

Understanding Creativity and Creative Writing

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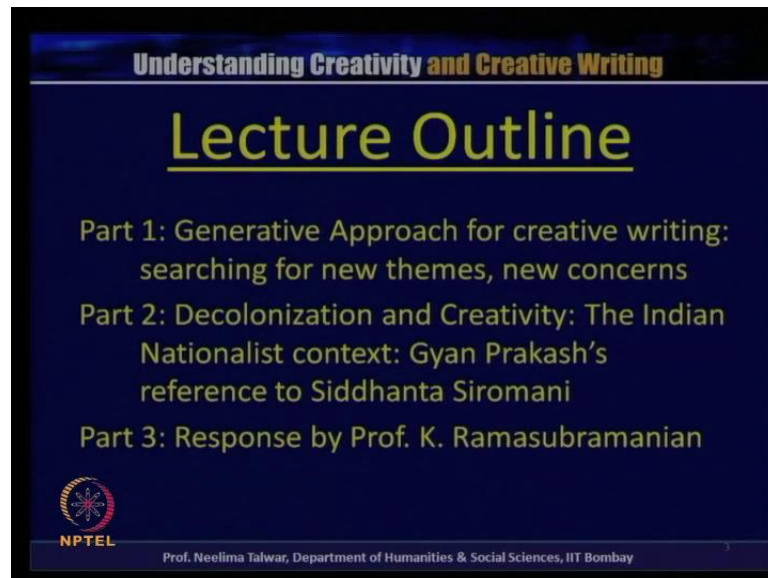
Lecture - 22

Contemporary Indian Writers

The Search for Creativity (I)

This lecture is titled Contemporary Indian Writers -The Search for Creativity. In this, we will talk about 3 interrelated ideas.

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In part 1, we will look at generative approach for creative writing which we have discussed earlier also; this involves searching for new themes and new concerns. Part 2 will deal with decolonization and creativity, and we will present the views of 3 very important scholars on this subject: Gyan Prakash, Shiva Vishvanathan and Ramasubramanian. In particular we will look at Gyan Prakash's reference to Siddhanta Siromani in his book, which we will of course, discuss soon. The most interesting part of this lecture is the response that Prof. Ramasubramanian has provided; and I hope our search will continue.

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Generative Approach for Creative Writing

- Begins with the evolving sense of self
- Erikson's psychosocial model: Identity vs. Role Confusion and Intimacy vs. Isolation
- Complex construction of the self: crystallisation of ideas, perceptions, feelings in the writing process (See lecture 3 of M1)
- Creativity in the surge of historical changes.

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To begin with, let us go over our earlier discussion of generative approach for creative writing in which we have pointed out to you that really there is nothing readymade available to anyone who is interested in writing. And, indeed all the joy and also excitement of this process will be lost, if something is readymade and you just fit into a pre-given formula. While talking about the evolving sense of the self, we had also talked about Erikson's psychosocial model.

However, I think that kind of model offers some help because it talks about the universal patterns that are applicable to young people and how the institutions around them shape them. Of course, the vitality and health of those institutions as well as the sort of creative sense of one's own self - these are very vital ingredients in the process.

However, this psycho social model does offer certain clarity in order to help us accept the kind of complex construction of the self that we undertake in the process of writing. We pointed out to you how Albert Camus and Margaret Atwood also undertook this journey in their own distinctive way and these are great professional writers, however; even if you are a person who wants to write; I think these are models that one should look at but at the same time one should look at one's own inner world as carefully as possible.

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Understanding Creativity and Creative Writing

A Period of Search

- Search for creativity was renewed due to the process of decolonization.
- Diversity of Indian systems of thought was rediscovered. New paradigms were generated for the vigorous process of nation-building.

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It is in this perspective that we really want to offer you this – the view of some of the scholars in terms of our own starting point for the search. The reason I have placed it within decolonization process is related to the fact that this is the period where the process of creativity was greatly intensified due to the kind of questions that were posed before the nation, before each individual in the nation.

And, it is within this frame work there I want to start with a provocative statement by Shiv Vishvanathan first. He who is a very important anthropologist of science that is how you know many people describe his work. He's looked at scientific institutions in India not only in terms of governmental institutions, but a lot of work that the NGOs have been undertaking. So let us look at what he has to say about this period of decolonization. And, this is part of our search for creativity which as I pointed out it was renewed due to the process of decolonization and what it did is to help us to understand that there is this immense diversity of Indian systems of thought.

And we in a way rediscovered it because all these systems were challenged by the British notions and these were notions that were calculated to really make us subservient. So, in that sense, they really do not represent the Western tradition in its own diversity also, it is kind of very calculated. And, therefore we have to understand what kind of tussles ensued in this process. Now, let me move to the next slide.

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A Period of Search

- ❖ Shiv Vishwanathan. *A Celebration of Difference: Science and Democracy in India*. 1998
- ❖ “India today stands as one of the world’s great clearing houses and compost heaps for ideas. It keeps alive some defeated ideas without consigning them to the museum and reinvents others through translation. This is best seen in the attitude to its three greatest imports – democracy, the English language, and modern western science.

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Let me look at Shiv Vishvanathan’s point of view which he expressed in ‘A Celebration of Difference’, an essay titled, sub-titled ‘Science And Democracy In India’ which was published in 1998. Do look, have a look at this full essay, because there is always this difficulty that when you extrapolate a statement, it takes on a slightly different color. But I think, what he points out is very important although he has own inimitable style which sometimes provokes a lot of discussions and I think it is intended to do so.

He says, “India today stands as one of the world’s great clearing houses and compost heaps for ideas. It keeps alive some defeated ideas without consigning them to the museum and reinvents others through translation. This is best seen in the attitude to its 3 greatest imports – democracy, the English language, and modern western science.” So, two of these things we are already invested in and the third too I think we are part of the democratic process. So then he goes on to say, “For Indians these were not alien ideas to be handled with suspicion but celebrations, which they had to be internalize and reinvent for themselves.”

