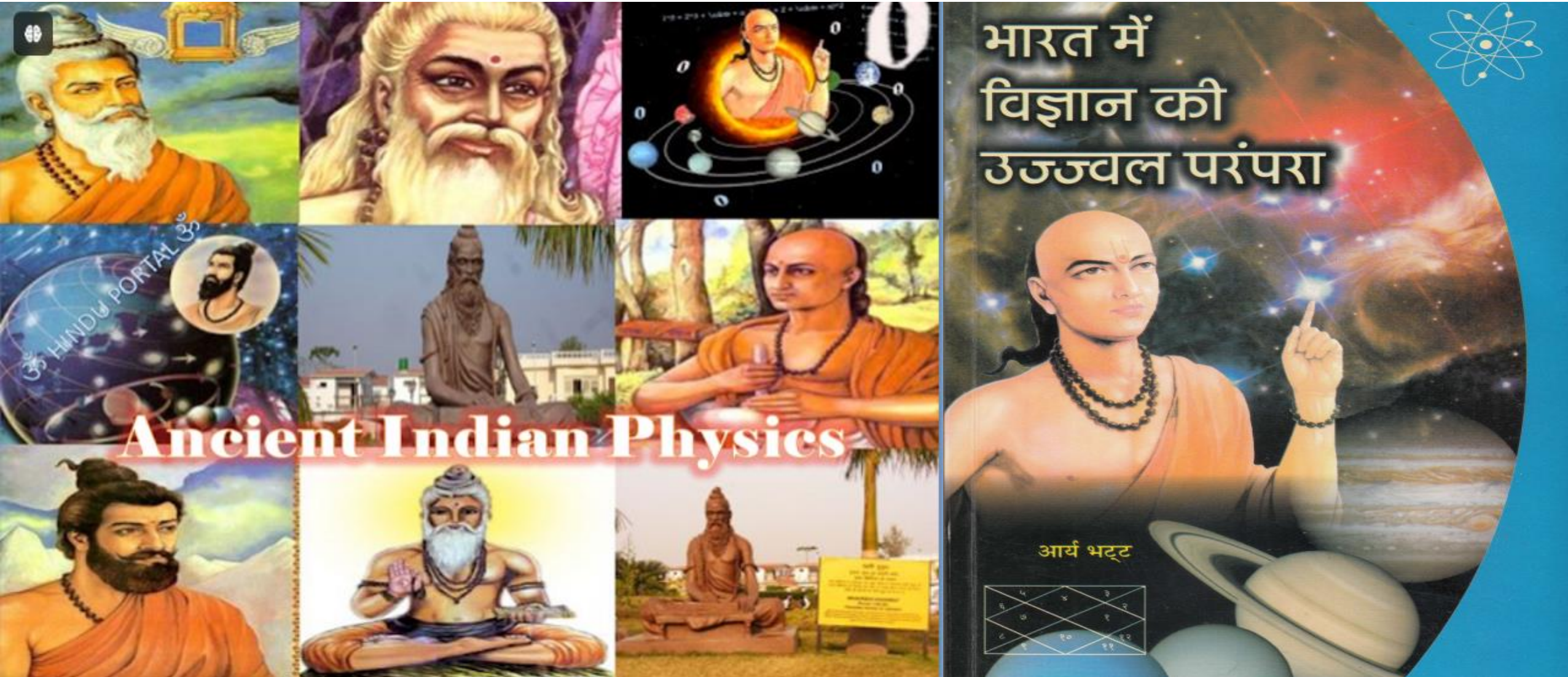


# Achievements of Ancient Indians in Physics



***"India is at the origin of everything; intellectually, religiously or politically where even the Greek heritage seems pale in comparison" : Albert Einstein***

om pūrṇamadaḥ pūrṇamidaṁ pūrṇātpūrṇamudacyate  
pūrṇasya pūrṇamādāya pūrṇamevāvaśiṣyate

ॐ पूर्णमदः पूर्णमिदं पूर्णात्पूर्णमुदच्यते ।  
पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते ॥

That is full, this also is full.  
This Fullness came from that Fullness.  
Though this Fullness came from that Fullness,  
That Fullness remains forever full.

ॐ (परमात्मा) सभी प्रकार से सदा सर्वदा परिपूर्ण है। यह जगत भी उस परब्रह्म से पूर्ण ही है, क्योंकि यह पूर्ण उसी पूर्ण से ही उत्पन्न हुआ है। उस पूर्ण में से पूर्ण को निकाल देने पर भी वह पूर्ण ही शेष रहता है।

जिनका मनन किया जाता है, उनको मंत्र कहा जाता है। ऋषि मंत्रद्रष्टा होते हैं। वेद मानवता का संविधान है। उसमें मंत्रद्रष्टा ऋषियों के मंत्र संकलित हैं। ऋग्वेद अर्चना का वेद है। यजुर्वेद कर्म प्रेरणा का वेद है। सामवेद, संगीत का वेद है। अथर्ववेद रसवेद है। रस जीवनानन्द है। उसे जीवन का वेद कहा जा सकता है।

इस संबंध में यहाँ नोबेल पुरस्कार विजेता श्री अब्दुस सलाम के व्याख्यान का उल्लेख करना उचित होगा, जिसमें यह बताया गया है कि किस प्रकार भारतीय खोज एशिया व यूरोप के क्षेत्रों में फैली। उनके अनुसार—

“बारह सौ वर्ष पूर्व अब्दुल्ला-अल-मंसूर, जो दूसरा अब्बासी खलीफा था, ने अपनी नई राजधानी बगदाद की स्थापना के अवसर पर एक अंतरराष्ट्रीय विज्ञान सम्मेलन का उद्घाटन किया था। उस सम्मेलन में यूनानी, नेस्टोरियन, बेजेंटान, यहूदी और हिंदू विद्वानों को आमंत्रित किया गया था। इस सम्मेलन, जो एक अरब देश में हुआ पहला विज्ञान सम्मेलन था, से इस्लाम से संबंधित विज्ञान का विधिवत् पुनरुद्धार प्रारंभ हुआ। इस सम्मेलन का मुख्य विषय अवलोकन आधारित खगोलविज्ञान था। अल-मंसूर उस समय

उपलब्ध सारणियों से बेहतर खगोल सारणियाँ तैयार करवाना चाहता था। अपनी इच्छा के अनुसार उसने सम्मेलन में पृथ्वी की परिधि नापने के बेहतर तरीके विकसित करने का आदेश दिया। उस समय सम्मेलन में उपस्थित किसी भी खगोलविद् को इसका तरीका ज्ञात नहीं था। पर तभी भारतीय खगोलविद् कंक ने हिंदू संख्याओं पर आधारित अपना आलेख पढ़ा। ये संख्याएँ भारत के बाहर शेष विश्व के लिए अज्ञात थीं। इसके साथ गणितीय सोच की संपूर्ण धारा ही बदल गई।”

## शुल्ब सूत्र

शुल्ब सूत्रों का उल्लेख किए बिना प्राचीन भारतीय गणित का वर्णन पूरा नहीं हो सकता है। ये सूत्र वैदिक काल (1500 ईसा पूर्व से 200 ईसा पूर्व) के दौरान विकसित किए गए थे। जैसा कि नाम से ही स्पष्ट है, ये नियम माप से संबंधित हैं। चूँकि उस समय नापने का काम रस्सियों से किया जाता था, कालांतर में इन रस्सियों को 'शुल्ब' कहा जाने लगा। इन सूत्रों का उद्गम वेदों के काल में ढूँढा जा सकता है और कम-से-कम ईसा पूर्व आठवीं या नौवीं शताब्दी में इनका ज्ञान रहा होगा।

इस संग्रह में जो विचार प्रस्तुत किए गए हैं, वे अवश्य ही यज्ञ अनुष्ठानों से प्रेरित रहे होंगे। आर्य/वैदिक काल में दैवी शक्तियों का आह्वान यज्ञों तथा वैदिक मंत्रों के माध्यम से किया जाता था। इन यज्ञों व इनसे संबंधित गतिविधियों की वेदी आदि से माप संबंधी प्रश्न खड़े हुए होंगे। इसके साथ ही ज्यामिति का जन्म हुआ होगा। शुल्ब सूत्रों में पाइथागोरस का प्रमेय तो है, पर उसका सत्यापन नहीं है, जो कि यूक्लिड की रचना में है। इसके सही परिणाम के अनुसार इन्हें शुल्ब प्रमेय की संज्ञा दी जानी चाहिए।

Sarans of The Sage Jagadha

# VEDANGA JYOTISHAM

(खेदांग ज्योतिषम्)

Dr. Suresh Chandra Mishra  
Jyotishacharya



The most ancient compendium of Vedic astrology.  
A full fledged treatise : an adjunct to the Vedas.

Chinmaya Research Series - 20

## Bhāskarācārya's Līlāvati

Part I  
Arithmetic and Algebra  
Part II

Geometry, First Degree Indeterminate Equation and Permutations

Translated and  
Edited by  
A. B. Padmana

General Edi  
Dilip Kumar

CLASSIC REPRINT SERIES

## THE ĀRYABHATĪYA

A Manual of Astronomy, With the  
Commentary Bhatadipikā of Paramādiçvara



Chinmaya International Founda

Adi Jeshara Nilayam, Veliyened, Ernak

2019

by  
Aryabhata

Chinmay Research Series 10

## ब्रह्मगुप्तगणितम् Brahmaguptaganitam

English Translation  
by  
Venugopal D. Heroor

General Editor  
Dr. Dilip Kumar Rana



Chinmaya International Foundation Shodha Samsthan

Ernakulam, Kerala, India

2014

## सूर्यसिद्धान्तः

कमलाकरभट्टविरचितं सौरशास्त्रसंस्कृतभाष्य एवं  
'रावेष्टरी' नामोद्दिष्टोद्भव्यरूपपाठिभूषितम्



हिन्दोपाध्यायकारः

पं. सत्यदेवशर्मा

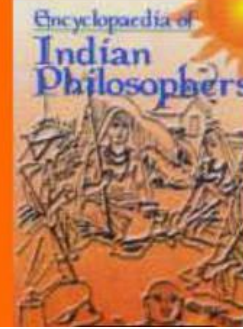
“ज्ञानं न पुरुष तंत्रं किंतु वस्तु तंत्रं”

Knowledge is not dependent on the person,  
but on the object.

“ Ancient Indian theories were brilliant imaginative explanations of the physical structure of the world, and in a large measure, agreed with the discoveries of modern physics. ”

- A.L. Basham,  
Australian Indologist

[http://www.unitedindia.com/laws\\_of\\_atoms.htm](http://www.unitedindia.com/laws_of_atoms.htm)



*Ancient Indian theories lacked an empirical base, but they were brilliant imaginative explanations of the physical structure of the world, and in a large measure, agreed with the discoveries of modern physics.*

– A.L. Basham, Australian Indologist

The two schools of Nyaya and Vaisheshika are two important Vedic texts which throw light on contemporary science, especially astronomy and physics, in the Vedic era.

Aastik + Nastik = Vedic philosophy

## Aastik philosophy

- ★ Nyaya
- ★ Vaisheshika
- ★ Sankhya
- ★ Yoga
- ★ Mimansha
- ★ Vedanta

## Nastik philosophy

- ★ Buddhism
- ★ Jainism
- ★ Charvaka
- ★ Ajivika
- ★ Agyana

# ANCIENT INDIAN CONTRIBUTIONS TO PHYSICS

Theory/concept	Indian origin	Western origin
<u>Velocity of light</u>	Rig Veda – Sayan bhasya (1400 AD)	19 <sup>th</sup> century
<u>Trans – saturnean planets</u>	Mahabharat (3000 BCE)	17 <sup>th</sup> century
<u>Another solar system travel</u>	Bhagwad puran (4000 BCE)	To be researched
<u>Tachyon – faster than light</u>	Mundakopanishad (7000 BCE)	20 <sup>th</sup> century
<u>Elliptical order of planets</u>	Rig Veda	Johannes Kepler
<u>Black holes</u>	Vishwaruchi (7000 BCE)	18 <sup>th</sup> century
<u>Infra red Band</u>	Sulohita (1200 BCE)	17 <sup>th</sup> century
<u>Robot</u>	Samarangam Sutradhara (1050 AD)	16 <sup>th</sup> century
<u>Electrical cells</u>	Agastya Samhita (4000 BCE)	Daniel (1836)
<u>Monsoon at summer solstice</u>	Rig veda	18 <sup>th</sup> century
<u>Nuclear energy</u>	Mundakopanishad – Spullingni (6000 BCE)	19 <sup>th</sup> century
<u>Gravitation</u>	Prashnopanishad (6000 BCE)	Isaac Newton (15 <sup>th</sup> century)

भाग अ - परिचय			
कार्यक्रम: प्रमाण पत्र	कक्षा: बी.एससी. प्रथम वर्ष	वर्ष: 2021	सत्र: 2021-2022
विषय - भौतिक विज्ञान			
1.	पाठ्यक्रम का कोड	S1-PHYS <sup>2</sup> (21)	
2.	पाठ्यक्रम का शीर्षक	यांत्रिकी और पदार्थ के सामान्य गुण (प्रश्न पत्र 2) (2)	
3.	पाठ्यक्रम का प्रकार :(कोर कोर्स/इलेक्टिव/जेनेरिक इलेक्टिव/वोकेशनल/.....)	कोर कोर्स	
4.	पूर्वपिक्षा (Prerequisite) (यदि कोई हो)	इस कोर्स का अध्ययन करने के लिए छात्र के पास 12 वीं कक्षा में भौतिकी विषय होना चाहिए।	
5.	पाठ्यक्रम अध्ययन की परिलब्धियां (कोर्स लर्निंग आउटकम) (CLO)	<ol style="list-style-type: none"> <li>1. पाठ्यक्रम छात्रों को भौतिक निकायों के व्यवहार के बारे में विचार कर विकसित करने के लिए सशक्त करेगा।</li> <li>2. यह दैनिक जीवन में हमारे आस-पास की सभी वस्तुओं का गति से संबंधित बुनियादी अवधारणा को प्रदान करेगा।</li> <li>3. यह छात्रों को विज्ञान और प्रौद्योगिकी के विभिन्न अनुप्रयुक्त क्षेत्र खासकर मैकेनिकल इंजीनियरिंग के क्षेत्र में नींव का निर्माण करने में सक्षम/ सहायक होगा।</li> <li>4. छात्र भौतिक विज्ञान में विभिन्न समस्याओं को हल करने के लिए गणितीय तरीकों का बुनियादी ज्ञान प्राप्त कर सकेंगे।</li> <li>5. छात्र ऊर्जा और द्रव्यमान के बीच संबंध, सापेक्षता प्रभाव को समझने में सक्षम होंगे।</li> </ol>	
6.	क्रेडिट मान	4	
7.	कुल अंक	अधिकतम अंक: 25+75	न्यूनतम उत्तीर्ण अंक: 33



