; industries were established mainly in the urban areas. Gandhi was basically against this. He sought to bring an Industrial revolution to India that would be non-exploitative. In modern terms, he was more inclined towards Micro, Small and Medium Enterprises (MSMEs). He did not want to bring a technological development that replicated the Industrial Revolution of Europe. Therefore, he gave more emphasize on the cottage and small scale industries. Gandhi's vision was very clear as he observed that the small industries promote less damage to natural resources and very effective in dealing the un-employability, economic sustainability and also eradicating the gender barriers. From the engineering point of view, hand woven khadi industries are less harmful to nature in comparison to the mill woven khadi industries. The hand woven khadi uses less energy. Further, water usage was the maximum in the use phase of the garment produced in the mills. Hand woven khadi is actually cleaner due to its manual operation. Therefore, Gandhi's approach to enhance the khadi industry has far reaching effect from the sustainability point of view. Gandhi's ethical ideologies prophesized many sustainable development goals that are realized today.

9. Conclusion

Undoubtedly Mahatma Gandhi was a great proponent of sustainable development. It is clear not only from his words but by action also. His popularization of khadi and charkha, his attire, his food habits and his bias towards village life speak volume about his commitment to sustainability. However, it is also clear that the concept of sustainability propounded by Gandhi had roots in Indian Knowledge System. However, Gandhi was a politician too and he was not a scholar either Sanskrit or tribal knowledge. Still his thoughts and actions are inspired by his inherited Indian Knowledge from his family and society. It is true that sometimes he could not advocate Indian Knowledge exclusively due to political compulsion. It is high time that modern stakeholders of sustainable development should look to Indian Knowledge for guidance.

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Portraying the attempts of scholars and scientists……..

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The Effectiveness of Marma Chikitsa in Present Era

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Abstract

The science of Marma chikitsa is an extraordinary and dynamic Ayurvedic therapy that has tremendous value in health, disease, everyday living and spiritual practice which reflects on the quality of life. Marmani are specific points on the body where the application of pressure induces the flow of vital energy Prana along a complex system of subtle channels called Nadi, which in turn govern the functional and health aspect of every metabolic system in the body, promote self-healing and harmonize mind and body and revitalize each and every cell of the body.This review outlines the role of Marma chikitsa in managing various conditions and its potential benefits as a safe, effective, and holistic approach for health.Therefore further development and expansion of such a viable non-invasive, inexpensive treatment is need of the hour.

Keywords: Ayurveda, Marma, Marma chikitsa

Introduction

Marma Chikitsa, an ancient therapeutic practice rooted in Ayurveda, involves stimulating vital energy points (marma) to balance the body's physiological and psychological functions. Marma Chikitsa traces its origins to ancient Indian scriptures, particularly the Ayurvedic texts like Charaka Samhita and Sushruta Samhita. The concept of marma junction of life force, consciousness, and physical structures is central to the practice. Historically used for both preventive and curative purposes, basically Ayurveda strives to keep the body healthy and prevent illness. As earlier yoga was the means of acquiring spiritual gains, in present era yoga is a tool for health promotion among the people. In the same way the implementation of marma chikitsa may help in health promotion and treating various ailments[1]. Marma is an anatomical site where muscles, veins, ligaments, bones and joints meet together.[2,3,4] They are also the sites where not only tridosha are present but their subtle forms prana, ojus and tejas are also present with sattva, raja and tama.[5] Acharya Sushruta has used the term marma both for diseases of vital organ system as well as the topographical cure points, therefore the marma in the system should be saved by stimulating topographical cure points.[6] Marma is the point on the body where the blockage of energy is felt.[7] It is the connection between physiology and consciousness, and by stimulating it changes the body's biochemistry and can unfold radical and

alchemical change in one's constitution. Initiating these inner pharmacy pathways signals the body to produce exactly what it needs including hormones and neurochemicals that heal the body, mind and consciousness.[8] Marma points are specific areas on the body, which has relation through pranic channels to various internal organs, doshas and srotas. These points are being used during abhyanga along with the application of different kinds of medicated and aromatic oils to stimulate internal organs. [9] Marma Chikitsa involves the application of pressure, massage, or stimulation of these specific Marma points. These points are considered energy centers where physical and energetic structures intersect, affecting the body's vital functions. Marma Chikitsa is believed to balance the flow of Prana (vital life force) throughout the body, which can enhance healing, reduce pain, and improve mobility. Marma therapy is often used for a range of health issues, including pain management, stress relief, and musculoskeletal disorders.[10]

Methodology

This review synthesizes findings from traditional texts, modern studies, and clinical trials to evaluate Marma Chikitsa's effectiveness. Literature from PubMed, Ayurvedic journals, and case studies were analysed to assess outcomes across various health conditions.