So that is where the tussle is – these ideas said to be internalized and reinvented. “Indeed the confidence and openness with which India greeted and scrutinized science constitutes one of the most fascinating chapters in the encounter between science and democracy.” A very thought-provoking and important idea indeed we will actually build on this essay further in the next lecture also. So I hope you would have time to read this essay

carefully and start reflecting on some of the observations through your own experience of these institutions.

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Science in Modern India

Gyan Prakash's historical study

- The British attempt to consolidate its power through the European idea of modernity. India's living traditions of diverse and sophisticated discourses of knowledge and philosophy. Translation of modernity in the colonial context through the notion of science.
- A sign of modernity: Science's cultural authority as legitimating sign of rationality and progress.

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The next scholar whose work we are looking at is Gyan Prakash who is a very important historian. What he has done in this famous study titled *Another Reason: Science and the Imagination of Modern India* is to look at the place of science as a discipline, as a metaphor, as an idea in modern India. He tries to reveal, through historical evidence, the British attempt to consolidate its power through the European ideas of modernity. And, also he, you know sort of, suggests that this was a kind of imposition. So, there was a lot of tussle between what we knew and what we were...we had been told to look at more seriously.

So in the process, the process of translation ensued which got connected to science as a sign of modernity. And therefore there was a kind of cultural authority of science as a legitimating sign of rationality and progress. So what I have done is to actually extrapolate a particular text from the third chapter part 1 of Gyan Prakash's book so that we can try and understand the implications of some of the ideas.

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Science in Modern India

Gyan Prakash's historical study

- Reference to *Bhugolsar* written by Omkar Bhatt comparing Copernican astronomy with systems described in the Puranas and the in *Siddhanta Siromani*, a 12th century text written by the astronomer-mathematician Bhaskaracharya.

See Chapter 3 "Translation and Power" of *Another Reason: Science and the Imagination of Modern India*.

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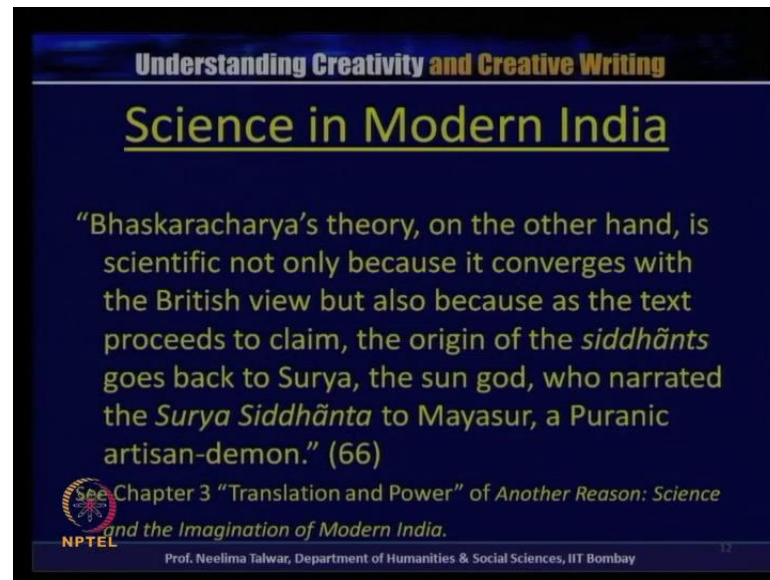
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Now, the particular reference that we are making here is to *Bhugolsar* which was actually written in 1841 by Omkar Bhatt. Let me give you a bit of the context for this write-up – there was an English gentleman who introduced on an experimental basis this whole idea of starting a secular classroom in which actually the Siddhantas were taught in order to teach mathematics and astronomy and he taught it through this very important ancient text but he brought it to point where then the students were introduced to the ideas of Copernicus, Newton and Galileo, thereby somehow suggesting although Siddhantas are very useful, but at the same time, because they also are often clubbed with the Puranas; the Puranas are really not important they are insignificant because there... really contain myths and historical legends that take you away from scientific learning.

So this seems to be the kind of ethos in which a lot of controversies were generated. When people began to see what Wilkinson was doing....and, the particular person we are referring to Omkar Bhatt, he wrote this pamphlet in Hindi in which the teacher and the student they discussed some of these ideas. And, I think the teacher is trying to prove the superiority of the Western scientific system. Now, of course, I would like you to read original in detail in order to understand it fully, but at the same time for our purpose we will extrapolate this particular statement from Gyan Prakash. This particular statement is not made by either the teacher or the student, but by Gyan Prakash who says, "While presenting these different conceptions of the earth, the text declares its commitment to

scientific understanding.” So, this is with reference to *Bhugolsar*, “it does not dismiss the sage Vyas but describes the Puranas which he narrated as great poetry and wonderful sketches of God’s play though, not Science.”

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Science in Modern India

“Bhaskaracharya’s theory, on the other hand, is scientific not only because it converges with the British view but also because as the text proceeds to claim, the origin of the *siddhānts* goes back to Surya, the sun god, who narrated the *Surya Siddhānta* to Mayasur, a Puranic artisan-demon.” (66)

Chapter 3 “Translation and Power” of *Another Reason: Science and the Imagination of Modern India*.

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And, then he goes on to say that, “Bhaskaracharya’s theory on the other hand is scientific not only because it converges with the British view but also because as the text proceeds to claim, the origin of Siddhantas goes back to Surya, the sun god, who narrated the Surya Siddhanta to Mayasur, a Puranic artisan-demon.”