भाग ब - पाठ्यक्रम की विषयवस्तु		
व्याख्यानों की कुल संख्या (घंटे में): 60		
इकाई	विषय	व्याख्यानों की संख्या
I	<p>ऐतिहासिक पृष्ठभूमि एवं गणितीय भौतिकी</p> <p>1. ऐतिहासिक पृष्ठभूमि:</p> <p>1.1. भारत और भारतीय संस्कृति के संदर्भ में गणित और यांत्रिकी का एक संक्षिप्त ऐतिहासिक पृष्ठभूमि विवरण।</p> <p>1.2. विज्ञान और समाज में बराहमिहिर और विक्रम साराभाई के प्रमुख योगदान के साथ उनकी एक संक्षिप्त जीवनी।</p> <p>2. गणितीय भौतिकी:</p> <p>2.1. अदिश और सदिश क्षेत्र, अदिश क्षेत्र का ग्रेडिएंट और भौतिक महत्व।</p> <p>2.2. सदिश समाकलन: रेखीय, क्षेत्रीय एवं आयतन समाकलन, एक सदिश क्षेत्र का डाइवर्जेंस और इसका भौतिक महत्व, गॉस डाइवर्जेंस प्रमेय।</p> <p>2.3. सदिश क्षेत्र का कर्ल और भौतिक महत्व, स्टोक्स एवं ग्रीन का प्रमेय, उपरोक्त विषयों पर आधारित संख्यात्मक प्रश्न।</p> <p>सार बिंदु (की बर्ड)/टैग: अदिश क्षेत्र, सदिश क्षेत्र, सदिश समाकलन, ग्रेडिएंट, डाइवर्जेंस, कर्ल।</p>	12
II	<p>दृढ़ एवं विरूप्य निकायों की यांत्रिकी</p> <p>1. दृढ़ पिण्ड यांत्रिकी :</p> <p>1.1. कणों का निकाय और दृढ़ पिण्ड की अवधारणा, बल आघूर्ण, द्रव्यमान केंद्र: द्रव्यमान केंद्र की स्थिति, द्रव्यमान केंद्र की गति, रेखिक और कोणीय संवेग का संरक्षण उदाहरण सहित, सिंगल स्टेज और मल्टीस्टेज रॉकेट।</p> <p>1.2. घूर्णन गति और जड़त्व आघूर्ण की अवधारणा, जड़त्व आघूर्ण प्रमेय: योग प्रमेय, लम्बवत अक्ष प्रमेय, समांतर अक्ष प्रमेय, एकसमान आयताकार पटल, वृताकार चकती, ठोस सिलेंडर एवं ठोस गोले के जड़त्व आघूर्ण की गणना।</p> <p>2. विरूप्य पिंडों की यांत्रिकी :</p>	12

Part B - Content of the Course		
Total number of Lectures (in hours): 60		
Unit	Topics	Number of Lectures
I	<p><b>Historical background and Mathematical Physics</b></p> <p><b>1. Historical background:</b></p> <p>1.1. A brief historical background of mathematics and mechanics in the context of India and Indian culture.</p> <p>1.2. A brief biography of Varahamihira and Vikram Sarabhai with their major contribution to science and society.</p> <p><b>2. Mathematical Physics:</b></p> <p>2.1. Scalar and vector fields, Gradient of a scalar field and its physical significance.</p> <p>2.2. Vector integral: line integral, surface integral and volume integral, Divergence of a vector field and its physical significance, Gauss divergence theorem.</p> <p>2.3. Curl of a vector field and its physical significance, Stokes and Green's theorem, Numerical problems based on the above topics.</p> <p><b>Keywords/Tags:</b> Scalar field, Vector field, Vector integral, Gradient, Divergence, Curl.</p>	12
II	<p><b>Mechanics of Rigid and deformable bodies</b></p> <p><b>1. Rigid body mechanics:</b></p> <p>1.1. System of particles and concept of Rigid body, Torque, centre of mass: position of the centre of mass, Motion of the centre of mass, Conservation of linear &amp; angular momentum with examples, Single stage and multistage rocket.</p> <p>1.2. Rotatory motion and concept of moment of inertia, Theorems on moment of inertia: theorem of addition, theorem of perpendicular axis, theorem of parallel axis, Calculation of moment of inertia of rectangular lamina, disc, solid cylinder, solid sphere.</p> <p><b>2. Mechanics of deformable bodies:</b></p> <p>2.1. Hook's law, Young's modulus, Bulk modulus, Modulus of rigidity and Poisson's ratio, Relationship between various elastic moduli.</p> <p>2.2. Possible values of Poisson's ratio, Finding Poisson's ratio of rubber in the laboratory, Torsion of a cylinder, Strain energy of twisted cylinder.</p> <p>2.3. Finding the modulus of rigidity of the material of a wire by Barton's method, Torsional pendulum and Maxwell's needle, Searl's method to find <math>Y</math>, <math>\eta</math> and <math>\sigma</math> of the material</p>	12

	<p>1.1. हुक का नियम, यंग प्रत्यास्थता गुणांक, आयतन प्रत्यास्थता गुणांक, दृढ़ता गुणांक एवं पॉइसन अनुपात, विभिन्न प्रत्यास्थता गुणांकों में संबंध।</p> <p>1.2. पॉइसन निष्पत्ति के संभावित मान, प्रयोगशाला में रबर का पॉइसन अनुपात ज्ञात करना, बेलन की ऐंठन, ऐंठित बेलन की विकृत ऊर्जा।</p> <p>1.3. बार्टन की विधि, ऐंठन लोलक एवं मैक्सवेल सुई द्वारा तार के पदार्थ का दृढ़ता गुणांक ज्ञात करना, सर्ल विधि द्वारा तार के पदार्थ का <math>Y</math>, <math>n</math> एवं <math>\sigma</math> ज्ञात करना, दण्ड का बंकन, कैंटीलीवर, दोनों सिरों पर आधारित तथा मध्य में भारित दण्ड।</p> <p>सार बिंदु (की बर्डी)/टैग: दृढ़ पिण्ड, द्रव्यमान केंद्र, जड़त्व आघूर्ण, पॉइसन निष्पत्ति।</p>	
III	<p>तरल यांत्रिकी</p> <p>1. पृष्ठ तनाव :</p> <p>1.1. अंतर-आणविक बल और स्थितिज ऊर्जा वक्र, ससंजक और असंजक बल।</p> <p>1.2. अंतर-आणविक बलों के आधार पर पृष्ठ तनाव की व्याख्या, पृष्ठ ऊर्जा, पृष्ठ तनाव पर ताप तथा अशुद्धियों का प्रभाव, पृष्ठ तनाव के कुछ अन्य उदाहरण।</p> <p>1.3. स्पर्श कोण, द्रव के दोनों वक्रिय सतहों के बीच दाबान्तर, साबुन के बुलबुले के अंदर अतिरिक्त दबाव, केशिकात्व, द्रव के पृष्ठ तनाव का मापन: केशिका उन्नयन विधि, जैगर की विधि।</p> <p>2. श्यानता :</p> <p>2.1. आदर्श और श्यान तरल, धारारेखीय तथा विक्षुब्ध प्रवाह, सातत्य समीकरण, घूर्णी और अघूर्णी प्रवाह, प्रवाहित तरल की ऊर्जा, अश्यान तरल की गति का यूलर का समीकरण एवं इसका भौतिक महत्व।</p> <p>2.2. बरनौली प्रमेय और उसके अनुप्रयोग (बही: स्त्राव वेग, हवाई जहाज के पंखों की आकृति, मैगनस प्रभाव, फिल्टर पम्प, बुन्सन बर्नर)।</p> <p>2.3. तरल का श्यान प्रवाह, केशिकानली के माध्यम से तरल का प्रवाह, प्वाइजुले सूत्र का निगमन एवं सीमाएं, स्टोक सूत्र, श्यान द्रव में निरने वाले गोलाकार पिंड की गति।</p>	12

	<p>of a wire, Bending of beam, Cantilever, Beam supported at its ends and loaded in the middle.</p> <p><b>Keywords/Tags:</b> Rigid body, Centre of mass, Moment of inertia, Poisson's ratio.</p>	
III	<p><b>Fluid mechanics</b></p> <p>1. <b>Surface Tension:</b></p> <p>1.1. Inter-molecular forces and potential energy curve, force of cohesion and adhesion.</p> <p>1.2. Surface tension, Explanation of surface tension on the basis of intermolecular forces, Surface energy, Effect of temperature and impurities on surface tension, Daily life application of surface tension.</p> <p>1.3. Angle of contact, The pressure difference between the two sides of a curved liquid surface, Excess pressure inside a soap bubble, Capillarity, determination of surface tension of a liquid - capillary rise method, Jaeger's method.</p> <p>2. <b>Viscosity:</b></p> <p>2.1. Ideal and viscous fluid, Streamline and turbulent flow, Equation of continuity, Rotational and irrotational flow, Energy of a flowing fluid, Euler's equation of motion of a non-viscous fluid and its physical significance.</p> <p>2.2. Bernoulli's theorem and its applications (Velocity of efflux, shapes of wings of airplane, Magnus effect, Filter pump, Bunsen's burner).</p> <p>2.3. Viscous flow of a fluid, Flow of liquid through a capillary tube, Derivation of Poiseuille's formula and limitations, Stocks formula, Motion of a spherical body falling in a viscous fluid.</p> <p><b>Keywords/Tags:</b> Inter-molecular force, Surface tension, Angle of contact, Capillarity, Viscosity, Euler's equation, Poiseuille's formula.</p>	12
IV	<p><b>Gravitational potential and Central forces</b></p> <p>1. <b>Gravitational potential:</b></p> <p>1.1. Conservative and non-conservative force field, Conservation of energy in motion under the conservative and non-conservative forces, Potential energy.</p> <p>1.2. Conservative force, Conservation of energy, Gravitational potential and gravitational potential energy, Gravitational potential and intensity of gravitational field due to a uniform spherical shell and a uniform solid sphere.</p> <p>1.3. Gravitational self-energy, Gravitational self-energy of a uniform spherical shell and a uniform solid sphere.</p>	12

	सार बिंदु (की बर्डी)/टैग: अंतर-आणविक बल, पृष्ठ तनाव, स्पर्श कोण, केशिकात्व, श्यानता, यूलर का समीकरण, प्वाइजुले सूत्र।	
IV	<p><b>गुरुत्वीय विभव और केंद्रीय बल</b></p> <p><b>1. गुरुत्वीय विभव:</b></p> <p>1.1. संरक्षी और असंरक्षी बल क्षेत्र, संरक्षी और असंरक्षी बलों के अंतर्गत गति में ऊर्जा का संरक्षण, स्थितिज ऊर्जा।</p> <p>1.2. संरक्षी बल की यांत्रिक ऊर्जा का संरक्षण, गुरुत्वीय विभव और गुरुत्वीय स्थितिज ऊर्जा, एक समान गोलीय खोल और एक समान ठोस गोले के कारण गुरुत्वीय विभव और गुरुत्वीय क्षेत्र की तीव्रता।</p> <p>1.3. गुरुत्वीय स्व-ऊर्जा, एक समान गोलीय खोल और एक समान ठोस गोले की गुरुत्वीय स्व ऊर्जा।</p> <p><b>2. केन्द्रीय बल:</b></p> <p>2.1. केन्द्रीय बल के अंतर्गत गति, केन्द्रीय बल की संरक्षी विशेषताएं।</p> <p>2.2. केन्द्रीय बल के अंतर्गत दो कणों के निकाय की गति, समानीत द्रव्यमान की अवधारणा, पॉज़िट्रो-नियम एवं हाइड्रोजन का समानीत द्रव्यमान।</p> <p>2.3. व्युत्क्रम-वर्ग केन्द्रीय बल में कणों की गति, खगोलीय पिंडों की गति और केप्लर के नियमों की व्युत्पत्ति।</p> <p>2.4. प्रत्यास्थ तथा अप्रत्यास्थ प्रकीर्णन (प्रारंभिक जानकारी)।</p> <p>सार बिंदु (की बर्डी)/टैग: संरक्षी बल क्षेत्र, गुरुत्वीय विभव, गुरुत्वीय स्व-ऊर्जा, केन्द्रीय बल, समानीत द्रव्यमान, प्रकीर्णन।</p>	12
V	<p><b>सापेक्षकीय यांत्रिकी और खगोल भौतिकी</b></p> <p><b>1. सापेक्षकीय यांत्रिकी:</b></p> <p>1.1. निर्देश तंत्र, गैलीलियन रूपान्तरण, माइकलसन - मॉर्ले प्रयोग, सापेक्षता के विशिष्ट सिद्धांत की अभिधारणाएं।</p> <p>1.2. लॉरेंट्ज रूपान्तरण, घटनाओं की समकालिकता और घटनाओं का क्रम, लंबाई संकुचन, समय विस्तारण, वेगों का सापेक्षकीय परिवर्तन, द्रव्यमान का वेग के साथ परिवर्तन।</p> <p>1.3. द्रव्यमान-ऊर्जा तुल्यता और इसका प्रायोगिक सत्यापन।</p>	12

	<p><b>2. Central forces:</b></p> <p>2.1. Motion under Central forces, Conservative characteristics of central forces.</p> <p>2.2. The motion of a two particles system in Central force, Concept of reduced mass, Reduced mass of positronium and hydrogen.</p> <p>2.3. Motion of particles in an inverse-square central force, Motion of celestial bodies and derivation of Kepler's laws,</p> <p>2.4. Elastic and inelastic scattering (elementary idea).</p> <p><b>Keywords/Tags:</b> Conservative force field, Gravitational potential, Gravitational self-energy, Central force, reduced mass, Scattering.</p>	
V	<p><b>Relativistic Mechanics and Astrophysics</b></p> <p><b>1. Relativistic Mechanics:</b></p> <p>1.1. Frame of references, Galilean transformation, Michelson - Morley experiment.</p> <p>1.2. Postulates of special theory of relativity, Lorentz Transformation, Simultaneity and order of events, Length contraction, Time dilation, Relativistic transformation of velocities, Variation of mass with velocity.</p> <p>1.3. Mass-energy equivalence and its experimental verification.</p> <p><b>2. Astrophysics:</b></p> <p>2.1. Introduction to the Universe, Properties of the Sun, Concept of Astronomical Distance.</p> <p>2.2. Life cycle of a stars, Chandrasekhar Limit, H-R diagram, Red giant star, White dwarf star, Neutron star, Black hole,</p> <p>2.3. Big Bang Theory (elementary idea).</p> <p><b>Keywords/Tags:</b> Transformation, Mass-energy equivalence, Astronomical distance, Chandrasekhar limit, Black hole.</p>	12
	<p><b>2. खगोल भौतिकी:</b></p> <p>2.1. ब्रह्मांड का परिचय, सूर्य के गुण, खगोलीय दूरी की अवधारणा।</p> <p>2.2. तारों का जीवन चक्र, चंद्रशेखर सीमा, एच-आर आरेख, लाल दानव तारा, सफेद बौना तारा, न्यूट्रॉन तारा, ब्लैक होल।</p> <p>2.3. बिग बैंग सिद्धांत (प्रारंभिक धारणा)।</p> <p>सार बिंदु (की बर्डी)/टैग: रूपान्तरण, द्रव्यमान-ऊर्जा तुल्यता, खगोलीय दूरी, चंद्रशेखर सीमा, ब्लैक होल।</p>	

Program	Class	Subject	Session	Course Code	Course Title	Course Type
UG Certificate	B.Sc. I Year	Physics	2025-26	S1-Physics 2T	Mechanics and General Properties of Matter	Core
UNIT	Existing Syllabus		Recommendations		Modified Syllabus	
I						
II						
III						
IV						
V						

**Subhash Kak and Raja Ram Mohan Roy studied Vedic texts and brought out some interesting aspects of physics described in various Vedas, as summarized below.**