Etymology of Marma

Marma is derived from Sanskrit origin word 'mri' meaning death. Marma- 'mah' denotes Prana 'ma' denotes residence .Hence the word, "Marma means residence of prana" This was explained by Astanga Hridaya. "Mru" dhatu combined with "Manin" pratyaya gives rise to word Marma which means jivasthana, sandhisthana. Marma are the vital points of the body. Its importance is explained by the slokha 'Maryanti iti marmani' which means that any harm to these points is harmful or any injury to these parts may cause severe pain, disability, loss of function, loss of sensation and death.[11] Acharya Sushruta also mentioned in Sushruta Samhita that these points should be protected from any injury during surgery. Marma also means secret or latent power.[12] Vagbhata defines that marma is the meeting point of mamsa, asthi, sira, snayu, damani and sandhi and is where the prana is present and which on injury leads to death. Vagbhata also states that marma is a place where unusual pulsations (visham spandana) can be felt and where shall be the tenderness on pressure (peeditae ruka).[13] In Charaka Samhita, though marma are referred and stated but their details are not available.[14, 15] Sushruta defined marma as the collective point of meeting of above mentioned dhatu except dhamani.

Enumeration and Classification of Marma[16]

In Ayurveda there are total 107 marma (upper and lower limbs 44, back-14, chest and abdomen-12, udarvajatrugata-37) in the body.

Marma are divided into different groups based on effect on injury (Parinama anusara), structure involved (Rachana anusara), part of body (Shadanga anusara), measurement (Pramana anusara) to the physic and also . The classification based on structure involved according to Sushruta is only five but according to Vagabhata are six with inclusion of Dhamani marma.

Parinama	Rachana	Shadanga	Pramana
Sadyahpranahara-19	Mamsa – 11	Shirogata-37	1 angula
Kalantara Pranahara -33	Sira – 41	Koshtagata -26	2 angula
Vishalyaghana -3	Snayu -27	Shakagata-44	3 angula
Vaikalyakara-44	Asthi- 8		4 angula
Rujakara -8	Sandhi -20		½ angula

Techniques to stimulate Marma points[17]

Marma chikitsa is to clear channels, maintain proper circulation; this is achieved by different methods according to location of marma external or internally, anatomical constituent, measure & Practitioner's knowledge.

- External stimulation,
- Different massage techniques,
- Bandaging techniques
- Applications of medicaments.

Methods adopted are based upon two types[17]

Pharmacological (with medicines)- Like using aroma oils, medicated ghrita (ghee), medicated oils, dry powders, different local applications, ointments & massage

Non pharmacological (without medicines)—Mardana (pressure application), Pranic healing, Vidhakarma (neddling), Psychological and rehabilitative treatments are also advised.

The Spiritual Value of Touch[18]

Touch initiates on the physical level, but it can reach much deeper, crossing the media of thoughts, feelings, and emotions. The skilled touch of a good practitioner of the healing arts can convey its message of compassion through prana into the manas, buddhi, smruti. It can enter ahamkara and gives its silent message through chitta into the soul. Along the way, and especially at this deepest level, touch can engender radical change in the neurochemistry. The human body is a unique chemical lab; a touch through the energy points of marmani can assess new pathways that affect our inner pharmacy. Certain marma therapies can not only facilitate thinking, feeling, and perception, they also have the potential to evoke a state of samadhi. Thus, the overall healing of body, mind and spirit can be achieved through marma chikitsa.

Applications in the Present Era[19,20]

Pain Management:

One of the primary benefits of Marma Chikitsa is its analgesic effect. By stimulating marma points, the therapy activates the body's natural pain-relief mechanisms, such as endorphin release, while improving nerve function. Marma stimulation helps to reduce the intensity of chronic pain in conditions like osteoarthritis and back pain.

Research indicates that Marma Chikitsa can effectively alleviate chronic pain, including musculoskeletal disorders such as arthritis and back pain.