So, while reading this text in order to understand the zest of this period, the demands of this period, I was somewhat you know, captivated by this reference to Mayasur and I did not really have a way unpacking this allusion at all, because I am not really well-versed with the text or history of science in India in those stages. Therefore, what we did is to request one of our colleagues, Prof. Ramasubramanian to actually see if some of our takes in terms of the mythic theme

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Indian Imagination

- Mythic themes such as the story of “Surya, the sun god, who narrated the *Surya Siddhānta* to Mayasur, a Puranic artisan-demon” are intriguing as they evoke multiple associations including the association of makers, fabricators with “demons”.
- New readings of ancient myths for our creative search.

 Jayan Prakash's *Another Reason: Science and the Imagination of Modern India*.

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and also its multiple associations including the association of makers, fabricators with demons, indeed what he thought about it.

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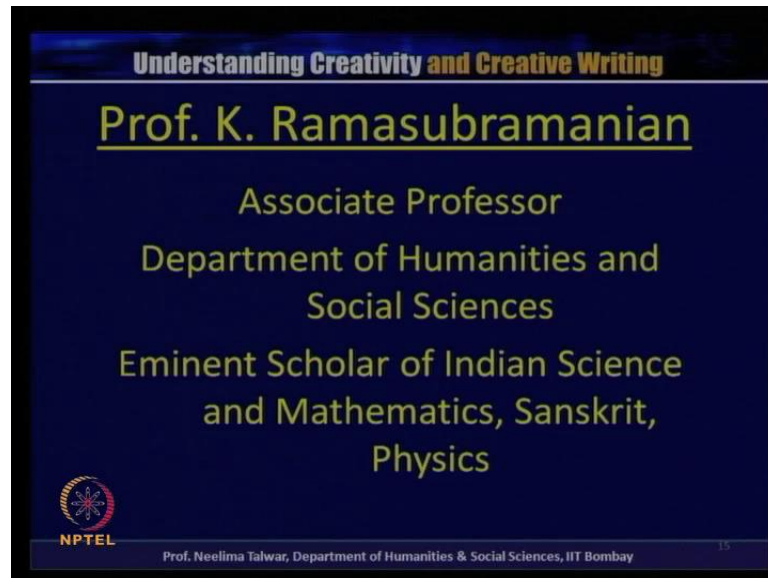
Part 3

- ❖ Presentation of the canonized text by Prof. K. Ramasubramanian to help us rediscover mythic and scientific material from the ancient period.

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And therefore, we indeed are very happy to have him here. He would respond to this allusion and, also the frame of reference in terms of science and scientific ideas and different aspects of how these were conveyed in the ancient period under discussion.

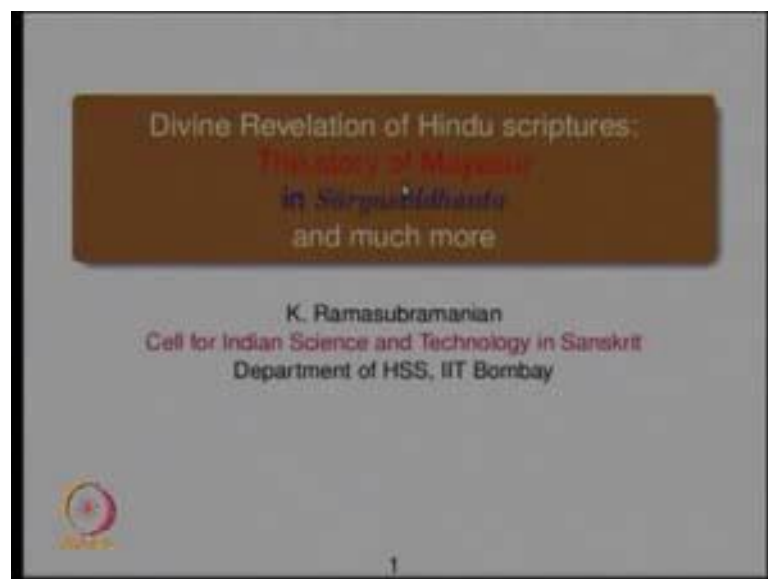
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So, we have the privilege of having Prof. Ramasubramanian who himself is a scholar of Indian science, mathematics, and Sanskrit. He will unpack the solution for us and indeed I think this will act to our journey in extremely significant ways. We will take up further discussion after his conversation with you.

Thank you.

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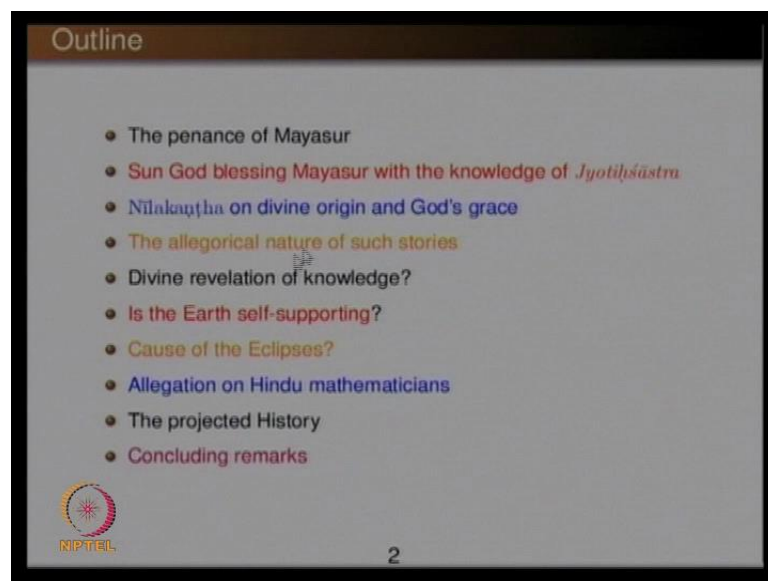


So in the recent past some efforts have been made by historians to try and understand how the Indian society tried to integrate the modern science along with their own

sciences. So in this connection some study has been made with regard to the observations made by certain authors around 19 century wherein... so, they try to see how we will be able to sort of integrate the ideas that emerged from modern science with ideas that have been represented ancient scriptures, particularly scientific scriptures related to astronomy and mathematics.