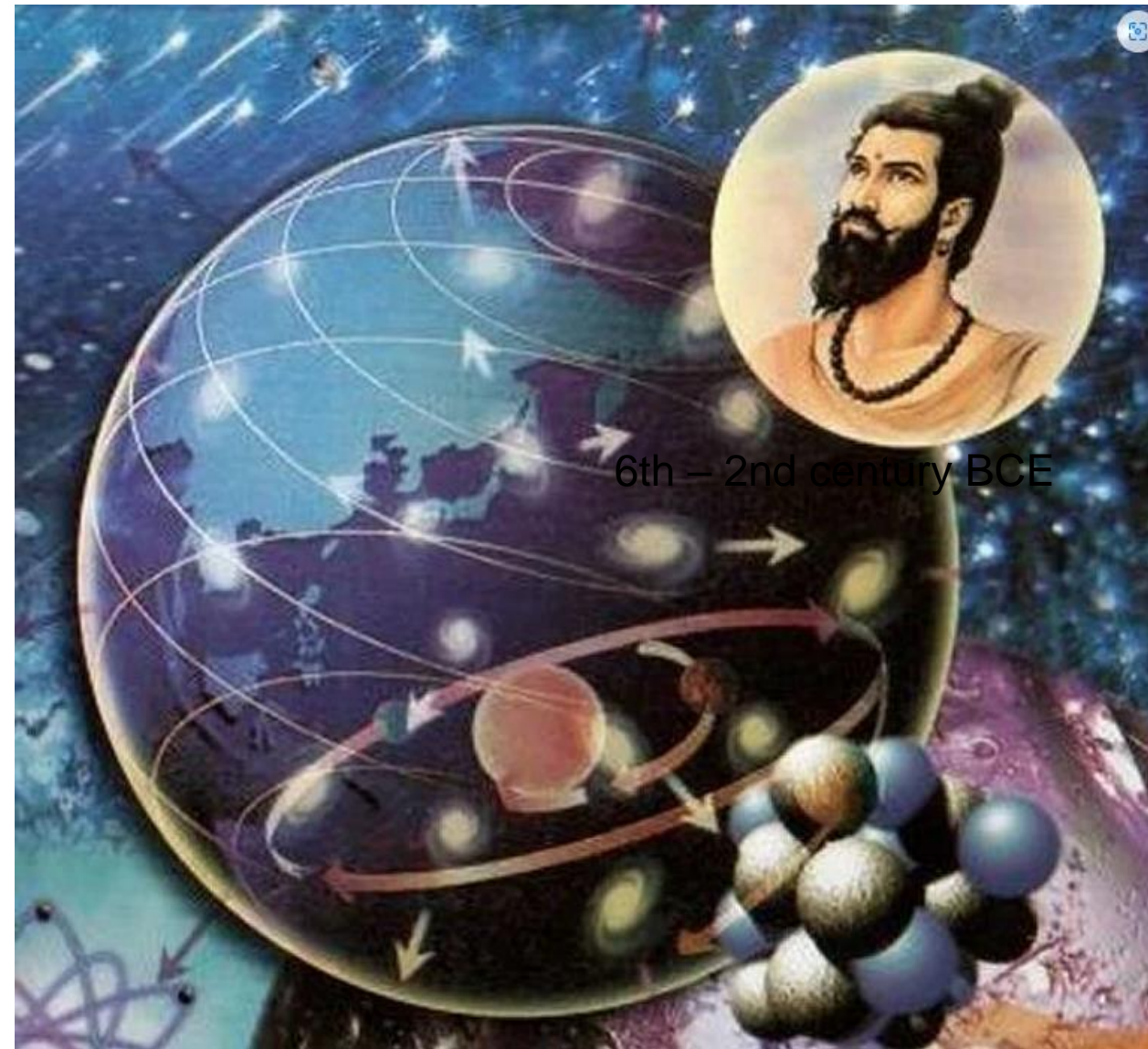
1. Energy and mass are equivalent.
2. Both heat and light radiation are a manifestation of energy.
3. Light comprises discrete particles.
4. A particle also has a wave nature, called the wave-particle duality now.
5. Radiation has wave nature.
6. A wave can be absorbed, reflected or refracted by certain materials.
7. Space-time constitutes a frame of reference in which the physical universe exists.
8. All the physical elements are made of discrete and distinct paramanus (atoms).

## Matter:

- The Nyaya-Vaisheshika system recognized nine elements or substances, namely **earth, water, fire, air, ether, time, space, soul, and mind** that are responsible for the formation of the universe as well as the evolution of life. Atomic particles take part in the physical and chemical reactions between different substances (**Padarthadharm Sangraha**).
- In the process of creation of matter, energy is conserved (Samkhya). The property of the matter (Satva), the principal activity of matter (Rajas) and inactivity (inertia) of matter are recognized in Samkhya philosophy. Integration and disintegration of matter are basically atomic phenomena [6-8].
- It is well known now that matter exists in four different forms: solid (**Earth**), liquid (**Water**), gas (**Air**), and plasma (Fire).

6th – 2nd century BCE

# A Theory of Atom



## Maharishi Kanada – Father Of Atomic Theory

- One of the notable scientists of the ancient India was Kanad who is said to have devised the atomic theory centuries before John Dalton was born.
- He speculated the existence of *anu* or a small indestructible particles, much like an atom.
- He also stated that *anu* can have two states – absolute rest and a state of motion.
- He further held that atoms of same substance combined with each other in a specific and synchronized manner to produce *dvyanuka* (diatomic molecules) and *tryanuka* (triatomic molecules).

## 1) First Law of Motion -

*Kanad* : वेगः निमित्तविशेषात् कर्मणो जायते

**Newton:** The change of motion is due to impressed force

## 2) Second Law of Motion -

*Kanad* : वेग निमित्तापेक्षात् कर्मणो जायते नियत्दिक् क्रिया प्रबंध हेतु

**Newton:** The change of motion is proportional to the motive force

impressed and is made in the direction of the right line in which the force is impressed

## 3) Third Law of Motion -

*Kanad* : वेगः संयोगविशेषाविरोधी

**Newton:** To every action there is always an equal and opposite reaction



# Bhagwat Puran

## Chapter 11

मैत्रेय उवाच

Maitreya  
(name)

Said

चरमः सद्विशेषाणामनेकोऽसंयुतः सदा ।

Ultimate

Many of the good features are uncombined

Always

Multiple

Unmixed

परमाणुः स विज्ञेयो नृणामैक्यभ्रमो यतः ॥ १ ॥

Atom

To be understood  
or heard or learned

Bending  
men

The illusion of  
unity of men

Unity Mistake

Because

ANCIENT INDIAN TRADITION  
AND MYTHOLOGY

Vol. 7

BHĀGAVATA  
PURĀNA  
PART I

*Tr. & Annot. by*  
DR. G.V. TAGARE



PART II



BHĀGAVATA PURĀNA

AITM  
Vol. 8

ANCIENT INDIAN TRADITION  
AND MYTHOLOGY

Vol. 7

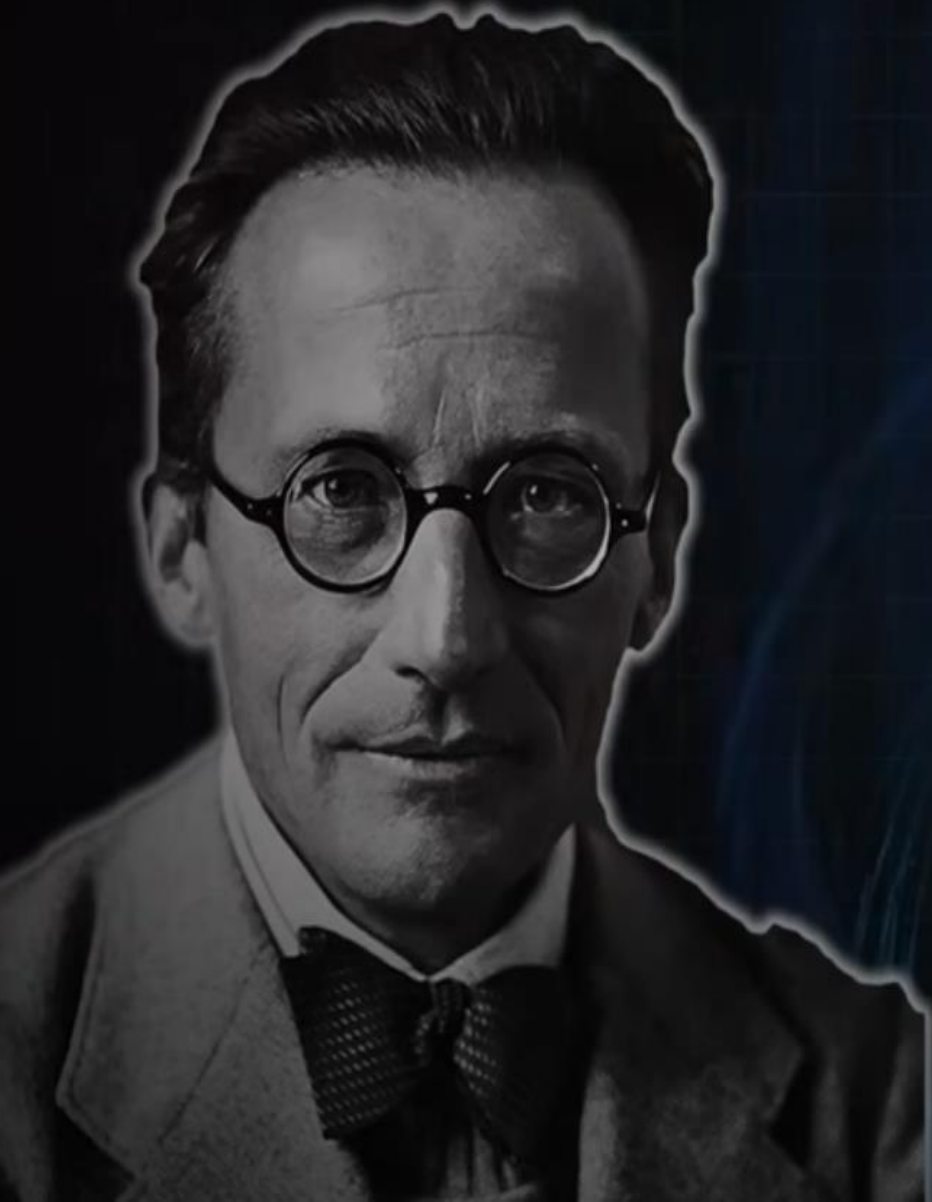


J. L. Shastri  
Vedic Texts Translator



G. V. Tagare  
Former Member of the  
Maharashtra Education Service





The unity and continuity of Vedanta are reflected in the unity and continuity of wave mechanics. This is entirely consistent with the Vedanta conc\_

Erwin Schrödinger

## THE VEDANTIC VISION

And thy spirit's highest fiery flight  
Is satisfied with likeness and with image.

GOETHE

but is in a certain sense the *whole*; only this whole is not so constituted that it can be surveyed in one single glance. This, as we know, is what the Brahmins express in that sacred, mystic formula which is yet really so simple and so clear:

*For man ask, this is you. Oh, again, in such words as 'I am in the east and in the west, I am below and above, I am this whole world'.*

Then you can throw yourself flat on the ground, stretched out upon Mother Earth, with the certain conviction that you are one with her and she with you. You are as firmly established, as invulnerable as she, indeed a thousand times firmer and more invulnerable. As surely as she will engulf you tomorrow, so surely will she bring you forth anew to new striving and suffering. And not merely "some day" — now, today, every day she is bringing you forth, not once but thousands upon thousands of times, just as every day she engulfs you a thousand times over. For eternally and always there is only now, one and the same now; the present is the only thing that has no end.

It is the essence of this truth (of which the individual is seldom conscious in his actions) which underlies all morally valuable activity. It brings a man of nobility not only to risk his life for an end which he recognizes or believes to be good but — as the case — to lay down in full awareness, even when there is no prospect of

ERWIN  
SCHRÖDINGER



MY VIEW  
OF THE  
WORLD



## THE VEDANTIC VISION

And thy spirit's highest fiery flight  
Is satisfied with likeness and with image.

GOETHE

For philosophy, then, the real difficulty lies in the spatial and temporal multiplicity of observing and thinking individuals. If all events took place in *one* consciousness, the whole situation would be extremely simple. There would then be something given, a simple datum, and this, however otherwise constituted, could scarcely present us with a difficulty of such magnitude as the one we do in fact have on our hands.

I do not think that this difficulty can be logically resolved, by consistent thought, within our intellects. But it is quite easy to express the solution in words, thus: the plurality that we perceive is only *an appearance*) it is not real. Vedantic philosophy, in which this is a fundamental dogma, has sought to clarify it by a number of analogies, one of the most attractive being the many-faceted crystal which, while showing hundreds of little pictures of what is in reality a single existent object, does not really multiply that object. We intellectuals of today are not accustomed to admit a pictorial analogy as a philosophical insight; we insist on logical deduction. But, as against this, it may perhaps be possible for logical thinking to disclose at least this much: that to grasp the basis of phenomena through logical thought may in all probability be impossible, since logical thought is itself a part of phenomena, and wholly involved in them; and we may ask ourselves whether, in that case, we are obliged to deny ourselves the

of consciousness, viz, the awakened state, the dreaming state, the state of dreamless deep sleep, and the superconscious state. These four states of consciousness are called here the four feet of Brahman.

*And this Atman also is Brahman.*—This is one of the *Mahavakyas* or the sacred formulæ which indicate the unity of the individual and the Supreme Soul. And this is the Mahavakya of the Atharvaveda.]

जागरितस्थानो बहिःप्रज्ञः सप्ताङ्ग एकोनविंशतिमुखः

स्थूलभुक् वैश्वानरः प्रथमः पादः ॥ ३ ॥

जागरितस्थानः whose field is waking life बहिःप्रज्ञः whose consciousness is outward सप्ताङ्गः seven-limbed एकोनविंशतिमुखः nineteen-faced स्थूलभुक् Enjoyer of the gross वैश्वानरः Vaiswanara (*lit.* where all beings live and who is in all beings) प्रथमः first पादः foot.

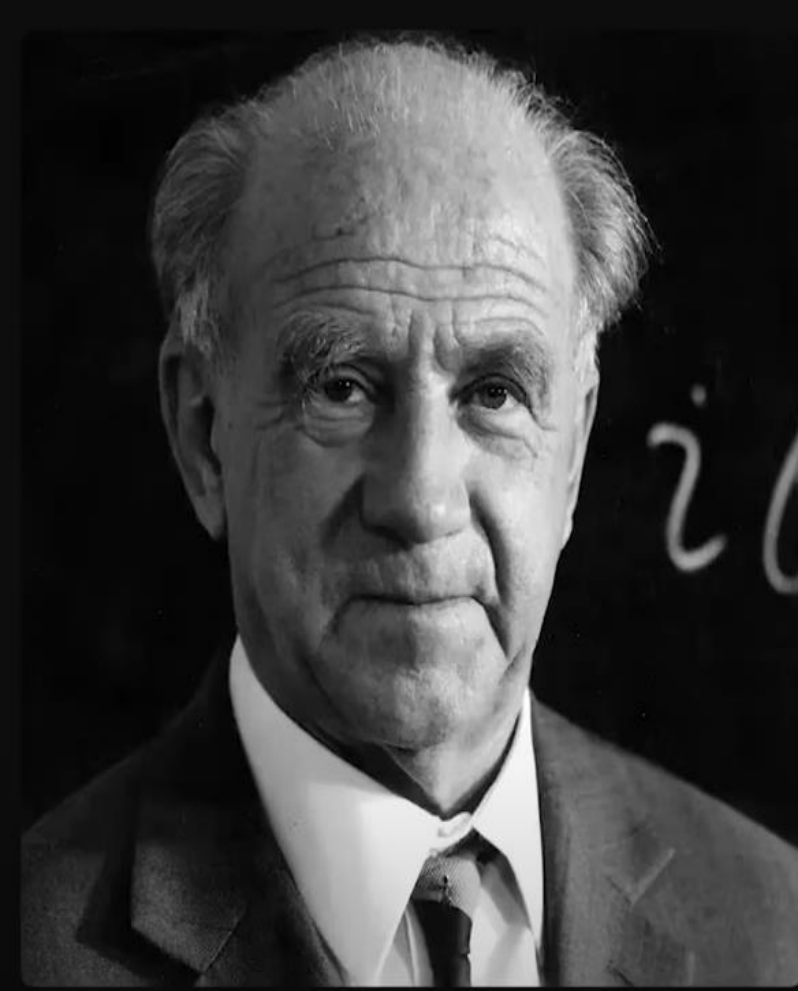
# Brahman

Whole universe  
as an entity

God

Atman=Brahman

Material world is an illusion



Werner Heisenberg

$$\Delta x \Delta p \geq \frac{\hbar}{2}$$

# Uncertainty Principle

## THE HINDU

Heisenberg learnt the Uncertainty Principle from the philosophy of Veda of this country. Heisenberg came to India in 1929 and met Rabindranath Tagore. In this meeting he discussed with Tagore different topics related to Vedic philosophy and theoretical physics."

modern scientific cosmology". Will Shamseer say that this scientific epiphany is a myth?

Muhammad Darah Shikoh, son of Mughal Emperor Shah Jahan, disclosed "After gradual research; I have come to the conclusion that long before all heavenly books, God had revealed to the Hindus, through the Rishis of yore, of whom Brahma was the Chief, His four books of knowledge, the Rig Veda, the Yajur Veda, the Sama Veda, and the Atharva Veda. The Quran itself made veiled references to the Upanishads as the first heavenly book and the fountainhead of the ocean of monotheism." Will Shamseer say it is a myth?