Mental Health:

Marma therapy has shown promise in reducing stress, anxiety, and depression by activating points associated with the nervous system.

Rehabilitation:

Marma Chikitsa has been integrated into post-stroke and injury rehabilitation programs to enhance mobility and reduce recovery time.

A clinical trial by Gupta et al. (2019) highlighted its role in improving motor function in stroke patients.

Preventive Healthcare:

Regular marma stimulation is suggested to boost immunity, improves digestion and sleep quality, removes toxins from the body and enhance overall vitality.

Improved Circulation and Muscle Relaxation:

Targeting marma points promotes blood flow to affected areas, ensuring better delivery of oxygen and nutrients, which is essential for tissue repair. This improved circulation also helps in reducing muscle stiffness and spasms, which are common in conditions like frozen shoulder and sciatica.

Reduction of Inflammation:

Inflammation is a hallmark of many musculoskeletal disorders. Marma Chikitsa's effect on certain marma points can activate anti-inflammatory responses in the body. Regular treatment may lead to reduced swelling and stiffness in conditions such as rheumatoid arthritis and tendinitis.

Health Promotion by Marma Therapy and Yogic Practices:

The whole world is requiring marma therapy and yoga as a weapon to combat the diseases of modern life. Marma therapy and yoga is practiced by many people for achieving the healthy state of life. A number of incurable diseases are treated with marma therapy and yogic practices.

Benefits of Marma Chikitsa over Conventional Treatments

Non-Invasive:

Marma Chikitsa is a non-invasive and gentle therapy that does not require medications or surgical interventions, making it an attractive option for individuals looking for holistic and natural treatments.

Holistic Approach:

Unlike conventional treatments that often focus on symptom relief, Marma Chikitsa addresses both physical and energetic imbalances, promoting overall health and well-being.

Minimal Side Effects:

As a therapy based on manual stimulation of points, Marma Chikitsa has minimal side effects when performed correctly by trained practitioners. This is in contrast to some medications used , which can have significant side effects with long-term use.

Discussion

According to Ayurveda the imbalance of doshas causes obstruction/deterioration of sira causing decrease of chala guna causing Avarodha in fine channels. With the help of marma stimulation, uttejana is provided to sparshendriya which increases blood supply to that area and shows increase of chala guna and increased chala guna, decreased sheeta guna and ruksha guna provides nourishment. This normalize the vitiated dosha suksamta of Vayu again enchances this process. This releases Vridh Vayu from the site of marma & the patient feels relieved, revitalized, energized, maintains health. The perspective modern science suggests that Marma Chikitsa works through

- **Neurological Stimulation:** Activating nerve endings at marma points.
- **Hormonal Balance:** Regulating stress hormones like cortisol.
- **Circulatory Effects:** Enhancing blood and lymphatic flow to affected areas.

Conclusion

Marma Chikitsa represents a valuable complementary therapy in the present era, addressing pain, mental health issues, and preventive care. Bridging traditional wisdom with modern research could unlock its full potential. Further studies and collaborative efforts are essential for its global acceptance and integration into mainstream healthcare. Thus we can say that Marma are the channels that regulate the flow of information, energy, nutrients, and toxins throughout the human body. Marma therapy is based on the fact that the "Marma system" becomes damaged through stressors and improper nutrition. This can revitalize through Marma therapy and restores the normal one.

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Astronomy of the Hindu pañcāṅga: cāndra māna

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Abstract

The Hindu pañcāṅga is a calendar that was used for timekeeping in India before the adoption of the modern calendar. This Hindu calendar has a sound astronomical basis. All the calendric elements in this calendar such as day, fortnight, month, year etc., are based on the movement of heavenly bodies, primarily the Sun and the Moon. In this article, we provide astronomical definitions of the calendric elements that are based on the movement of the Moon.

Keywords: astronomy , calendar, pañcāṅga, lunar pañcāṅga

Introduction

The Hindu pañcāṅga is used exclusively for religious purposes today. Yet, up until the end of the medieval period, the pañcāṅga served as the civil calendar in India. Time periods such as years, months, fortnights and days were reckoned using the pañcāṅga. Hence, the pañcāṅga can be considered to be a Hindu calendar. This Hindu calendar was scrupulously designed based on the movement of the heavenly bodies, specifically the Sun and the Moon.