So, in this connection I would like to say a few observations which have been made by certain modern historians where they try to interpret the notion of divine revelation that one finds in many of the Hindu scriptures. For instance one of the most important texts in Indian astronomy is Surya Siddhanta so, which actually begins with the story of Mayasur receiving the knowledge of motion of planets from the sun god itself. So, we will try and understand what this divine revelation means and, how this divine revelation has been understood by Indian astronomers themselves.

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So, the way I would like to present this – he starts with the description presence of Mayasur, and how the sun god reveals the knowledge of Jyotishsastra so, to Mayasur. And then we proceed with the interpretation of what one means by divine origin and the grace of god. Then, we will see that this knowledge per say – though it is ascribed to the divine being – so how do the Indian astronomer as well as philosopher try to understand what this Divine revelation is.

And, then so, we move on a specific topic wherein, a question is being raised – so earth is a heavy body – all heavy bodies are falling in space. So does the earth stand on its own or is it supposed to fall? Does it require some supporting agency? And, how the notion of eclipses have been considered by the then astronomers and then we see certain allegations which has been made on astronomers, and mathematician, and then we conclude with few remarks.


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The penance of Mayasur

- One of the well-known texts in Indian Astronomy, namely *Suryasiddhanta* commences with the episode of Mayasur:

अल्पाविष्टे तु कृते मयो नाम महासुरः ।
 रहस्यं परमं पुण्यं जिज्ञासूर्जानमुत्तमम् ॥
 वेदाङ्गमग्र्यमखिलं ज्योतिषां गतिकारणम् ।
 आराधयन् विवस्वन्तं तपस्तेपे सुदुश्चरम् ॥

- मयो नाम महासुरः – the great artisan-demon by name Maya
- जिज्ञासूर्जानमुत्तमम् – with an urge for the supreme knowledge
- ज्योतिषां गतिकारणम् – of the cause of the motion of the luminary objects
- तपस्तेपे सुदुश्चरम् – performed severe austerities
- आराधयन् विवस्वन्तं – pleasing the Lord Sun


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Coming to the story of Mayasur – so the Surya Siddhanta actually begins with the following words. So after paying his obeisance to God so, then he starts with the story of Mayasur wherein he describes the penance done by Mayasur [Sanskrit shloka reading]. So, these are the second and third verses of Surya Siddhanta. So, wherein he says there was Asura called Mayasura.

If you were to trace the mythology - one finds in Ramayana – Mandodari wife of Ravana is suppose to be the daughter of Mayasura. So Mayasura, though demonic, he was endured with great skills and therefore, people called him artisan – artisan-demon.

Then at one point of time he was so curious to know how the planets are moving in the sky, so how things are understood, so, he say, *jynasuh*, the poet says *jynasuh* actually means, a craving for knowledge. He wanted to attain supreme knowledge. And, therefore he did severe austerities – *tapastepe suduscharam* – So, the reason for doing this penance is to obtain the *jyotishaam gatikaranam* to understand the – gathi is basically motion –

jyotishaam gatihi – *jyotisham* actually means a certain branch of knowledge wherein they study the luminary objects per say. So, there is a common misunderstanding in the term *jyotisha* refers to astrology which is not quite true. So *jyotisham* the very word *jyotisha* springs from *yuti* – *yutirdiptam* – so, basically study of luminary objects.

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Blessing Mayasur with the knowledge of *Jyotiḥśāstra*

- The text *Sūryasiddhānta* proceeds with the story as follows:

विदितस्ते मया भावः तोषितस्तपसाह्वहम् ।
 दद्यां कालाश्रयं ज्ञानं ग्रहाणां चरितं महत् ॥
 न मे तेजःसहः कश्चित् आख्यातुं नास्ति मे क्षणः ।
 मदंशः पुरुषोऽयं ते निशेषं कथयिष्यति ।
 इत्युत्त्वान्तर्धे देवः समादिश्यांश्चमात्मनः ।
 स पुमान् मयमाहेदं प्रणतं पाञ्चलिस्थितम् ॥
- तोषितस्तपसाह्वहम् – being pleased with your penance
- दद्यां कालाश्रयं ज्ञानं – will bless you with the knowledge that forms the basis for the 'time'.
- ग्रहाणां चरितं महत् – the great story (related to the motion) of the planets
- आख्यातुं नास्ति मे क्षणः – do not have even a moment to take off to explain to you

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So then it proceeds – the text proceeds...So, the story basically goes like this so, the sun god so the sun god apparently comes and then reveals himself to Mayasura and then he says I am pleased by your penance. So...and I also understand the reason for which you have undertaken these austerities. So I am going to reveal you the knowledge.

So this is a very interesting statement which has been made here, the term Kala has various connotations. So, Kala actually refers to the god of death, Kala actually refers to time, so on, and so forth. Here the word *kalashriyajanam* is what is being stated. So, the notion of time that we have 11:30, 12:30 etcetera is all based upon the motion of planets actually – time per say is an extremely intricate concept where physicists are grappling and we do not have a clear understanding till date.

So, it has various connotations, but here we will limit our notion of time to those which are defined with the motion of the celestial objects. In fact, the very notion of the year that we have has to do the earth around the sun or as perceived by us the time taken by the sun to move around the earth once and so on. So, very notion of the moon, lunar month and so on and so forth is basically defined with the celestial objects – and

therefore we find this description *kalashriyajanam* – so it is primarily the motion of the celestial objects that actually gives us the notion of time. If the period were to change, the rotational period of the earth were to change so then the 24 hours will be no more 24 hours and so on.