Niels Bohr, Heisenberg and Schrödinger regularly read Vedic texts. Heisenberg stated: "Quantum theory will not look ridiculous to people who have read Vedanta." Vedanta is the conclusion of a Vedic thought. Schrödinger, in speaking of a universe in which particles are represented by wave functions, said: "The unity and continuity of Vedanta are reflected in the unity and continuity of wave mechanics. This is entirely consistent with the Vedanta concept of All in One."

A similar view is expressed by Hans-Peter a German physicist who made his contribution to the field of nuclear and quantum physics. He was so influenced by Hinduism that he dedicated 33 years of his life to studying and mastering the Vedas and Upanishads. He once said that when he teaches Quantum Physics, he feels like he's giving a lecture on Vedanta philosophy.

The famous Danish physicist and Nobel Prize Laureate Niels Bohr was a follower of the Vedas. He said, "I go into the Upanishads to ask questions."



# PHYSICS IN ANCIENT INDIAN LITERATURE

- 1. Battery Benjamin Franklin (1752 AD) gave practical information about electricity. The British scientist John Frederick Daniel (1836 AD) carried this information, and the battery was Invented. In India this concept was known thousands of years ago.
- Agastya Samhita, composed by the great sage Agastya describes thus –

14<sup>th</sup> century  
AD

**Sansthapya Mrinmaye Patre Tamrapatram Susanskritam  
Chhadyechhikhigriven Chardrarbhih Kashthpamsubhih.  
Dastaloshto Nidhatavyah Pardachhaditastah  
Sanyogajjayte Tejo Mitravarunsangyitam.**

—(Agastya Samhita)<sup>14</sup>

“Take an earthen pot, place a copper sheet, and put the *shikhigreeva* in it. Then, smear it with wet sawdust, mercury and zinc. Then, if you join the wires, it will give rise to *Mitravarunashakti*.”

# PHYSICS IN ANCIENT INDIAN LITERATURE

Take an earthen pot. Keep a Copper sheet and Copper Sulphate in it. Put some wet saw dust between them. Then Mercury amalgamated Zinc plate should then be placed on top of the saw dust. By their contact electricity is produced.

On the basis of the above description, Based on the above description, Mr. PP Holle, Professor of Engineering in Nagpur and his friends built a cell on this basis and measured it by digital multimeter. Its open circuit voltage was 1.38 volts and short circuit current was 23 milli amperes. This successful experiment was demonstrated on 7 August 1990 by the Swadeshi Science Revision Institute, Nagpur. Thus the concept is validated. The sage Agstya probably belonged to 1000BCE .

# GENERATION OF ELECTRICITY IN A CELL



## Shloka:

Dastalosto nidhatatvah paradacchaditastatah |  
Utpadayati tanmitram samyogastamradastayoh ||

## Meaning:

Lumps of gems generate electricity by the union of copper and zinc

## Shloka:

Samyogajjayate tejo yanmitramiti kathyate |  
Evam satanam kumbhanam samyogah karyakrtsmrtah |

## Meaning:

By the union, energy is boen which is referred to as the sun,  
Such a union of hundred of cells isremembered as the doer  
Of generating electricity

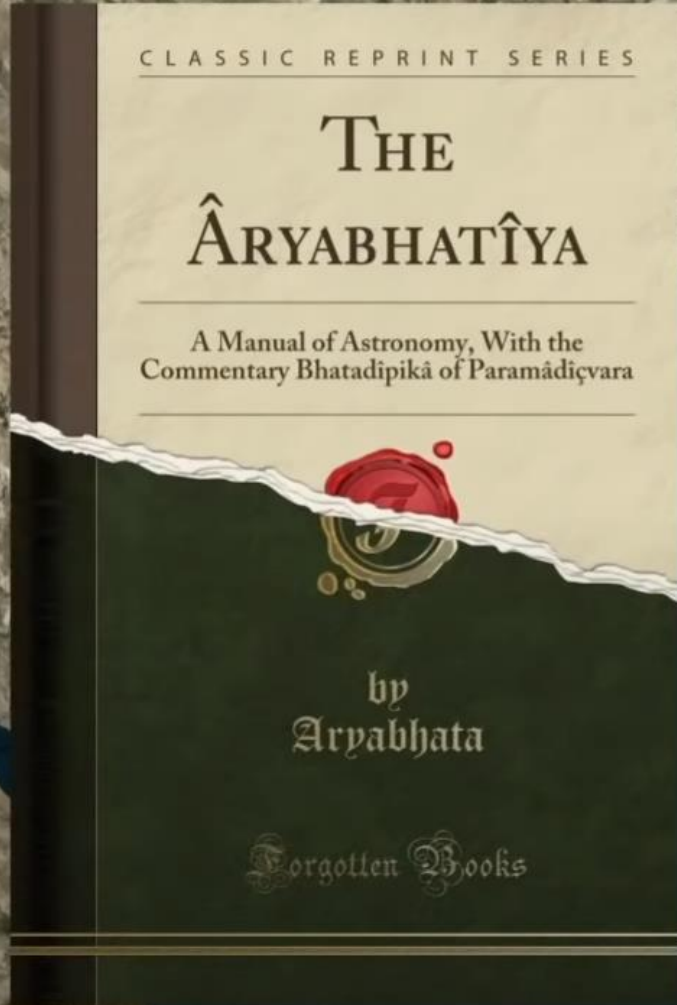
Source: Agastya-samhita (14th Century AD)



Baudhayan



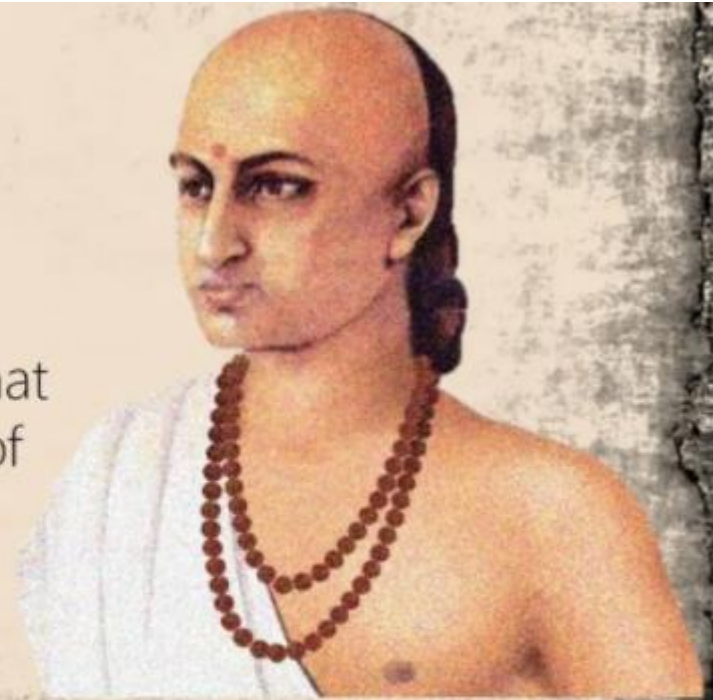
Aryabhata



**In the 5th century AD, at the age of 23 Aryabhata authored a book named Aryabhattiya which was a collection of advanced mathematical concepts.**

# $\pi$

The great Indian mathematician Aryabhat calculated the value of pi at 3.1416

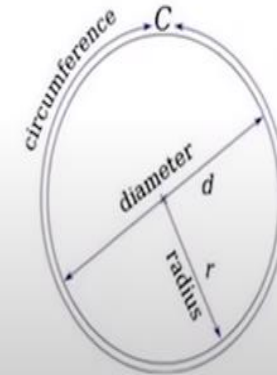


Aryabhata (476-529)

## Area of Circle – By Aryabhata

समपरिणाहस्य अर्धं विष्कम्भ अर्धहतं एव वृत्तफलम् । - आर्यभटीयम् २.७ (१)

"Half of the circumference, multiplied by the semi-diameter (i.e. radius), certainly gives the area of a circle"



$$\begin{aligned}\text{Area of circle} &= \frac{1}{2} \times 2\pi r \times r \\ &= \pi r \times r \\ &= \pi r^2\end{aligned}$$

As Aryabhata explained the irrational Pi ( $\pi$ ) in his book Aryabhatiya as he writes, caturadhikaṃ śatamaṣṭagaṇaṃ dvāṣaṣṭistathā sahasrāṇāmayutadvayaviṣkambhasyāsanno vṛttapariṇāhaḥ

it means, “add 4 to 100, multiply by 8, and then add 62,000. By utilizing this rule, the circumference of a circle with the diameter of 20,000 can be approached”.

Âryabhata was a brilliant scientist who lived at Kusumapura (probably today's Patna). In 499 CE, he wrote the *Âryabhatîya*, a brief but extremely important treatise of mathematics and astronomy, at the age of 23! A few highlights:

### Âryabhata about the earth:

- The earth is a rotating sphere: the stars do not move, it is the earth that rotates.
- Its diameter is 1,050 *yojanas*. Its circumference is therefore  $1050 \times 13.6 \times \pi = 44,860$  km, about 12% off. (1 *yojana* = 8,000 human heights) 40,007.863 km

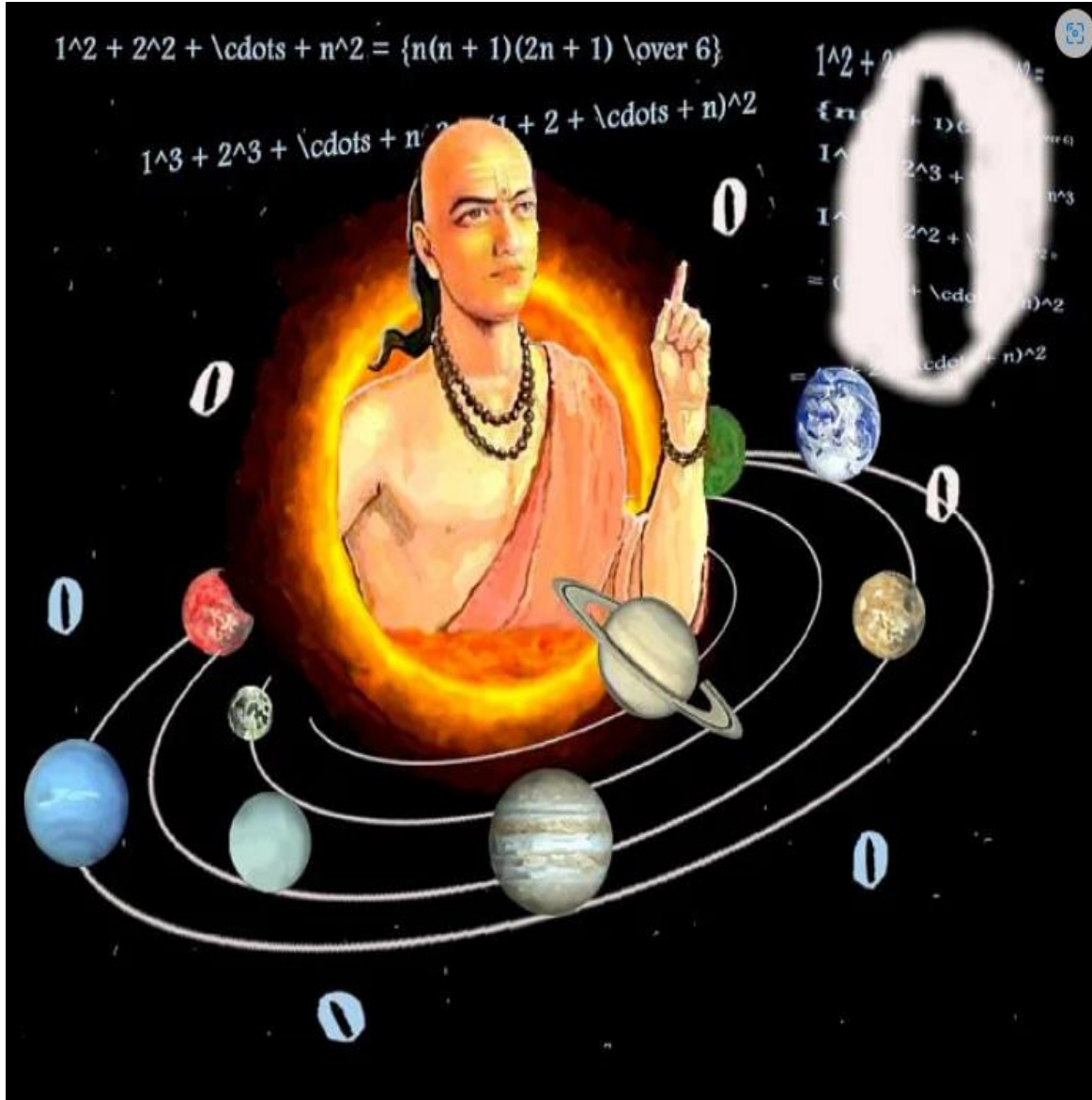


### Âryabhata on eclipses:

“The moon eclipses the sun, and the great shadow of the earth eclipses the moon.”

(*Âryabhatîya*, IV.37)

# The Heliocentric Theory



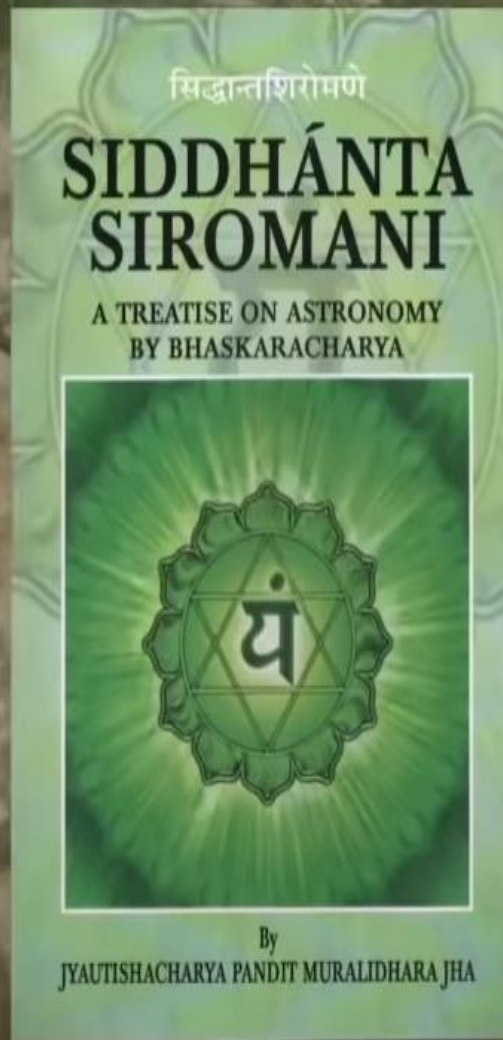
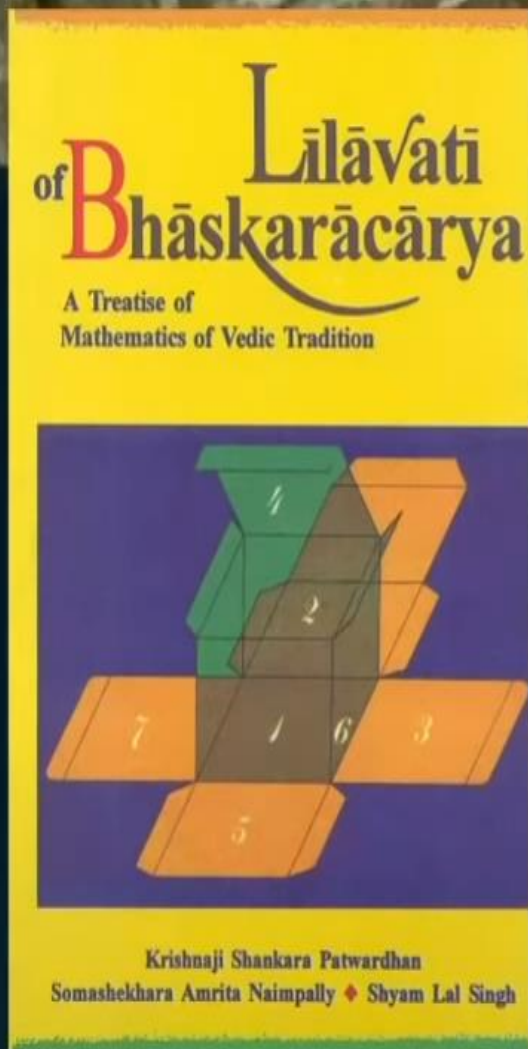
- Mathematicians of ancient India often applied their mathematical knowledge to make accurate astronomical predictions. The most significant among them was Aryabhata whose book, *Aryabhatiya*, represented the pinnacle of astronomical knowledge at the time.
- He correctly propounded that the Earth is round, rotates on its own axis and revolves around the Sun i.e the heliocentric theory. He also made predictions about the solar and lunar eclipses, duration of the day as well as the distance between the Earth and the Moon.