While the pañcāṅga has survived till today as a religious artifact, the astronomy of the Hindu calendar has, by and large, been forgotten. In this article we provide the astronomical definitions of the calendric elements that are categorized as cāndra māna – the lunar portion of the Hindu calendar. These calendric elements are used to determine the dates of most of the major Hindu festivals.

This article relies on the Sūrya Siddhanta, one of the oldest astronomical treatises of the Hindu school of astronomy, as its primary source.

Preliminaries

The geocentric model

The astronomy of the Sūrya Siddhanta is based on a geocentric model of the solar system. We know now that the solar system is heliocentric, i.e., the Sun is at the centre. The Sūrya Siddhanta, on the other hand, specifies that the Earth is at the centre. This geocentric model derives its validity from the fact that, for an observer standing on the surface of the Earth, it would indeed appear as if the Earth were at

the centre. To visually observe the heliocentric model, the observer would have to relocate to the surface of the Sun!

The ecliptic

The *ecliptic* is the apparent orbit of the Sun around the Earth in the geocentric model. In reality, this is the orbit of the Earth around the Sun.

The ecliptic coordinate system

The ecliptic forms the basis for the two-dimensional *ecliptic coordinate system.*[2] In this system:

- The *ecliptic longitude* of a heavenly body is the position of the body measured along the ecliptic, starting from a defined origin.
- The *ecliptic latitude* of a heavenly body is the position of the body measured perpendicular to the ecliptic with positive and negative signs representing north and south of the ecliptic respectively.

Elongation

Elongation is the angular distance of a heavenly body from the Sun, measured along the ecliptic plane. In other words, this is the difference between the ecliptic longitudes of the Sun and the heavenly body in question. It is customary in astronomical literature (and software) to record elongations east or west of the Sun, whichever is numerically smaller.

Movements of celestial bodies

It is well known that the Sun rises in the east and sets in the west causing day and night. Along with the Sun all other planets and stars too rise and set daily. Such daily movements are referred to as *diurnal* movements.

Diurnal rising and setting is an apparent movement. In reality, the Earth rotates on its axis causing this rising and setting of all heavenly bodies. Diurnal movement is of importance for clocks but when it comes to calendars, we have look beyond diurnal movement.

In the geocentric model, the Sun, the Moon, and the planets are orbiting the Earth whereas the stars are fixed in their position in space. These fixed stars serve as reliable backdrop to observe the movement of the Sun, Moon, and planets. All observations and measurements carried out with respect to these fixed stars are known as *sidereal* observations.

All observations and measurements carried out with respect to another moving body, instead of the fixed stars, are knowns as *synodic* observations, e.g., conjunction and opposition of the Moon (new moon and full moon respectively) are defined with respect to the Sun, which is also moving.

The nine measures of time

A *māna*[3] is a set of measures of time.

The Sūrya Siddhanta defines nine māna as shown in Table 1. Each māna is a collection of calendric elements of durations varying from the very large to the very small.[4]

Table 1 – The nine māna of sūrya siddhanta

māna	calendric elements
brāhma māna	kalpa, parārdha
prajāpatya māna	yuga, caturyuga, manvantara
gurormāna	saṃvatsara
divya māna	divya ahōrātra, divya varṣa
saura māna	sauramāsa, ṛtu, ayana, saura varṣa
pitṛya māna	day and night of the pitṛ
cāndra māna	karaṇa, tithi, pakṣa, cāndramāsa, cāndra varṣa
sāvana mana	sāvana ahorātra
nākṣatra māna	prāṇa, vināḍi, nāḍi, nākṣatra ahorātra

The first two in the above list define calendric elements arithmetically, whereas the rest define calendric elements astronomically. In this article we focus on cāndra māna

cāndra māna

Th *cāndra māna* contains all the calendric elements that are defined using the orbital movement of the Moon relative to the Sun. The calendric elements contained in cāndra māna are:

[2] Astronomical coordinate systems are used to locate the position of a heavenly body in the sky. All astronomical coordinate systems are two dimensional. The third dimension – distance – is only perceptible as brightness and as such, is not relevant for locating the position of the heavenly body in the sky.

[3] International Alphabet of Sanskrit Transliteration (IAST) is used throughout this article to represent Sanskrit terms.