So anyway *jyotisham* is basically *kalashriyajanam* and the sun god so, as the episode goes, the sun apparently tells Mayasura that if you were to approach anywhere near you then you will be no more existing, you will be burnt. Therefore, you will not be able to bear the heat. Therefore I will employ somebody else to reveal this knowledge to you. And, this person reveals the knowledge to Mayasura and so on and so forth. So, this is how the story goes, but this concept of Divine revelation is not something found in Surya Siddhanta alone. So, this will be found in many of the texts in many disciplines as well in the Indian scriptures. So, how do people understand, in the Indian tradition itself, what the Divine revelation means.

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Nilakantha on divine origin and God's grace

- Nilakantha Somayāji (c. 1500 AD), one of the brilliant astronomers of the Kerala school, in his seminal work *Jyotirmīmāṃsā* observes:

ननु तपोभिः प्रसन्नो ब्रह्मा आर्यभट्टाय भगणपरिध्यादिकं
ग्रहगणनसाधनभूतं सङ्ख्याविशेषमुपदिदेश। तदुपदिष्टं पुनरार्यभट्टः
सर्वं यथोपदिष्टमेव ददामिः गौतिभिः निबन्ध इति
केचिन्मन्यन्ते। तस्य कृतः परीक्षणं, ब्रह्माणः सर्वज्ञत्वात्,
राग-द्वेषाद्यभावाच्च, अविश्वत्त्वनिश्चयात्, इति चेत्

- तपोभिः प्रसन्नो ब्रह्मा – Brahma, pleased with the penance
- सङ्ख्याविशेषमुपदिदेश – instructed Āryabhaṭa the revolutions numbers, etc.
- तस्य कृतः परीक्षणं – why should that be examined?
- ब्रह्माणः सर्वज्ञत्वात् – Brahma being omniscient
- राग-द्वेषाद्यभावाच्च – also being free from likes and dislikes

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So, let us take the example of a Nilakantha. So, Nilakantha was an astronomer who lived around fourteenth, fifteenth in fact, fifteenth-sixteenth century that was the exact period. So, he was brilliant astronomer in Kerala School wherein he contributed significantly to the improvement of the planetary model. So, considering this particular passage from Surya Siddhanta, as well as the passages which have been interpreted differently by different people right from the work of by Aryabhat which was in fifth century.

Nilakantha discusses at length in very interesting text called *Jyotirmimamsa*. *Jyotirmimamsa* essentially means enquiry; enquiry into the discipline of the science of celestial objects. So, *Jyotirmimamsa* is the title of the text wherein he asks this question [Sanskrit shloka reading]. This is a very interesting passage which actually helps us in trying to understand the kind of methodology which Indian astronomers have adopted. It is a very important thing to understand today – so, there are 2 things which emerge from this particular passage.

One is, is it necessary for us to attribute something to divine origin for the knowledge to be valid forever? So, is it necessary for us to call it scientific only if it is Divine revelation or do we describe these Indian scriptures are scientific at all, if at all they can be described? So, all these things emerge from this. So, in this particular context for instance in the recent studies which have gone also – the kind of struggle which these historians seems to have undergone or rather academicians... in trying to understand the academicians who were there in nineteenth century trying to sort of integrate the modern science into their society.

So, this passage is extremely useful in trying to understand that. For instance in one of the recent studies which has been made by Gyan Prakash. So, he tries to cite a certain text called *Bhugolsar* by Omkar Bhatt which has been written around the middle of nineteenth century. So, this *Bhugolsar* as the title indicates – Bhugola is basically earth, sphere, the earth in the form of sphere, *saar* is essence of it – so the motion which is being described. So, in the Indian scripture one finds that sun moves around the earth. So, of course, this is what one can do through naked eye observations – this is the best thing that can be done.

So whereas the modern Copernican modern astronomy which starts with – rather Copernicus – around the time of Copernicus so, it presents the picture wherein, the sun is at the centre and the earth moves around that. So, how do we understand this with the picture which has been depicted in the Indian scriptures? And, in the Indian scriptures as we find so, it has been revealed by sun god himself. So, how can this go wrong so on and so forth. So, there has been a certain confusion which has been there in trying to integrate this modern picture with the ancient pictures, with the pictures given by the ancient scriptures.

So, in this context so, Bhatt for instance – in his *Bhugolsar* tries to present a certain picture – wherein he says that the knowledge as revealed by Bhaskaracharya in his Siddhanta Siromani is scientific for two reasons. One, we find certain things which are described in Siddhanta Siromani which are in concordance with what has been revealed in the modern science on the one hand. And, it is also scientific for the reason that this has been revealed by the sun god himself so on and so forth. So, what does one really mean by revelation of knowledge by Divine grace? So, this is where it goes.

So, the question is – by austerities Aryabhat pleased Brahma – so Aryabhat got this knowledge from Brahma. And, for instance in Surya Siddhanta we find the knowledge is revealed through sun god. So, if it has been revealed by divine people, why is it that we need to revise them at all? So, this is the question that the student poses.

So, *tasyakutafpariksham* means why should that be examined? Why should that be examined – this question arises, because Brahma is considered to be omniscient. So, anything that is revealed by omniscient has to be valid forever. And, also for the reason for that the description about Brahma is *raagadveshadhyabhava* so; he is a being free from likes and dislikes. Of course, one can be omniscient and of course, if one wants to deceive others one can give wrong information. So, Brahma is also free from likes and dislikes and, whatever that had been revealed by Brahma to Aryabhat should be valid forever. So if that is so, why we is it that we need to examine this at all.