Baudhayan was the first one ever to arrive at several concepts in Mathematics, which were later rediscovered by the western world. The value of pi was first calculated by him. As you know, pi is useful in calculating the area and circumference of a circle. What is known as Pythagoras theorem today is already found in Baudhayan's Sulva Sutra, which was written several years before the age of Pythagoras

**Budhyan was the first Mathematician to calculate the value of Pi. He also provided equations similar to Pythagoras theorem in his book Sulva Sutra, much before Pythagoras.**





In 12th century AD, Bhaskaracharya authored Siddhanta Shiromani, a masterpiece of Arithmetic, Algebra, Spheres & Mathematics of Planets.

**Bhaskaracharya** Bhaskaracharya was the leading light of 12th Century.

His famous book Siddanta Shiromani is divided into four sections: Lilavati (Arithmetic), Beejaganit (Algebra), Goladhyaya (Sphere) and Grahaganit (mathematics of planets).

A 12 century born, Indian mathematician and Astronomer Bhaskaracharya or **Bhaskara II should be credited for the formulation of laws of gravity.**

Bhaskaracharya – The Concept Of Gravity



## गुरुत्वाकर्षण का सिद्धांत

- गुरुत्वाकर्षण का सिद्धांत भी 1200 वर्ष पहले भारतीय गणितज्ञ भास्कराचार्य ने बताया था। उन्होंने यह स्पष्ट किया था कि गुरुत्वाकर्षण एक सार्वभौम बल है जिसके प्रभाव से कोई द्रव्यमान अन्य द्रव्यमान की ओर आकर्षित होता है। सूर्य का गुरुत्वाकर्षण बल सभी ग्रहों को उनकी कक्षाओं में बनाए रखता है। पृथ्वी भी गुरुत्वाकर्षण बल के कारण सूर्य का परिभ्रमण करती है। उन्होंने मौलिक रूप से आर्यभट्ट द्वारा लिखा गए 'सूर्य सिद्धांत' में भी गुरुत्वाकर्षण के नियमों का लेख किया था।
- यहां सूर्य सिद्धांत से कुछ श्लोक हैं जो बताते हैं कि गुरुत्वाकर्षण कैसे कार्य करता है:
  - मारुचलो भूराखला स्वभावतो यतो
  - विचित्रवत्वस्तु शक्त्यः
    - - (सिद्धांत शिरोमणि गोलाध्याय-भुवनकोश -5)

**Marucchalo bhoorachala swabhaawato yato**

**Vichitravataavastu shaktyah**

**—(Siddhant Shiromani Golaadhyay-Bhuvankosh -5)**

**Aakrishtishaktishch mahi taya yat khashtham Guru swabhimukham swashaktya.  
Aakrishyate tatpatateev bhaati Samesamantaat kwa patatviyam khe.**

—(*Siddhanta Shiromani Golaadhyay-Bhuvankosh*—6)

आकृतिशक्तिश्च महि ताय यत् खस्तं गुरु स्वाभिमुखम् स्वशक्त्य ।

आकृष्यते तत्पटतेव भाति सममंतात क्वा पटत्वयम खे।

प्रत्येक वस्तु पृथ्वी की कार्याकर्षण शक्ति के कारण पृथ्वी पर गिरती है। यह शक्ति ही सूर्य, पृथ्वी, चंद्रमा और नक्षत्रों को आकाश में खड़ा रखती है।

This means that the earth has the power of attraction. So, it attracts heavy things towards itself and because of the attraction, they fall to the ground. But, when an equal power or strength pulls from all directions in the sky, then how can a thing fall? This means that the planets stay in the sky without any support because the gravitational powers of the various planets maintain the balance.

आज हम कहते हैं कि न्यूटन ने सबसे पहले पृथ्वी की गुरुत्वाकर्षण शक्ति की खोज की थी, लेकिन उनसे 550 साल पहले भास्कराचार्य ने इसके बारे में बताया था।

# सूर्यसिद्धान्त

(संस्कृत पाठानुवाद, विज्ञानभाष्य सहित आचार्य  
रङ्गनाथविश्वचितया गृहार्थप्रकाशिका व्याख्या)

(भाग-एक)



विज्ञानभाष्यकार  
महावीर प्रसाद श्रीवास्तव

29. This Brahma-egg is hollow; within it is the universe, consisting of earth, sky, etc.; it has the form of a sphere, like a receptacle made of a pair of caldrons.

30. A circle within the Brahma-egg is styled the orbit of the ether (syomata): within that is the revolution of the asterisms (ôba), and likewise, in order, one below the other.

31. Revolve Saturn, Jupiter, Mars, the sun, Venus, Mercury, and the moon; below, in succession, the Perfected (siddha), the Possessors of Knowledge (vidyâdhara), and the clouds.

The order of proximity to the earth in which the seven planets are here arranged is, as noticed above (i. 51-62), that upon which depends the succession of their regency over the days of the week, and so also the names of the latter. So far as the first three and the last are concerned, it is a naturally suggested arrangement, which could hardly fail to be hit upon by any nation having sufficient skill to form an order of succession at all: the order in which the sun, Mercury, and Venus are made to follow one another is, on the other hand, a matter of more arbitrary determination, and might have been with equal propriety, for aught we can see, reversed or otherwise varied. Of the supernatural beings called the "possessors of knowledge" (vidyâdhara) we read only in this verse: the "perfected" we find again below, in verse 40, as inhabitants of a city on the earth's surface.

32. Quite in the middle of the egg, the earth-globe (bhûgôla) stands in the ether, bearing the supreme might of Brahma, which is of the nature of self-supporting force.

33. Seven cavities within it, the abodes of serpents (nâga) and demons (âsura), endowed with the savor of heavenly plants, delightful, are the interterranean (pâtâla) earths.

34. A collection of manifold jewels, a mountain of gold, is Meru, passing through the middle of the earth-globe, and protruding on either side.

35. At its upper end are stationed, along with Indra, the gods, and the Great Sages (maharshi); at its lower end, in like manner, the demons (asura) have their place—each the enemy of the other.

26. Now having created things of different natures by compounding in various proportions the best, middling, and worst qualities (i. e. principles of truth, passion, and darkness) BRAHMÂ made the universe containing Gods and animate and inanimate things.

27 and 28. Having created (Gods and animate and inanimate things) successively according to their qualities and actions, the able BRAHMÂ arranged the planets, asterisms, stars, the earth, worlds, Gods, Demons, men, and SIDDHAS, regularly at proper places and times in the way mentioned in the VEDAS.

29. This BRAHMÂNDA (the golden egg sacred to BRAHMÂ) is hollow: in this (the worlds) BRÛA, BHUVAS &c., are situated. It is like a SAMPUÛA (a casket) formed by two KATKAS (frying vessels joined mouth to mouth) and of a spherical shape.

Order of the orbits of the stars and planets situated one below the other.

30 and 31. The circumference of the middle of the BRAHMÂNDA is called VYOMAKAKSHÂ (the orbit of heaven).

In it (i. e. BRAHMÂNDA) all the stars revolve. Beneath them Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon revolve one below the other, beneath them the SIDDHA, the VIDYÂDHARA and clouds are situated.

Answers to the questions stated in 2nd S'IKHÂ.

32. The terrestrial globe, possessing BRAHMÂ'S most excellent power of steadiness, remains in space at the centre of the BRAHMÂNDA (which is) all around.

33. The seven PÂTALA BRÛMIS or infernal regions formed by the concave strata of the earth are very beautiful, being inhabited by NÂGAS (serpents) and ÂSURAS (demons) and having the liquors of the divine plants (which shine by their own light).

The position of Meru.

34. The golden mountain Meru, containing heaps of various precious stones, passes through the middle of the terrestrial globe (as an axis projecting on both sides at the poles).

मध्ये समन्ताद्दण्डस्य भूगोला व्योम्नि तिष्ठति ।

बिभ्राणः परमां शक्तिं ब्रह्मणो धारणात्मिकाम् ॥ ३२ ॥

**1.2 The first principle of gravity was stated by “Bhaskaracharya” and “not Newton.”**

Bhaskaracharya stated the laws of gravity in the book Surya Siddhanta in 11<sup>th</sup> century. Thus, the law exists even before the birth of Sir Isaac Newton (Newton was born in the 16<sup>th</sup> century). Here are some of the slokas from his book Surya Siddhanta that mentions how gravitation work:

*“madhye samantandasya bhugolo vyomni tisthati  
bibhranah paramam saktim brahmano dharanatmikam”*

[Surya Sidhantha 12<sup>th</sup> Chapter 32 Sloka]

**This means:** The spherical earth stands at the centre of earth in space due to the dharanatmikam sakti which prevents earth from falling away and helps it to stand firm.

*“akrsta saktisca mahi taya yat svastham guru svabhimukham svasaktya  
akrsyate tatpatativa bhati same samantat kva patatviyam khe”*

[Sidhanta Shiromani, Bhuvanakosa, 6<sup>th</sup> Sloka]

30. A circle within the Brahma-egg is styled the orbit of the ether (*vyoman*) : within that is the revolution of the asterisms (*bha*) ; and likewise, in order, one below the other,

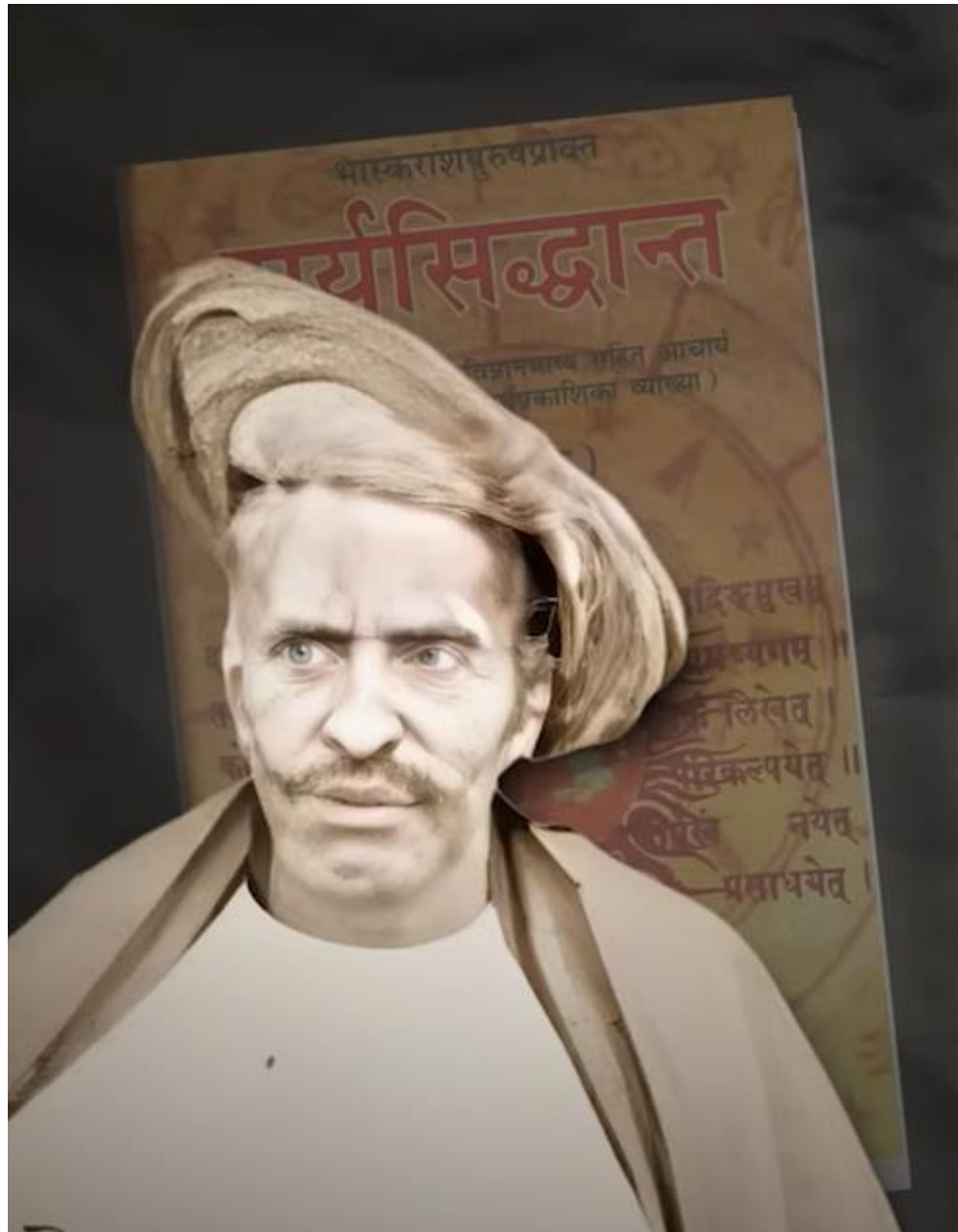
31. Revolve Saturn, Jupiter, Mars; the sun, Venus, Mercury, and the moon; below, in succession, the Perfected (*siddha*), the Possessors of Knowledge (*vidyādhara*), and the clouds.

The order of proximity to the earth in which the seven planets are here arranged is, as noticed above (i. 51-52), that upon which depends the succession of their regency over the days of the week, and so also the names of the latter. So far as the first three and the last are concerned, it is a naturally suggested arrangement, which could hardly fail to be hit upon by any nation having sufficient skill to form an order of succession at all: the order in which the sun, Mercury, and Venus are made to follow one another is, on the other hand, a matter of more arbitrary determination, and might have been with equal propriety, for aught we can see, reversed or otherwise varied. Of the supernatural beings called the " possessors of knowledge " (*vidyādhara*) we read only in this verse: the " perfected " we find again below, in verse 40, as inhabitants of a city on the earth's surface.

32. Quite in the middle of the egg, the earth-globe (*bhūgola*) stands in the ether, bearing the supreme might of Brahma, which is of the nature of self-supporting force.

33. Seven cavities within it, the abodes of serpents (*nāga*) and demons (*āsura*), endowed with the savor of heavenly plants, delightful, are the interterranean (*pātāla*) earths.

34. A collection of manifold jewels, a mountain of gold



mate things) successively according to their qualities and actions, the able BRAHMÁ arranged the planets, asterisms, stars, the earth, worlds, Gods, Demons, men, and SIDDHAS, regularly at proper places and times in the way mentioned in the VEDAS.

29. This BRAHMÁNDA (the golden egg sacred to BRAHMÁ) is hollow: in this (the worlds) BHÚR, BHUVAR &c., are situated. It is like a SAMPUṬA (a casket) formed by two KAṬAKHAS (frying vessels joined mouth to mouth) and of a spherical shape.

Order of the orbits of the stars and planets situated one below the other.

30 and 31. The circumference of the middle of the BRAHMÁNDA is called VYOMAKAKSHÁ (the orbit of heaven).

In it (i. e. BRAHMÁNDA) all the stars revolve. Beneath them Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon revolve one below the other, beneath them the SIDDHA, the VIDYÁDHARA and clouds are situated.

Answers to the questions stated in 2nd S'LOKA.

32. The terrestrial globe, possessing BRAHMÁ's most excellent power of steadiness, remains in space at the centre of the BRAHMÁNDA (which is) all around.