[4] At the high end, a parārdha is a duration of 155.52 lakh crore years. At the low end, a prāṇa is a duration of 3.989 seconds.

karaṇa – lunar half-day
tithi– lunar day
pakṣa – lunar fortnight
cāndramāsa – lunar month
cāndra varṣa – lunar year

Before defining the above calendric elements, we start by defining two fundamental astronomical phenomena that underpin the design of cāndra māna:

amāvāsyā is the moment in time when the Moon's elongation is 0°. At this moment, the Moon is said to be in conjunction with the Sun. This is nothing but the New Moon.

pūrṇimā is the moment in time when the Moon's elongation is 180°. At this moment, the Moon is said to be *in opposition to* the Sun. This is nothing but the Full Moon.

pakṣa

A *pakṣa* is a fortnight.

śukla pakṣa (the silver fortnight) is the duration of time between an amāvāsyā and the succeeding pūrṇimā. pūrṇimā marks the culmination of śukla pakṣa and hence is included in śukla pakṣa. During this period, the Moon is said to be *waxing*.

kṛṣṇa pakṣa (the black fortnight) is the duration of time between a pūrṇimā and the succeeding amāvāsyā. amāvāsyā marks the culmination of kṛṣṇa pakṣa and hence is included in kṛṣṇa pakṣa. During this period, the Moon is said to be *waning*.

cāndramāsa

māsa is a month. *cāndramāsa* is a lunar month. There are two definitions of cāndramāsa:

amānta[5] definition :

A amānta cāndramāsa is the duration of time between two successive amāvāsyā, with the amāvāsyā marking the end of the cāndramāsa. It follows that a cāndramāsa consists of one śukla pakṣa followed by one kṛṣṇa pakṣa. This definition is widely used in southern India.

pūrṇimānta[6] definition:

A pūrṇimānta cāndramāsa is the duration of time between two successive pūrṇimā, with the pūrṇimā marking the end of the cāndramāsa. It follows that a cāndramāsa consists of one kṛṣṇa pakṣa followed by one śukla pakṣa. This definition is widely used in northern India.

[5] amāvāsyā-anta, i.e., ending with amāvāsyā. We use this definition in the rest of this article.

[6] pūrṇ imā-anta, i.e., ending with pūrṇimā.

Synodic orbital period of the moon

Both the above definitions of a cāndramāsa are equivalent to the synodic orbital period of the Moon. At the end of a synodic orbit, the Moon comes back to the same location with respect to the Sun (i.e., in conjunction with / in opposition to the Sun). Thus, the Moon completes one synodic orbit around the Earth during a cāndramāsa.

The mean synodic orbital period of the Moon is 29.53 days.[7]

Sidereal orbital period of the moon

Geometrically speaking, completion of one sidereal orbit would indicate an angular movement of 360°. At the end of a sidereal orbit the Moon comes back to the same location in space where it started, with respect to the fixed stars, thus completing a 360° rotation.

The sidereal orbital period of the Moon is 27.32 days. This is shorter than the synodic orbital period for the following reason:
Assume the Moon is in conjunction with the Sun (i.e., amāvāsyā). After 27.32 days the Moon will complete one sidereal orbit and return to the starting position, but it is not in conjunction with the Sun now because the Sun has moved forward in its orbit around the earth.[8] It takes the Moon an additional 2.2 days to catch-up with the Sun and reach the next conjunction.[9]
This sidereal orbital period of the Moon is central to the design of a calendric element known as *nakṣatra*.

cāndra varṣa

varṣa is a year.

cāndra varṣa is a lunar year consisting of twelve lunar months. The names of these twelve cāndramāsa, in order, are:

caitra māsa	vaiśākha māsa
jyeṣṭha māsa	āṣāḍha māsa
śrāvaṇa māsa	bhādrapada māsa
āśvina māsa	kārttika māsa
mārgaśīrṣa māsa	pauṣa māsa
māgha māsa	phālguna māsa

The beginning of a cāndra varṣa (i.e., the moment after phālguna amāvāsyā) is celebrated as *cāndra māna yugādi*.

[7] Since the Sun's orbit is elliptical, the actual synodic period will vary around this mean value.

[8] by ~27° (since the Sun moves ~1° per day).

[9] since the Moon moves ~12° per day.