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Nilakanṭha on divine origin and God's grace

- Nilakanṭha befittingly replies this query, which incidentally clarifies the concept of *Isvara-prasada* as understood in the tradition.

**मन्द, मैवम् । देवताप्रसादः मतिवैमल्यहेतुरेव । न च पुनः
ब्रह्मा आदित्यो वा स्वयं आगत्य उपदिशेत् ।**

- मन्द, मैवम् – Oh! dull-witted, you are not supposed to think so.
- देवताप्रसादः मतिवैमल्यहेतुरेव – The grace of Lord is only means for acquiring a clarity in thinking.
- न च पुनः ब्रह्मा आदित्यो वा – Neither Brahma nor the Sun God
- स्वयं आगत्य उपदिशेत् – would themselves appear [in person] to reveal the knowledge.


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Then Nilakantha tries to reply this query in a very interesting way. So, he explains a very important concept which one calls Devata prasada. In fact, if one looks into these Indian texts so, this Devata Prasada means this has been received by divine grace – that's what it really means. What is this Devata prasada? Nilakanta says, when we say devata prasada it essentially means, the person acquires a certain clarity in thinking

So, an understanding emerges only if the person keeps on contemplating on something and in the process of contemplation obviously there will be various thoughts which will come to us. And one will be defiantly in a confused state and till one gets resolved. And, this resolution that takes place because of a certain clarity which emerges in thinking is what one calls as devata prasadam in fact he goes on further and says [Sanskrit reading].

So, its a very important statement. In *Aryabhatia* for instance it is said that Brahma revealed the knowledge, in Surya Siddhanta as he stated earlier... so it is stated that this Mayasura got it directly from sun or the one who was employed by sun. So, what does one understand? So, this does not really mean that Brahma or the sun god directly going to come in front of you and then present the knowledge to you. So, it is not what is meant by Devata prasada. So, Devata Prasada is *mativalyaipu* – it is essentially a certain clarity in thinking which emerges because of a certain contemplation which this person does or meditation this person does, whatever, it is.

So, the point that I am trying to drive in here is so one need not call a work scientific because it is revealed by divine beings. One need not call it scientific because it has to be eternal. In fact the very notion of science is it is something that's going to change continuously. So, if at all you call it as scientific so it is questionable. So, it is not that it is taken for granted forever and therefore, it is scientific. But this kind of a conclusion is has been there which is what is brought out by some of this authors. And there are different reasons for that so, which will you see if, as we progress further.

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The allegorical nature of such stories

- The insertion of such episodes are **purely allegorical** in nature, and in no case should be taken at face value.
- For instance, *Ādi Śaṅkara* while commenting on *Upaniṣads* explains on various occasions the purpose of the episodes.

‘ब्रह्म ह देवेभ्यो’ इति ब्रह्मणो दुर्विज्ञेयतैः यन्नाधिकार्या ।
समाप्ता ब्रह्मविद्या यदधीनः पुरुषार्थः । अत ऊर्ध्वं अर्थवादेन
ब्रह्मणो दुर्विज्ञेयता उच्यते ।
तत्र आख्यायिका विद्यास्तुत्यर्था ॥

- **यन्नाधिकार्या** – [this is] to convey the enormous disciplined-effort involved [in understanding the truth]
- **अर्थवादेन** – by means of an allegory
- **दुर्विज्ञेयता** – the difficulty in understanding
- **विद्यास्तुत्यर्था** – to praise (convey the importance) of the knowledge

Appears at the beginning of the *vākya-bhāṣya* of *Kenopaniṣad*.
Appears right at the beginning of the commentary of *Kathopaniṣad*.

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And, one more point that I wanted to drive in here is the episodes which are found so, in some of these works are purely allegorical in nature. So, this has been very clearly stated not necessarily in the works on astronomy, but; in some of the most profound works which have been created in philosophy as well. For instance Adishankara himself so, while trying to comment upon some of these Upanishads so, in 1 or 2 instances, in few instances he actually says... so for instance in Kena Upanishad so, while describing certain story which has been revealed in the Upanishad. So, he says [Sanskrit reading] so, where in it is stated that this knowledge is something so profound and it has not even been understood by some of these divine people.

So, what does one understand by this statement – that it is not understood by divine beings? It only means that the effort that is involved in trying to understand is enormous [Sanskrit reading]. So, Arthavada is certain term which is used in Sanskrit to mean something which is allegorical in nature one should not take it upon at face value that is what one means by Arthavada. So, then we have also a statement in Katha-Upanishad right at the beginning Shankara makes *vidyastutyertha* – *akhyayika vidyastutyertha* – *akhyayika* means a certain episode which is presented *vidyastutyertha* in order to praise the importance of knowledge. So this particular episode has been integrated with this Upanishad so it should not be just taken on its face value.

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Divine revelation of knowledge?

- Though belief in God's grace, is almost an all pervasive feature of Indian society, there was no confusion regarding the role played by the grace.
- Grace is NO substitute for hard work in gaining knowledge.
- In fact, in the very long astronomical tradition, at no point of time do we find an astronomer detaching the burden and easily shifting it to the shoulders of God, Fate, Fortune, etc.
- Nilakantha describing about his teacher observes:
पञ्चपञ्चाशद्वर्षकालं निरीक्ष्य ग्रहणग्रहयोगादिषु परीक्ष्य
समदृग्गणितं चकार ।
- Āryabhaṭa towards the end of his work says:
सदसज्ज्ञानसमुद्रात् समुद्धृतं देवताप्रसादेन ।
सज्ज्ञानोत्तमरत्नं मया निमग्नं स्वमतिनावा ॥

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So, this message that one gets from all this is: though belief in God's grace is almost all pervasive feature of Indian society, at no point of time there was any confusion among them that this knowledge is directly gained by some divine being and therefore, you need not work towards it. So, grace is no substitute for hard work in gaining knowledge. So, this has been extremely quite clear. And, in the very long astronomical tradition so, as we find at no point of time people say that something went wrong so I am not responsible, something else is responsible. They just take upon – the burden – upon themselves.