33. The seven PÁTÁLA BHÚMIS or infernal regions formed by the concave strata of the earth are very beautiful, being inhabited by NÁGAS (serpents) and ASURAS (demons) and having



**7. Distance of the various planets**<sup>70</sup> – Aryabhatta has also written about the distances of the various planets from the sun. It is very much similar to the modern measurements. Today, the sun is at a distance of  **$1.5 \times 10^8$  kms** = 15 crore kms from the earth. It is called **AU** or Astronomical Unit. On the basis of this proportion, we can make the following list:

Planet	Aryabhatta's measurement	Today's measurement
Mercury	0.375 AU	0.387 AU
Venus	0.725 AU	0.723 AU
Mars	1.538 AU	1.523 AU
Jupiter	5.16 AU	5.20 AU
Saturn	9.41 AU	9.54 AU

16 वीं सदी में रहने वाले तुलसीदास सबसे सटीक अनुमान दे सकते थे जो 20वीं सदी के खगोलविदों के अनुमान के बहुत करीब है। बचपन में हनुमान सूर्य को पका हुआ आम समझकर उसे पकड़ने के लिए कूद पड़े। हनुमान चालीसा का 18वाँ श्लोक कहता है

## युग-सहस्र-योजना परा भानु लील्यो ताहि मधुर फल जानु

भगवद गीता के अनुसार, ब्रह्मा के एक दिन को कल्प कहा जाता है और यह 1000 युगों के बराबर होता है और इसके बाद इतनी ही अवधि की रात होती है।

सहस्र-युग-पर्यन्तमहार्यब्रह्मणोविदुः  
रात्रि युग-सहस्रान्तमते 'हो-रात्रि-विदोजानः।'

1 युग = 4,320,000 वर्ष = 12000 दिव्य वर्ष

(1 दिव्य वर्ष = मानव गणना के अनुसार 360 वर्ष)

हनुमान चालीसा के उपरोक्त श्लोक के अनुसार, सूर्य और पृथ्वी के बीच की दूरी है:

**युग-सहस्र-योजना = 12000 x 1000 योजन**

योजन दूरी का एक वैदिक माप है और लगभग 8 मील के बराबर होता है (14वीं सदी के विद्वान परमेश्वर, दृग्गणिता प्रणाली के प्रवर्तक के अनुसार)। और 1 मील = 1.60934 किलोमीटर.

हनुमान चालीसा में प्रस्तुत गणना के अनुसार सूर्य और पृथ्वी के बीच की दूरी 12000 x 1000 योजन = 96 मिलियन मील **153.6 मिलियन किमी**, जो आधुनिक वैज्ञानिकों की गणना के काफी करीब है।

**Earth / Current distance from sun 149.60 million km**

# PHYSICS IN ANCIENT INDIAN LITERATURE

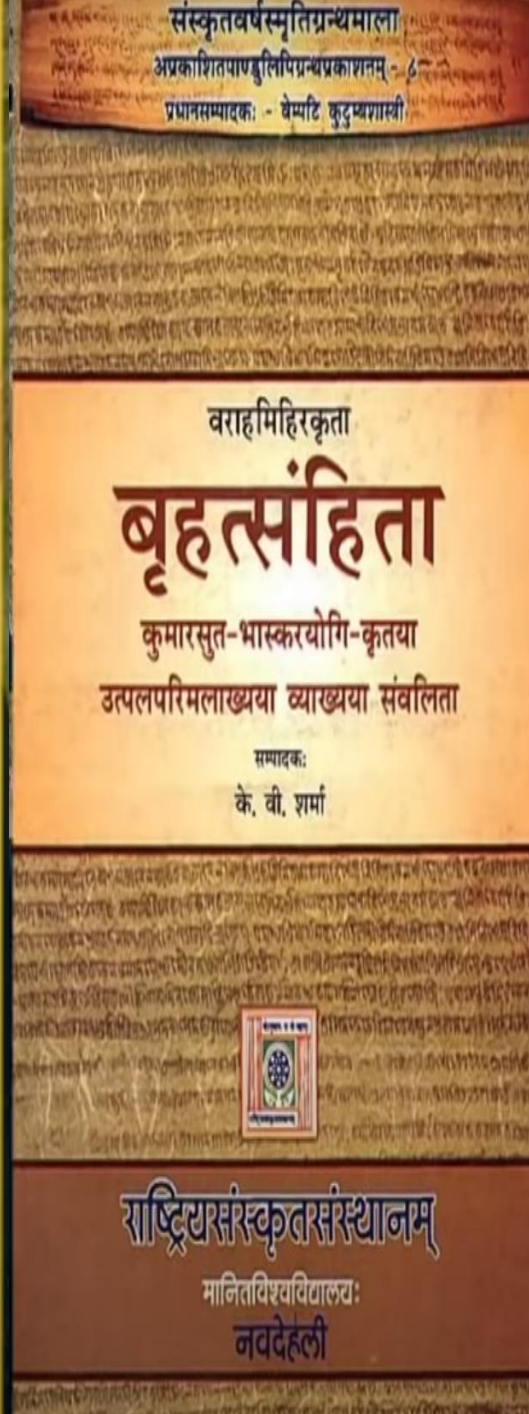
- Solar System and Motion of Planets
- Please see these Mantras from Rig Veda 10/149/1
- 1. सविता यन्त्रैः पृथिवीमरम्णादस्कम्भने सविता द्यामुद्वहत् ।
- अश्वमिवाधुक्षदधुनिमन्तरिक्षमतूर्ते बद्धं सविता समुद्रम् ॥
- *“The sun has tied Earth and other planets through attraction and moves them around itself as if a trainer moves newly trained horses around itself holding their reins.”*

# The Panchasiddhantika

The Astronomical Work Of  
Varaha Mihira (1889)

**VARAHMIHIR**

G. Thibaut  
Mahamahopadhyaya Dvivedi



He authored a book  
Panchsiddhantika  
which describes  
5 Astronomical  
systems

# Motion:

- The Vaisheshika recognized motion as an inherent property of matter. Prasastapada (600AD) classified motion into twelve different types [4] that include rectilinear motion, curvilinear motion (gamana), rotatory motion (bhramana), and vibratory motion (spandana).
- He differentiated between impressed motion (samskara) and the three types of samskara – vega (momentum/persistent tendency), bhavana (mental impression), and stithisthapaka (elasticity).
- Prasastapada believed that when a body falls under the influence of gravity, the motion is due to gravity as well as samskara. Samskara persists till the motion lasts.
- Since the Vaisheshika did not explore the subject further, they did not arrive at the logical expression which was later given mathematically by Newton as  $F=m.a$ .

# Space and time:

- Vachaspati Misra (840AD) in his Nyayasuchi-Nibandha, states that the position of a particle in space could be calculated by assuming that its motion takes place relative to another particle and measuring it **along three (imaginary) axes**. Eight centuries later Rene Descartes (French, 1644AD) introduced the Cartesian coordinate system which is still in use.
- Bhaskaracharya (1150AD), in his Siddhanta Shiromani and Ganitadhyaya, gave an expression for the average velocity of an object as  $v=s/t$  where 't' is the time taken by it to cover a distance 's' with the average velocity 'v'.
- According to Bhaskaracharya, the instantaneous position of a planet is determined from its position at two successive instants of time, assumed to move with a uniform velocity.

## **Elasticity:**

Deformation of a substance by application of a force and regaining of its original shape after the force is withdrawn were well known in ancient India. The Vaisheshikas were familiar with the concept of elasticity (stithisthapaka) as a type of samskara, and the property of dense materials comprising closely packed molecules. Displacement of these molecules gives rise to the property of elasticity of a substance which makes its material to regain its original shape after the applied force is withdrawn.

## **Fluidity:**

Ancient Indians described a fluid as “An extremely subtle, supernatural fire that imparts the property of fluidity to water atoms”. Prasastapada visualized fluidity as a property of water, earth and fire, expressed by the act of flowing just as gravity manifests by falling down of a body towards the earth’s surface.

## **Viscosity:**

Viscosity (sandrata) is the property that causes cohesion between water molecules and the smoothness of water itself. It was thus seen as an operative cause of conjunction. According to physics, viscous fluids can hold the fluid molecules together withstanding finite velocities.

## Surface Tension:

The cause of surface tension/capillary motion (abhisarpana) was unknown and unseen (adrshita) but the ancient Indians were fully aware of this phenomenon. Sankara Misra (1500AD) gave two examples of this phenomenon in his treatise Upaskara as follows:

1. The ascent of sap from root to stem and eventually to the branches and leaves of a plant, and
2. The ability of liquids to penetrate through pores of porous vessels, such as earthen pots made of clay.



- How planets move around Sun
- Size of Earth
- Reasons of Eclipse
- Gravity
- Speed of light
- Age of Universe
- Time dilation
- Atomic theory
- Quantum physics

# Speed of Light

## Speed of Light from ancient Hindu Rig Veda



Blog by Xx Yy

### || The Vedic Texts ||

#### 'Speed of Light' in Vedas

We know that speed of light is nearly  $3 \times 10^8$  m/sec or 186282 miles/s. But do you know approximately same value for velocity of light has been calculated in Vedas. Let us discuss about such Vedic verses.

## speed of light define in vedas

👤 Eternal hindu 🕒 March 01, 2019 🗨️ 0

Modern Science's great achievement is Danish astronomer and Olaus Roemer's speed of light. It discovered in the 16th century.

 **The Indian EXPRESS**  
JOURNALISM OF COURAGE

Explained Opinion Entertainment Sports Politics Lifestyle Tech Education Investigations Research Videos Audio

TRENDING Mini Crosswords Latest News UPSC Special Asia Cup Premium Stories Express et al Health Specials

News / Cities / Mumbai / Soon, in engineering syllabus: 'Rig Veda accurately mentions speed of light, theory of gravitation'

## Soon, in engineering syllabus: 'Rig Veda accurately mentions speed of light, theory of gravitation'

Scientists protest endorsement of book published by Bharatiya Vidya Bhavan

Quora

🔍 Search for questions, people, and topics

Was the speed of light already mentioned in the Hindu Vedas, and many other cosmic truths? How come?

speed of light given by vedas

तरणिविश्वदर्शतो जयोतिष्कदसि सूर्य ।  
विश्वमा भासिरोचनम ॥

The fourth verse of the Rigvedic hymn 1:50 (50th hymn in book 1 of rigveda) is as follows: तरणिविश्वदर्शतो जयोतिष्कदसि सूर्य ।  
विश्वमा भासिरोचनम | taraNir vishvadarshato jyotishkrdasi surya | vishvamaa bhaasirochanam ||

which means: "Swift and all beautiful art thou, O Surya (Surya=Sun), maker of the light, Illumining all the radiant realm."

The fourth verse of the Rigvedic hymn 1:50 (50th hymn in book 1 of rigveda) is as follows:

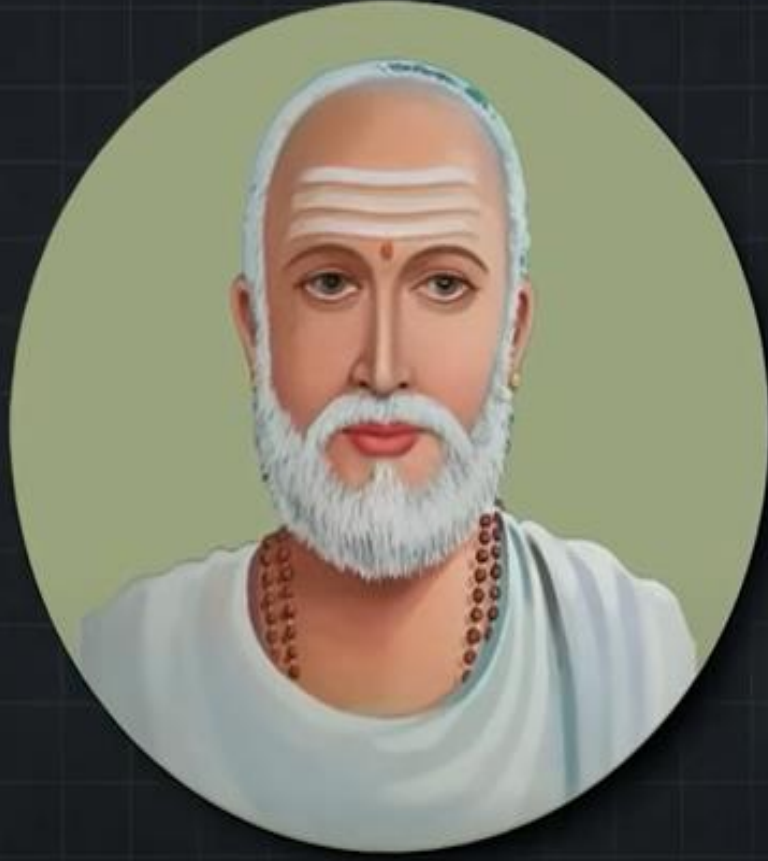
तरणिविश्वदर्शतो जयोतिष्कदसि सूर्य ।  
विश्वमा भासिरोचनम ।

taraNir vishvadarshato jyotishkrdasi surya |  
vishvamaa bhaasirochanam ||

which means "Swift and all beautiful art thou, O Surya (Surya=Sun), maker of the light, Illuming all the radiant realm."

**Swift and all beautiful art thou, O Surya (Surya=Sun),  
maker of the light, Illuming all the radiant realm!!**





तरणिर्विश्वदर्शतो जयोतिष्कृदसि सूर्य ।  
विश्वमा भासिरोचनम ॥

तथा च स्मर्यते योजनानां सहस्रं द्वे द्वे शते द्वे  
च योजने एकेन निमिषार्धे- न क्रममाण  
नमोऽस्तुते- ॥

# PHYSICS IN ANCIENT INDIAN LITERATURE

- Explaining this verse in his Rig Veda commentary, Sayana, who was a minister in the court of Bukka of the great Vijayanagar Empire of Karnataka in South India (in early 14th century), says:
- *tatha ca smaryate yojananam. sahasre dve dve sate dve ca yojane ekena nimishardhena kramaman.*
- This means “It is remembered here that Sun (light) traverses 2,202 yojanas in half a nimisha.”
- Note: Nimisharda = half of a nimisha In the vedas Yojana is a unit of distance and Nimisha is a unit of time.
- Unit of Vedic Time: Nimisha
- The Moksha Dharma Parva of Shanti Parva in Mahabharata describes Nimisha as follows: 15 Nimisha = 1 Kasha 30 Kasha = 1 Kala 30.3 Kala = 1 Muhurta 30 Muhurtas = 1 Diva-Ratri (Day-Night) We know Day-Night is 24 hours So we get 24 hours =  $30 \times 30.3 \times 30 \times 15$  nimisha in other words 409050 nimisha We know 1 hour =  $60 \times 60 = 3600$  seconds So 24 hours =  $24 \times 3600$  seconds = 409,050 nimisha  $409,050 \text{ nimisha} = 86,400 \text{ seconds}$  1 nimisha = 0.2112 seconds (This is a recursive decimal. The wink of an eye is equal to 0.2112 seconds.)  $1/2 \text{ nimisha} = 0.1056 \text{ seconds}$

तथा च स्मर्यते योजनानां सहस्रं द्वे द्वे शते द्वे

Such

And be recorded

9 Miles

Kilometre

Two Hundred

च योजने एकेन निमिषार्धे- न क्रममाण

Addition

in a moment

Proceeding

नमोऽस्तुते- ॥

I bow down to pray

नमति -(नम्)
नमन
नमपति
नाममात्र
नामभङ्ग
नामनिर्देश
नाम
नाम
नाम
नमस्
नमः
नमस्
नमन
नमस्ते
नमस्ते
नामपत्र
नामाङ्कन
नमस्कार

"With deep respect, I bow to the sun, who travels 2,202 yojanas in half a nimesha"

# 15 January 2021



Prof. Subhash Kak

his commentary on the fourth verse of the hymn 1.50 of the R̥gveda on the Sun, he says<sup>1</sup>

*tathā ca smaryate yojanānām sahasrī dve dve śate dve ca yojane  
ekena nimisārdhena kṛmamāṇa*

Thus it is remembered: [O Sun] you who traverse 2,202 yojanas  
in half a *nimeṣa*.

The same statement occurs in the commentary on the Taittirīya Brāhmaṇa by Bhaṭṭa Bhāskara (10th century?), where it is said to be an old Purāṇic tradition.

The figure could refer to the actual motion of the Sun but, as we will see shortly, that is impossible. Is it an old tradition related to the speed of [sun]light that Śāyana appears to suggest? We would like to know if that supposition is true by examining parallels in the Purāṇic literature.