Duration of a cāndra varṣa

The following equations derive the duration of a cāndra varṣa:

1 cāndramāsa	=	1 synodic orbit of the Moon
1 cāndra varṣa	=	12 cāndramāsa
	=	12 synodic orbits of the moon
	=	12 x 29.53 days
	=	354.36 days

Reason for twelve cāndramāsa

The Moon orbits the Earth ~12 times faster than the Sun does.

Synodic orbital period of the Moon	=	29.53 days
Sidereal orbital period of the Sun	=	365.256 days
Ratio of lunar and solar orbital periods	=	29.53 : 365.256
	=	1 : 12.37

This means that by the time the Sun completes one sidereal orbit (i.e., in one sidereal solar year), the Moon would have completed twelve synodic orbits and started off on its thirteenth orbit.

This is the reason that twelve lunar months was chosen to make a lunar year. By choosing a dozen, the duration of a lunar year was brought as close to a solar year as possible without exceeding it.

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tithi

A *tithi* is the time taken by the Moon to advance 12° from the Sun, as measured by its elongation, starting from amāvāsyā. It follows that śukla pakṣa is made up of fifteen tithi (180° divided by 12°); kṛṣṇa pakṣa is also made up of fifteen tithi; and a cāndramāsa is made up of thirty tithi.

Since the duration of a cāndramāsa is 29.53 days and a cāndramāsa is made up of thirty tithi, it follows that the duration of each tithi is approximately one day. Since the lunar and solar orbits are elliptical, the angular velocity of the Moon and the Sun are not uniform throughout their orbit.[10] As a result, the duration of a tithi is not fixed; it fluctuates around twenty-four hours.

Thus, a tithi can be considered to be a *lunar day*[11] but it must be emphasised that a tithi has absolutely no correlation with sunrise. A tithi can start and end at any time of the day (or night).

A tithi is identified by its position within a pakṣa - 1st tithi, 2nd tithi, 3rd tithi, etc. of kṛ ṣṇa pakṣa / śukla pakṣa - using the equivalent Sanskrit terms, as follows:

1. prathama tithi
2. dvitīya tithi
3. tṛtīya tithi
4. caturthī tithi
5. pañcamī tithi
6. ṣaṣṭhī tithi
7. saptamī tithi
8. aṣṭamī tithi
9. navamī tithi
10. daśamī tithi
11. ekādaśī tithi
12. dvādaśī tithi
13. trayodaśī tithi
14. caturdaśī tithi
15. pūrṇimā tithi / amāvāsyā tithi

The span of each tithi is enumerated in Table 2.

pūrṇimā tithi / amāvāsyā tithi

In keeping with the above notation, the 15th tithi should have been named pañcadaśī tithi (i.e., 15th tithi). Instead, the terms pūrṇimā and amāvāsyā are reused as the identifiers of the 15th tithi of śukla pakṣa and kṛṣṇa pakṣa respectively.

Thus, the terms pūrṇimā and amāvāsyā have two usages:

- stand-alone they indicate full moon and new moon respectively
- when combined with the term *tithi* they indicate the 15th tithi of śukla pakṣa and kṛṣṇa pakṣa respectively. It is easy to see that pūrṇimā tithi ends with a pūrṇimā and amāvāsyā tithi ends with an amāvāsyā.

tithi associated with a solar day

According to the Sūrya Siddhanta tithi is a very important consideration for Hindus for performing religious ceremonies such as weddings, fasting, pilgrimages, festivals etc. At the same time, all human activity begins with sunrise and a solar day starting at sunrise naturally governs all human activities. In order to force a correlation between a tithi and a solar day, the following convention is used:

The tithi prevailing at sunrise is determined (based on the position of the Moon at sunrise). That tithi is then

[10] In modern science, this is codified as Kepler's second law of planetary motion

[11] though in modern astronomy a lunar day indicates a day on the surface of the Moon!

associated with the entire solar day, even if astronomically the tithi changes in the middle of the day or night. Thus, the question "What is the tithi today?" is answered by determining the tithi prevailing at sunrise.

adhika tithi / kṣaya tithi

Since a tithi can exceed 24 hours, sometimes it happens that the tithi prevailing at two successive sunrises is the same.[12] In such as case, two successive solar days are associated with the same tithi. The second solar day is said to be associated with an *adhika tithi*.[13]

Since a tithi can fall short of 24 hours, sometimes it happens that an entire tithi elapses between two successive sunrises. In such as case, it appears as if the second solar day skipped a tithi and is associated with the next but one tithi. Such a skipped tithi is known as a *kṣaya tithi*.[14]