And, in fact if people were to completely believe in divine grace then, there was no need for these astronomers or any of these people in the medicine field, ayurveda or whatever field, to work hard to gain this knowledge. In fact in one of his works Nilakantha describing about his grand teacher Parameswar he says [Sanskrit reading]. So, he make this statement so, [it] means he worked continuously for 55 years so having made crucial observation then having examined all the result that he has obtained over these years so, then he composed a certain work.

So, the message is: so this Devata Prasada has nothing to do with divine being coming in front of the person and revealing the knowledge. So, in fact Aryabhata himself towards the end of the work he says [Sanskrit reading] This is the most important statement. This is a most poetical description of what Aryabhata did. Towards end of the work he says,

so there has been this ocean of knowledge in front of me; when he says the ocean of knowledge there are right things, there are wrong things.

So, what he did was to plunge into this ocean. So I plunged into this ocean by means of a boat and the boat is none other than my own intellect. So, plunging into this ocean through my own intellect – how do I get this right knowledge? You can choose anything. Therefore, he says *devata prasaden* – through the grace of god – that actually means through the clarity which I got through meditation etc, I was able to pull out the right knowledge – *matinava* – this what understands by divine revelation.


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Is the Earth self-supporting?

- There are descriptions in some of the *purānas* to the effect that the Earth is supported by a tortoise, a serpent, etc.
- All these views are based upon the premise that heavy objects cannot stand in space without a support.
- While scrutinising these views, Bhaskaracarya in his *Siddhāntaśiromaṇi* observes:³

मूर्ती धर्ता चेत् धरित्र्याः, ततोऽन्यस्तस्याप्यन्यस्य पृथग्भ्रानवस्था।
अन्ये कल्प्या चेत् स्वप्रतिः किमादौ किं नो भूमेः साष्टमूर्तेह
मूर्तिः ॥

- मूर्ती धर्ता चेत् धरित्र्याः – If some tangible object must be there for supporting the earth
- पृथग्भ्रानवस्था – proceeding along similar lines we will end up in an infinite regress
- अन्ये कल्प्या चेत् स्वप्रतिः – If at the end you have to think of a self-supporting entity ...

 *Siddhāntaśiromaṇi, Golādhyāya, chap. 2, (Bhuvanakosa), verse 4.*

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So, coming to certain other issues which are discussed in some of these texts in presenting the history. So one often finds several statements which are somewhat infelicitous so, with the reference to the contribution made by the Indians. So, in this context I just wanted to – for instance Gyan Prakash – so he quotes in certain passages from Sidhanta Shiromani which has been cited by Omkar Bhatt in his own work and this is something which one finds in many other works also in history.

So for instance, this is an important question which could come up to anybody's mind. After all if one finds a heavy body the heavy body falls towards the earth. So one may, in common man's parlance, one can say it is falling down, okay? So, when you say falling down - down - with reference to something which you have defined as up in space – there's geometrical up and geometrical down and a heavy body cannot be suspended on

its own in space and therefore it falls towards the earth. So, if this were the case then obviously, earth also being a very heavy body – so, where does it stand in space? So this is the kind of question that it raises. So, there one finds certain descriptions in some of these Puranas that it is sort of supported by some hood of the serpent and so on and so forth.

So, these kinds of description in Puranas – this is where the kind of... when with we talk of so, this creative writing and various things which one speaks of – there are various ways of describing things. For instance even today in common parlance we say that this computer has been affected by virus – when you make this statement – what has system virus has to do with myself being affected by a viral infection.

So, these are all terms which are used in various contexts, in various connotations. So that apart – here, this question that arises – how we said that the earth is supported. So this could have been explained to some people at some stage that it is supported by elephant, it is supported by serpent so on so forth. It is supported by tortoise – these are all certain poetic descriptions of certain things which one finds in Puranas. So in a text on astronomy, how is it that the astronomers have perceived it. This is a very interesting question so which has been posed.

And, Bhaskara, he traces the answer – this is not only an answer by Bhaskaracharya – even earlier astronomers have responded to this question – since Bhaskaracharya's Siddhanta Siromani is considered to be one of the most profound works and this has been cited often by various historians. So, we will just to read this verse which is given in Bhaskaracharya's Siddhanta Siromani and, kind of argument that he presents to explain – so after all when one says that there is something called proof. So, what is really a proof? So proof is a certain argument is presented by somebody in order to convince someone else. So, the very notion of proof varies from discipline to discipline, it varies from time to time, it's something that one needs understand.

So, what acts as a proof at one point of time will no more be accepted as a proof at a different point of time, more evidences have been procured or we have certain devices which have been invented to probe much deeper into the aspects and so on. So, this being the case – during his time, which is around twelfth century – this is a very interesting passage which one finds in Bhaskaracharya's. So, he says [Sanskrit reading].


This occurs in Goladhyaya of Bhaskaracharya's Siddhanta Siromani. The question that he asks is... Dharitri is earth. ...If you say there should be some tangible object which is supporting the earth in space. Then, the next question that arises is whatever be the tangible object – that has be supported by something else and so on so forth. So, where will you end up? We will end up in finite regress. So, at some point of time you have to say that there is something else which is self-supported. If you say that the entity is self-supported – what is so special about that entity – why not assign to first entity itself.

So, that is what he's saying *antiye kalpaache swashakti* on its own if it can get supported, it does not depend on nothing else; this if you can ascribe to some entity at some point of time, then why not be ascribe it to the earth itself? So, this is a kind of argument which he gives but this is not quite convincing – but the point is that you will not be able to find a solution by saying it is supported by serpent it is supported by elephant – these are all stories which have been constructed to explain to some people at some point of time, but this is not something which stands scrutiny.