The units of *yojana* and *nimeṣa* are well known. The usual meaning of *yojana* is about 9 miles as in the *Arthaśāstra* where it is defined as being equal to 8,000 *dhanu* or “bow,” where each *dhanu* is taken to be about 6 feet. Āryabhaṭa, Brahmagupta and other astronomers used smaller *yojanas* but such exceptional usage was confined to the astronomers; we will show that the Purāṇas also use a non-standard measure of *yojana*. As a scholar of the Vedas and a non-astronomer, Śāyana would be expected to use the “standard” *Arthaśāstra* units.

The measures of time are thus defined in the Purāṇas:

- 15 *nimeṣa* = 1 *kāṣṭhā*
- 30 *kāṣṭhā* = 1 *kalā*
- 30 *kalā* = 1 *muhūrta*
- 30 *muhūrta* = 1 day-and-night

A *nimeṣa* is therefore equal to  $\frac{16}{3}$  seconds.

De and Vartak have in recent books<sup>2</sup> argued that this statement refers to the speed of light. Converted into modern units, it does come very close to the correct figure of 186,000 miles per second!

## The Speed of Light and Puranic Cosmology

Article · May 1998

Source: arXiv

CITATIONS

11

READS

3,547

1 author:



Subhash Kak  
Oklahoma State University - Stillwater

464 PUBLICATIONS 5,190 CITATIONS

SEE PROFILE





again, *yo va iha yojate amum lokam nakshate*, either, he who performs worship here, obtains the next world, or, *sukritam va etani jyotinshi yan nakshatrani*, those constellations are the luminaries of those who practise religious acts, that is, according to *Sayana*, those who by attending to religious duties in this world attain *Swarga*, are beheld in the form of constellations,—*iho loka Karma-nushthaya ye swargam prapnuvanti te nakshatrarupena drishyante*.

4. *Sayana* says, that, according to the *Smṛiti*, the sun moves 2,202 *rojanas* in half a twinkle of the eye.

*Jyotishkrit*, giving light to all things, even to the moon and the planets, by night; for they, it is said, are of a watery substance, from which the rays of the sun are reflected, in like manner as the rays of the sun, falling upon a mirror placed in the door-way of a chamber, are reflected into the interior, and give it light. *Sayana* also explains the whole passage metaphysically, identifying the sun with the supreme spirit, who enables all beings to pass over the ocean of existence, who is beheld by all desirous of final emancipation, who is the author of true or spiritual light, and who renders everything luminous through the light of the mind.

5. The text has, *pratyau devanam vishah*, before the men or people of the gods; that is, the *Maruts*, who in another *Vaidik* text are so designated: *Martuo vai devanam vishah*.

8. *Sapta haritah*; which may also mean the seven rays. The seven horses are the days of the week; the seven rays may express the same. They can scarcely be referred to the prismatic rays, although the numerical coincidence is curious.

9. *Sapta shundhyuvah*; *ashva-striyah*, mares. They

11

are also called *naptiyah*, because with them the car does not fall: *yabhir na patati rathah*,—they were more docile than those of Phaeton's father.

PAGE 75

10. Here again we may have an allusion to a spiritual sun. The darkness, it is said, implies sin, and the approach to the sun intimates reunion with supreme spirit; as in other texts, *Aganma jyotiruttamam*, we go to the best light; that is, we become identified with spiritual light,—*sayujyam gachchamah*; and again, he (the worshipper) becomes identical with that which he worships,—*tam yatha yathopasate tad eva bhavati*.

11. *Hrid-roga* may also mean heart-burn or indigestion; *harimanam*, greenness or yellowness, is external change of the colour of the skin in jaundice or bilious affections. This verse and the two following constitute a *tricha* or triplet, the repetition of which, with due formalities, is considered to be curative of disease. *Surya*, thus hymned by *Praskanwa*, cured him, it is said, of a cutaneous malady or leprosy under which he was labouring; accordingly *Shaunaka* terms the couplets a *mantra*, dedicated to the sun, removing sin, healing disease, an antidote to poison, and the means of obtaining present happiness and final liberation. The especial worship of the sun in India at the time of the first incursions of the Mohammedans, attributed to that luminary's having cured *Samba*, the son of *Krishna*, of leprosy, is fully related by M. Reinaud in his interesting *Memoire sur l'Inde*, and was then, no doubt, of ancient date, originating with the primitive notions of the attributes of *Surya* here adverted to. The hymn is throughout of an archaic character.

12. So the Scholiast interprets the *Haridrava* of the text, *Haritala druma*; but there is no tree so called.



H.H Wilson

Sanskrit Professor  
Oxford University

SPEED OF LIGHT ?

S.V. Gupta

SPRINGER SERIES IN MATERIALS SCIENCE 122

# Units of Measurement

Past, Present and Future.  
International System of Units

 Springer



MSI



National Physical Laboratory

Much before the present era, in Vedic times, more than 5,000 years BC, Indians had separate names for much smaller time intervals. The term for the smallest time interval as given in the holy book *Shrimadbhagwat Puran* [2] was *permanu*, and its multiples are as follows:

2 *permanu* = 1 *anu*  
3 *anu* = 1 *trisrenu*  
3 *trisrenu* = 1 *truti*  
100 *truti* = 1 *vedh*  
3 *vedh* = 1 *love*  
3 *love* = 1 *nimesh*  
3 *nimesh* = 1 *chhun*  
5 *chhun* = 1 *kashta*  
15 *kashta* = 1 *laghu*  
15 *laghu* = 1 *nadika*  
2 *nadika* = 1 *mahurat*  
30 *mahurat* = 1 day and 1 night (one sunrise to the next)  
7 days and 7 nights = 1 *saptah*  
2 *saptah* = 1 *paksh*  
2 *paksh* = 1 lunar month  
2 months = 1 *ritu*  
3 *ritu* = 1 *ayan*  
2 *ayan* = one lunar year

From the above data we get:

3,280,500,000 *permanu* = 24-h day = 86,400 s  
37,968.75 *permanu* = 1 s  
1 *permanu* = 2.6  $\mu$ s

However, for day-to-day life in the holy book *Mahabharat*, *ashloka* 231 [3], the smallest time interval was considered as *nimesh*, and its multiples, which are used till today, are as follows:

15 *nimesh* = 1 *kashta*  
30 *kashta* = 1 *kala*  
30 *kala* = 1 *mahurat*  
30 *mahurat* = 1 day and 1 night  
4.6875 *nimesh* = 1 s or  
1 *nimesh* = 0.21333  $\approx$  0.2 s

The existence of a separate name for the time interval known as *permanu*, which is equivalent to 2.6  $\mu$ s, indicates two things: there was a frequent need to have such a small time interval and there existed methods of detecting such small intervals with reasonable precision.

In addition to the above, we get quite a few sets of time intervals and counting of time in various literatures, which is inevitable when we are looking at a history of 10 million years. Some of these systems are mentioned below.

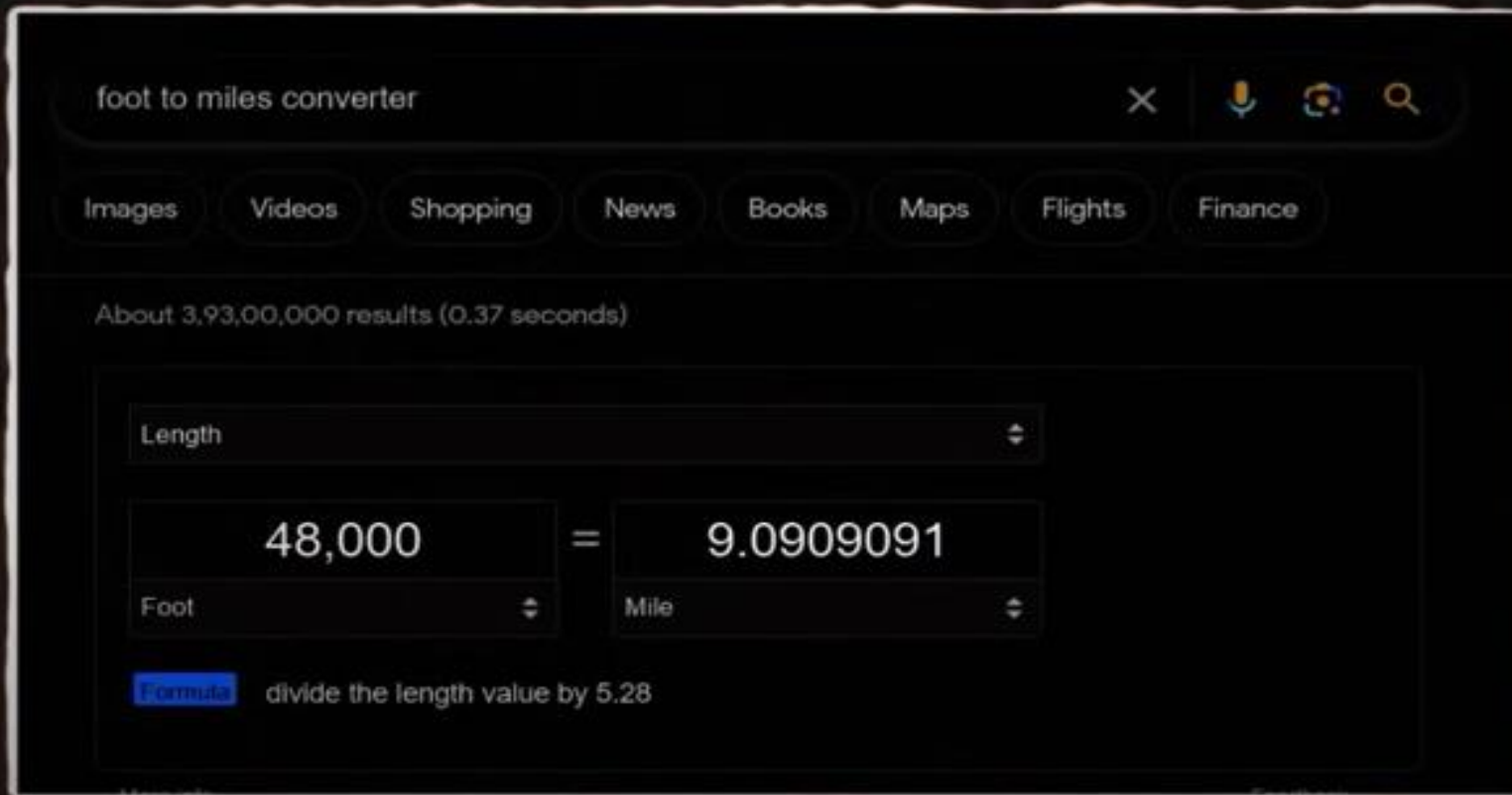
#### Smaller Units of Time Used in the Vedas [5]

1 *trasarenu* = the combination of 6 celestial *atoms*  
1 *truti* = the time needed to integrate 3 *trasarenu*, or 1/1,687.5 of a second  
1 *vedha* = 100 *truti*  
1 *lava* = 3 *vedha*  
1 *nimesha* = 3 *lava*, or a blink  
1 *kshana* = 3 *nimesha*  
1 *kashta* = 5 *kshana*, or about 8 s  
1 *laghu* = 15 *kashta*, or about 2 min  
15 *laghu* = 1 *nadika*, which is also called a *danda*



$$\begin{aligned} 1 \text{ Yojana} &= 8000 \times 6\text{ft} \\ &= 48,000 \text{ ft} \end{aligned}$$

Google search:



foot to miles converter

Images Videos Shopping News Books Maps Flights Finance

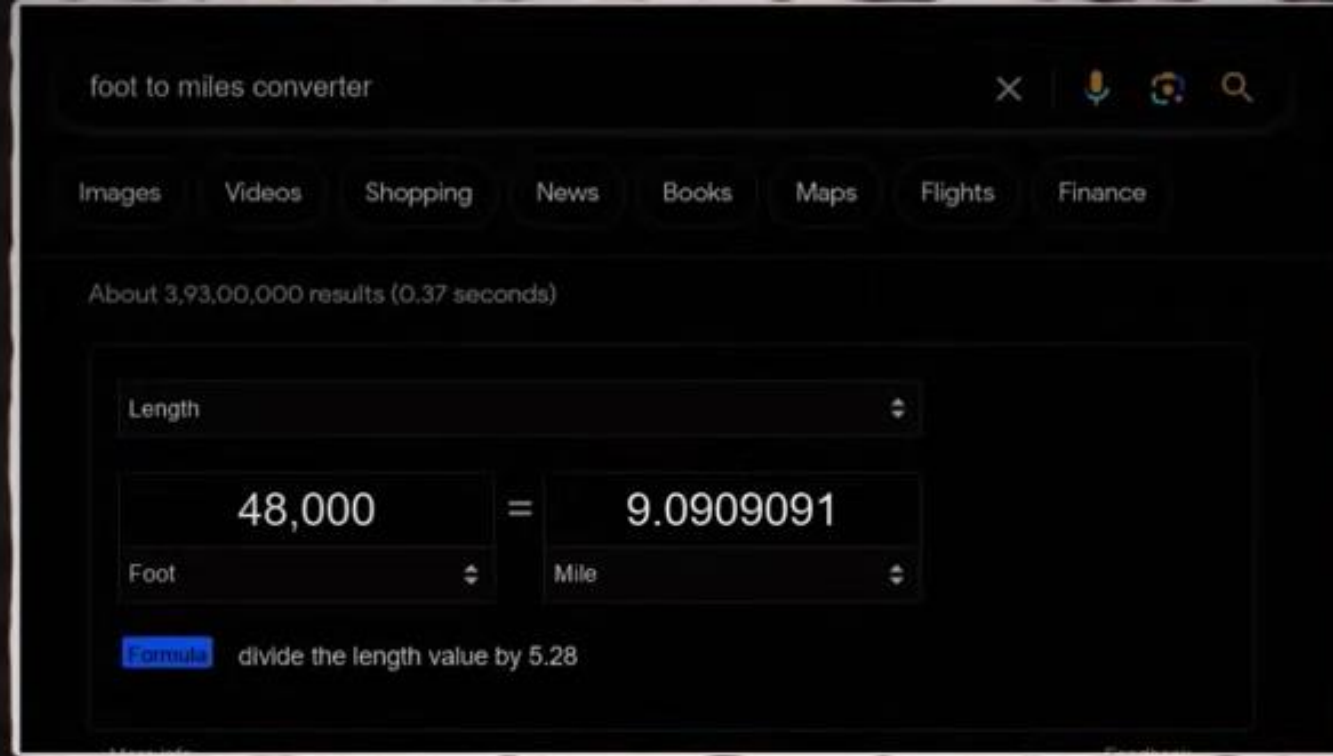
About 3,93,00,000 results (0.37 seconds)