Table 2 – Span of each tithi

śukla pakṣa		kṛṣṇa pakṣa	
tithi	**elongation of the Moon**	**tithi**	**elongation of the Moon**
prathama tithi	> E0° to <= E12°	prathama tithi	>= W162° to < W180°
dvitīya tithi	> E12° to <= E24°	dvitīya tithi	>= W156° to < W168°
tṛtīya tithi	> E24° to <= E36°	tṛtīya tithi	>= W144° to < W156°
caturthī tithi	> E36° to <= E48°	caturthī tithi	>= W132° to < W144°
pañcamī tithi	> E48° to <= E60°	pañcamī tithi	>= W120° to < W132°
ṣaṣṭhī tithi	> E60° to <= E72°	ṣaṣṭhī tithi	>= W108° to < W120°
saptamī tithi	> E72° to <= E84°	saptamī tithi	>= W96° to < W108°
aṣṭamī tithi	> E84° to <= E96°	aṣṭamī tithi	>= W84° to < W96°
navamī tithi	> E96° to <= E108°	navamī tithi	>= W72° to < W84°
daśamī tithi	> E108° to <= E120°	daśamī tithi	>= W60° to < W72°
ekādaśī tithi	> E120° to <= E132°	ekādaśī tithi	>= W48° to < W60°
dvādaśī tithi	> E132° to <= E144°	dvādaśī tithi	>= W36° to < W48°
trayodaśī tithi	> E144° to <= E156°	trayodaśī tithi	>= W24° to < W36°
caturdaśī tithi	> E156° to <= E168°	caturdaśī tithi	>= W12° to < W24°
pūrṇimā tithi	> E162° to <= E180°	amāvāsyā tithi	>= W0° to < W12°

karaṇa

A *karaṇa* is the time taken by the Moon to advance 6° from the Sun as measured by its elongation, starting from amāvāsyā. A karaṇa is half a tithi.

A day in the Hindu calendar

A day in the Hindu calendar is identified by a triplet consisting of cāndramāsa, pakṣa, tithi.

Hindu festivals

As mentioned earlier, tithi is the determinant for all religious activities including festivals. Hence, the dates of almost all Hindu festivals are fixed based on the cāndra māna calendar. Some examples are shown in Table 3.

We have already seen that a tithi can start at any time in the day (or even in the night) but most human activity, including festival celebrations, is governed by the rising of the Sun. Hence, after the tithi starts, it is customary to wait until the next sunrise before performing the religious ceremonies associated with the festival. In general, the heads of various religious communities decide and communicate the exact pūja muhūrta.[15]

We are all aware that on the modern calendar, Hindu festivals fall on different months and days in different years. Yet, it is evident from Table 3 that they always fall on the same māsa-pakṣa-tithi in every cāndra varṣa of the Hindu calendar.[16]

[12] Very soon after sunrise the tithi will change but such a change is ignored as per the convention explained earlier.
[13] adhika tithi, i.e., extra tithi.
[14] kṣaya tithi, i.e., lost tithi.
[15] pūja muhūrta - time of prayer
[16] There are some community-specific exceptions to this statement. For instance, some communities celebrate Krishna Janmashtami according to the Hindu solar calendar.

Table 3 – Hindu festival dates

festival	cāndramāsa		pakṣa	tithi
	amānta	pūrṇimānta		
Chandramana Yugadi	caitra		śukla	prathama
Rama Navami	caitra		śukla	navamī
Akshaya Tritiya	vaiśākha		śukla	tṛtīya
Krishna Janmashtami	śrāvaṇa	bhādrapada	kṛṣṇa	aṣṭamī
Ganesha Chaturthi	bhādrapada		śukla	caturthī
Durgashtami	āśvina		śukla	aṣṭamī
Maha Navami	āśvina		śukla	navami
Vijaya Dashami	āśvina		śukla	daśamī
Dhan Teras	āśvina	kārttika	kṛṣṇa	trayodaśī
Naraka Chaturdashi	āśvina	kārttika	kṛṣṇa	caturdaśī
Lakshmi Puja	āśvina	kārttika	kṛṣṇa	amāvāsyā
Bali Padyami	kārttika		śukla	prathama
Bhai Dooj	kārttika		śukla	dvitīya
Shiva Ratri	māgha	phālguna	kṛṣṇa	caturdaśī
Holi	phālguna		śukla	pūrṇimā

Summary

The cāndra māna of the Hindu calendar defines a set of calendric elements based on the movement of the Moon relative to the Sun. The definitions of these calendric elements are summarized in Table 4.

Table 4 – Mapping from the Hindu calendar to the modern calendar

māna	Hindu calendric element	modern calendric element	astronomical definition
cāndra māna	amāvāsyā	new moon	Elongation of the Moon = 0°
	pūrṇimā	full moon	Elongation of the Moon = 180°
	śukla pakṣa	waxing fortnight	0° > Elongation of the Moon <= 180°
	kṛṣṇa pakṣa	waning fortnight	180° > Elongation of the Moon <= 360°
	cāndramāsa	lunar month	Synodic orbit of the Moon
	cāndra varṣa	lunar year	12 synodic orbits of the Moon
	tithi	lunar day	$1/30^{th}$ of a synodic orbit of the Moon
	karaṇa	half a lunar day	$1/60^{th}$ of a synodic orbit of the Moon

Continued from Cover Page 2

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Dancing with the Cosmos: The Nataraja Statue at CERN

Nataraja in CERN, Switzerland

The Nataraja statue situated in CERN's (the European Organization for Nuclear Research) campus in Geneva, Switzerland stands an extraordinary symbol of cosmic harmony. This bronze sculpture of Shiva as the cosmic dancer represents synergy between ancient wisdom and modern science, embodying creation, preservation, and destruction.

Significance of Nataraja

The Nataraja, or "King of Dance," is a central icon in Indian culture. The statue depicts Lord Shiva performing the *Tandava*, the divine dance that symbolizes the eternal cycles of creation, preservation, and destruction. The figure's dynamic posture, encircled by a ring of flames (*prabhamandala*), represents the rhythmic energy that sustains the cosmos.

Journey to CERN

In 2004, the statue was gifted by Department of Atomic Energy, Government of India to CERN, the European Center for particle physics; celebrating collaboration in particle physics and commemorating the longstanding partnership between India and CERN in scientific research.

Symbolism at CERN

The ~2-meter diameter bronze statue weighing approximately 400 kg reflects a philosophical alignment: Shiva's dance mirrors the cycles of cosmic creation and destruction, akin to the dance (motion) of subatomic particles in quantum mechanics.

The statue, located near CERN's main buildings, serves as a bridge between science and spirituality, reminding scientists and visitors of the philosophical parallels between ancient Indian knowledge and cutting-edge research in particle physics.

The Plaque for Nataraja@CERN

The plaque displayed aside the statue reads as follows:

NATARAJA

Known as the Nataraja, this particular form of the Dancing Shiva is one of the greatest gift to the world of art. Shiva symbolizes "*Shakti*" or life force, in the Hindu Trinity. He is the Creator, the Sustainer and the Destroyer. Beyond the Nataraja's artistic form lies a profound meaning to be comprehended at many levels. The Nataraja is Ananda Tandava shows Him dancing the universe into existence, sustaining it with His rhythm and dancing it to extinction…….

……More recently Fritjof Capra explained that "Modern physics has shown that the rhythm of creation and destruction is not only manifest in the turn of the seasons and in the birth and death of all living creatures, but also in the very essense of inorganic matter", and that "For the modern physicists, then, Shiva's dance is the dace of subatomic matter".

It is indeed as Capra concluded: "Hundreds of years ago, Indian artists created visual images of dancing Shivas in the beautiful series of bronzes. In our time, physicsts have used the most advanced technology to protray the patterns of the cosmic dance. The metaphor of the cosmic dance thus signifies ancient mythology, religious art and modern physics".

Relevance Today

More than art, the Nataraja statue at CERN symbolizes the universality of knowledge, bridging cultural divides. It also is a masterpiece of metallurgical technology of non-ferrous alloy casting which was mastered by Indians several centuries ago.

Photo courtesy:

The photograph is provided by Dr. K R Phaneesh, retired Professor from Department of Mechanical Engineering, M. S. Ramaiah Institute of Technology, Bengaluru, Karnataka, India. The photo was taken during his visit to Switzerland. Along with the Nataraja, in the photo is Dr. Phaneesh who was passionate about Archometallurgy all through his career.