Length

48,000	=	9.0909091
Foot		Mile

[Formula](#) divide the length value by 5.28

$$1 \text{ Yojana} = 9.09 \text{ miles.}$$



**1 Yojana = 9.09 miles.**

**2202 Yojana = 2202 x 9.09 miles  
= 18379.98 miles**

# Nimisha

$$1 \text{ Nimisha} = 0.2 \text{ sec}$$

$$\frac{1}{2} \text{ Nimisha} = 0.1 \text{ sec}$$

$$\text{Speed} = \frac{\text{distance}}{\text{Time}} = \frac{18379.98 \text{ miles}}{0.1 \text{ sec}}$$

$$= 1,83,799.8 \text{ miles/sec}$$

295,797.105331 km/sec

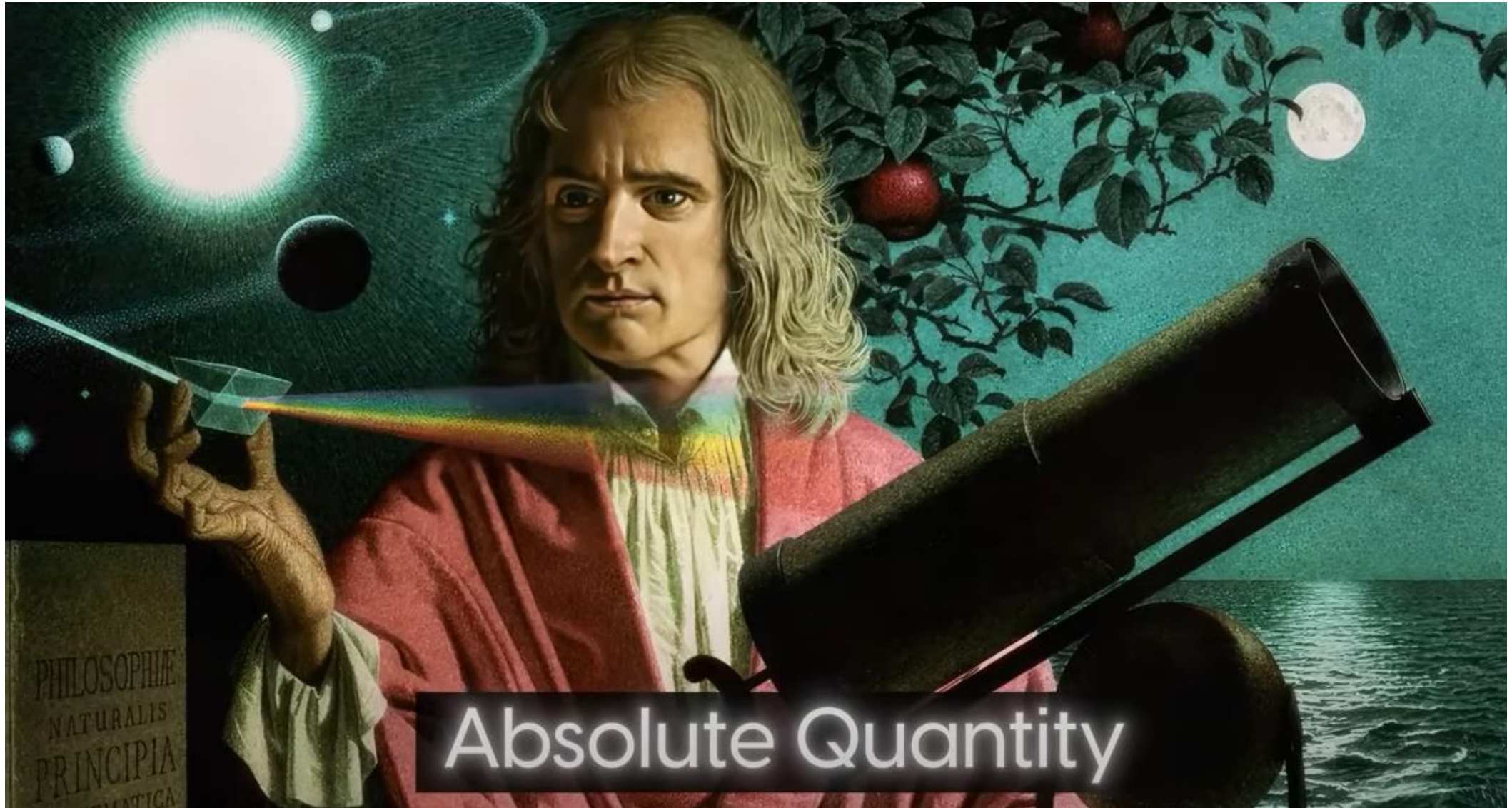
Modern speed  
of light :

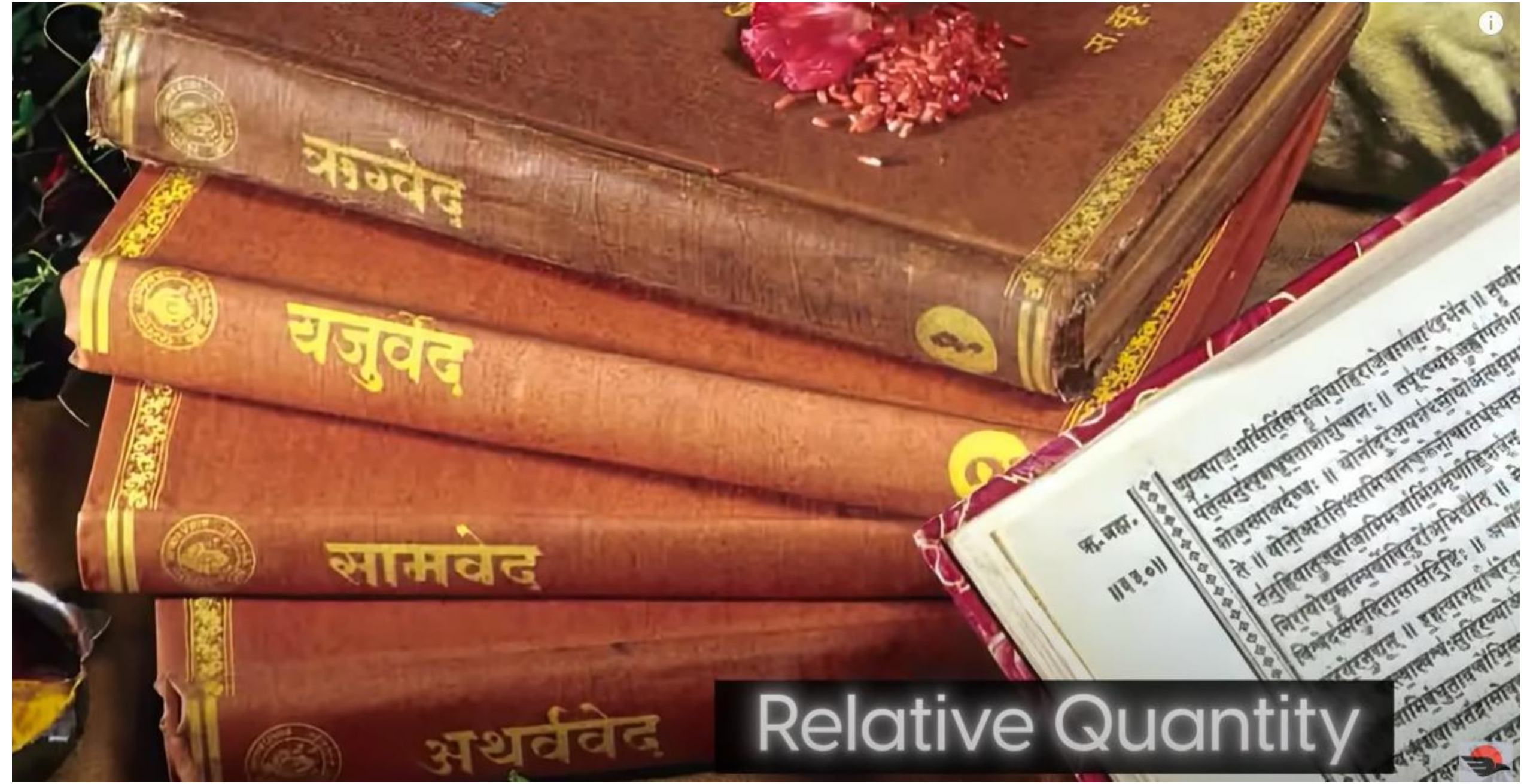
299,792.458 km/sec

Difference 1.33% off



# Time Dilation





ऋग्वेद

यजुर्वेद

सामवेद

अथर्ववेद

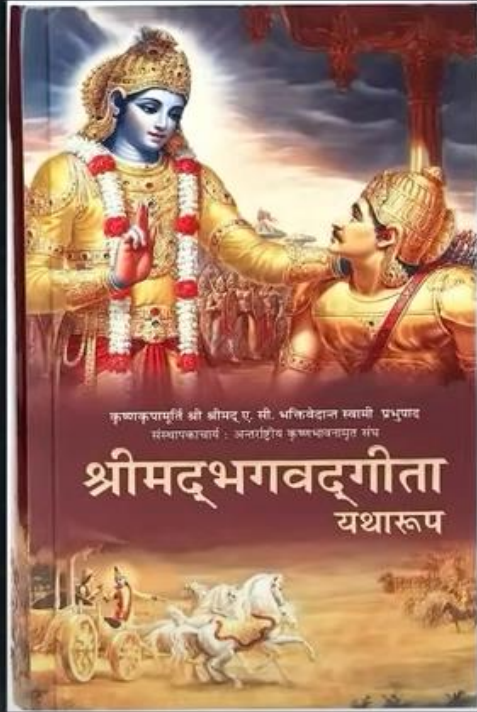
Relative Quantity

ऋ. प्र. ॥३३॥

शुभ्रपात्रः प्रीतिस्तुष्वीषिहिराजेवामवा...  
पतत्यनुस्त्रुणुपुतागोशुचानः ॥ तपुस्त्वमे...  
शोबस्माजदक्षः ॥ योनौदुरेअयनंदमोयोअत्ये...  
ते ॥ योनोअरतिस्वमिचान...  
तनुहिवातुपुनाजामिप्रजाभिप्रमृणी...  
निराशोद्यज्जान्धुबापिदुरोअभिधौत ॥  
विश्वदस्मलदिनायासदिदिः ॥ अ...  
यंरनुयान् ॥ इहस्वाभूयाचिरं...  
यास्वम्भःसुहिरुप्यो...  
मिभुचुतामलोभिस...  
शोवाअतद्रामो...  
रख



8th Chapter / 17th shlok



Bhagavad Gita

सहरस्रयुगपर्यन्तमहर्यद्ब्रहाणो विदुः ।  
रात्रिं युगसहरतस्त्रान्तां तेऽहोरात्रविदो जनाः ॥

By human calculation, a thousand  
ages taken together form the  
duration of Brahmā's one day. And  
such also is the duration of his night.

# THE BHAGAVAD GITA

WITH THE COMMENTARY OF  
SRI SANKARACHARYA

Translated from  
the original Sanskrit into English

By

ALLADI MAHADEVA SASTRY

समत्वं योग उच्यते

SAMATA BOOKS  
MADRAS

Google

"Oriental Libraries" are those libraries that have literature pertaining to Oriental studies and languages. "Oriental" in this context refers to the ancient Near East, including India, Persia (Iran), and ancient Arabia, among other places, and the languages and literatures of those places and peoples.

14—18]

ABHYASA YOGA.

231

सहस्रयुगपर्यन्तमहर्षद्रक्षणो विदुः ।

रात्रिं युगसहस्रान्तां तेऽहोरात्रविदो जनाः ॥ १७ ॥

17. They—those people who know day and night—know that the day of Brahma is a thousand yugas long and the night is a thousand yugas long.

Brahma is the Prajapati, the Viraj. Those persons who know how to compute Time know that Brahma's day is a thousand yugas long, and that His night is of the same duration as His day. Because the worlds are thus limited by time, therefore they return again.

What takes place during the Prajapati's day and what takes place during His night will now be described :



**Annie Besant**

सहस्रयुगपर्यंतमहर्षद्ब्रह्मणो विदुः ।

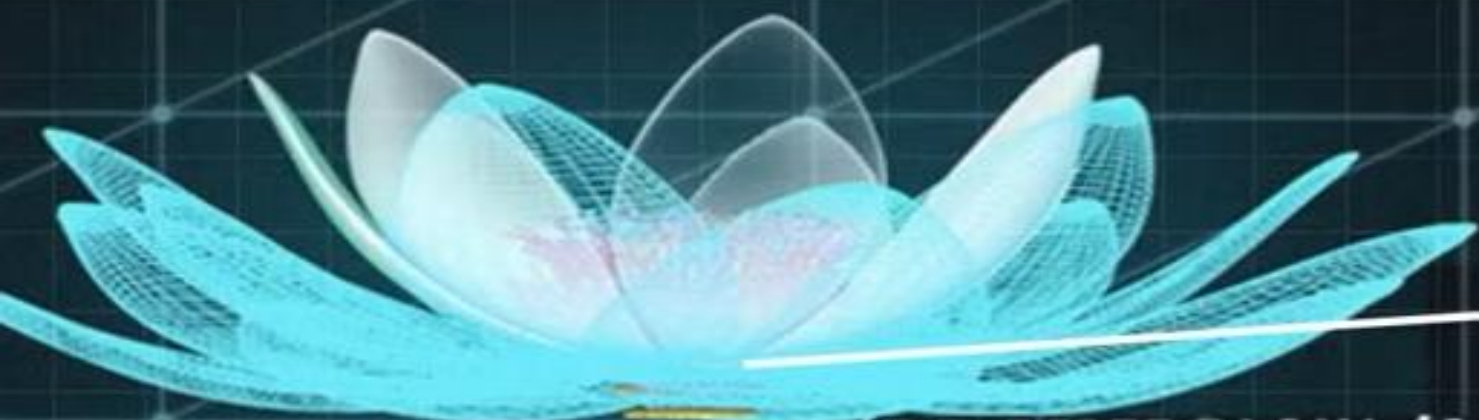
रात्रिं युगसहस्रांतां तेऽहोरात्रविदो जनाः ॥१७॥

The people who know the day of Brahmā, a thousand ages in duration, and the night, a thousand ages in ending, they know day and night. (17)

The people who know the day of Brahma,  
a thousand ages in duration,  
and night a thousand ages in ending,  
they know day and night.



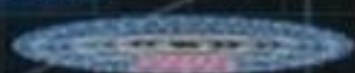
1 Day



**BRAHMALOKA (SATYA LOKA)**

100 YOJANAS

10,000,000 YOJANAS



**SVARGALOKA**



**BHULOKA**

1000 yuga



# PHYSICS IN ANCIENT INDIAN LITERATURE

- Let us know some of the common features in both the systems.

Adishankara	Quantum Physics
This world is (maya) an illusion.	The world we see and perceive are not real, they are just 3D projections of mind
Brahma sathya jagan mithya (Only the Brahman is the absolute reality)	Only that consciousness is reality
The Brahamhanda is created and dissolved again in to the para -brahman.	The atoms bind together to make planets, stars ,comets and at some time later they dis-integrate and merge with consciousness.
Jivatma is nothing but a separated soul from Brahman. and has to strive to merge with Brahman called moksha	Everyone was once part of one conciousness later seperated. And has to merge back to that consciousness.
Jiva feels he is real because of the presence of mind.	Individuality is an illusion that is caused by mind.

# References

1. भारत में विज्ञान की उज्ज्वल परंपरा सुरेश सोनी अर्चना प्रकाशन 2003
2. साइंस एण्ड सोसायटी इन एंशिएन्ट इण्डिया, पृष्ठ संख्या-158 से उद्धृत, देवीप्रसाद चट्टोपाध्याय एवं एस जी सरदेसाई
3. प्राचीन भारतीय ग्रंथों में विज्ञान और प्रौद्योगिकी ISBN: 9788124606322 डी. के. प्रिंटवर्ल्ड प्रा. लिमिटेड 2012
4. भारत में विज्ञान एवं विज्ञान संचार की परंपरा एयर वाइस मार्शल (से.नि.) विश्व मोहन तिवारी आईसेक्ट प्रकाशन 2015
5. India`s Glorious Scientific Tradition Suresh Soni Prabhat Prakashan 2003
6. Scientific Edge - the Indian Scientists from vedic to Modern Period Jayant Narilkar
7. A Concise History of Science in India D. M. Bose, Samarendra Nath Sen, B. V. Subbarayappa (editors) Indian National Science Academy 1971
8. Vedic Science & History: Ancient India's Contributions to the Modern World Gosai Publishers 2018 ISBN 13:9789381391020



## References:

- [1] Rakesh Prabhakara, Vedic Physics: The best-kept secrets [http://analogis fun: wordpress.com/2012/02](http://analogisfun.wordpress.com/2012/02)
- [2] Roopa Hulikal Narayan, The Theory of Matter in Indian Physics, [arxiv.org/pdf/physics/0702012](http://arxiv.org/pdf/physics/0702012)
- [3] S. Kak, the Astronomical Code of the Rigveda (Aditya Prakashan, New Delhi, 1994).
- [4] Justice Markandey Katju, Sanskrit literature and the scientific developments in India Lecture delivered at Banaras Hindu University, Varanasi
- [5] Raja Ram Mohan Roy, Vedic Physics, Scientific Origin of Hinduism (Golden Egg Publishing, Toronto, 1999).
- [6] Indian heritage, a living portrait of India, <http://indiaheritage.org/science/physics.htm>
- [7] The Cultural Heritage of India, Editors Priyadarajan Ray & S.N. Sen, The Ramakrishna Mission Institute of Culture
- [8] History of Science & Technology in India, Editors G. Kuppuram & K. Kumudamami, Sandeep Prakashan