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Situation of the Earth

- While offering reasoning in the same vein, Bhāskara (b. 1114 AD) observes:⁴
आकृष्टशक्तिश्च महती तथा यत् खस्थं गुरुं स्वभिमुखं स्वशक्त्या ।
आकृष्यते तत्पततीव भाति समे समन्तात् क्व पतत्वियं खे ॥
The Earth is known to be possessing the power of attraction (ākṛṣṭa-śaktiḥ). All the heavy objects in the sky are attracted towards it by this power. That is why, the objects are indeed found to be falling. This phenomenon is uniform (samam) all around (samantāt) the Earth; [This being the case,] if this (the Earth) itself were to fall [being unsupported] where would it fall (go and settle) in the space?
- Thus clearly according to the Indian astronomers, the Earth stands in the space self-supported.

 Siddhantaśiromani, Golādhyaya, chap. 2, verse 6.
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So, that is what Bhaskara says. He further goes on and then says [Sanskrit reading] – this is a very interesting passage. And, sometimes this is also grossly misinterpreted by some people. So, this is something which one needs to be understood. See, there are some people who try to study some of these ancient scriptures and they get excited as they keep reading them and then the moment they find something which is similar to what has

been expressed in modern science they say whatever has been stated in modern science it's there. Sometimes they go to the extent of saying that they find some term which is similar to what is there in modern science and then they say that the whole theory is there in ancient science, the ancient Indian science.

So...I will just cite one example in fact. A few years back was in IIT Madras listening to a seminar presented by a mathematics professor – he went to the extent of saying that – there is something called string theory in modern physics – so he went to the extent of saying that in Bhagavad-Gita we find string theory described. I was taken aback by this statement. But then he tries to defend himself by saying... by citing a sloka wherein he says – we find a statement in Bhagavadgita [Shloka reading] the term sutra means a string, and therefore we find the term string and therefore, we have the string theory in Bhagavadgita. So people think that they are doing some justice to ancient science but that is going to be counterproductive. So, when one looks into ancient texts one has to be all the more cautious.

And here why I'm mentioning this is because there is a term [Sanskrit phrase] so *shaktih* is a certain force, *akrishta* means a certain force which is attractive in nature. So one should not immediately jump to the conclusion that Bhaskaracharya knows gravitational theory. So, this is absolutely wrong which is what some people try to do. And it is injustice to both modern science as well as ancient scriptures – that's what I want to say.

So, here *akrishta shaktih* – it is a very interesting argument which is presented by Bhaskaracharya, which is I thought I will explain this verse – suppose you think of the earth, it is well known to Indian astronomers, it can be easily understood through various means as to why the earth has to be spherical in nature – so, this has been understood from the period of even Aryabhata. Aryabhata himself described it to be spherical and there are reasons which have been given by these astronomers which will be as valid today, as it was valid in those days and so on.

So here – that the earth is spherical in nature – which is very clearly understood. So, given that, now one poses the question if the earth were to fall where will it fall? So, why should – why at all you feel that earth has to fall - because it is a heavy object, okay? Now, any heavy object falls from above to below, right? So it falls down. So, imagine another observer sitting in California which is directly opposite to some part in India so, there

also this fellow will see something falling towards him – so, what is up and what is down? So, for him this is up, for the fellow in California that will be down – that is the kind of argument which...Bhaskara gives here. [akrishtashakticha mahi] See, from the fact that one observes that all objects are attracted towards the earth one concludes that there is a certain force of attraction towards the earth. Mahi, mahi means prithvi.

So, *khastam* – the word *kham* means space, *khastam* means an object which is in space, *gurum* so an object which is heavy, *swadhimukham* towards it, *swashaktiyah* because of the force of attraction which it has attracts any heavy object towards it, *akrishyateh*, so it is being attracted. Since it is been attracted we feel that it falls - *tatpattativabhati*. So then he says this phenomenon is true all around the earth. So not necessarily here. Therefore, whether you are in India or you are sitting somewhere in California which is directly opposite to some location in India – diametrically opposite point – also experience that they are pulled towards it. Therefore, there is nothing like up and down wherein earth can go down, so this argument – *kopatativiyamkhe* – this object, where will it fall? So, this is the kind of present argument that he presents.

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Cause of the Eclipses

- There is a puranic story related to churning the milky ocean to obtain nectar. . . . out of spite, the head swallows the Sun and the Moon during eclipses.
- There had been other beliefs that snake causes eclipses.⁵
- Refuting these and other illogical views Lalla observes:⁶

If you are of the opinion that an artful demon is the cause of eclipses [and he always swallows Moon at a distance of 6 signs] then how is it that an eclipse can be determined (time can be predicted) by means of calculation? [demon can do it at any time] Moreover, why is there not an eclipse on a day other than the day of new or full Moon?

⁵One of the possible reasons for this belief is that – during total solar eclipse one find bands passing across the observer at tremendous speeds, which would look like passage of serpents.

⁶*Sisyadhivardhida-tantra*, of Lalla, chap. 20, verse 21-26.

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So, the message is: they presented certain arguments with their own limited understanding of what is called gravitation today. One should not simply jump to the conclusion that because he uses the word *akrishtashaktih* Bhaskaracharya knew gravitation as Newton understood it.

Okay so there are other instances in Indian astronomy also wherein there are descriptions of eclipses, wherein one may find that ahead Rahu Ketu and so and so forth but these are again very similar to Mayasura receiving the knowledge of the motion of planets directly from the sun.


So, these stories are not accepted by astronomers. In fact they argue strongly and logically as to why these stories cannot be taken as explanation for certain physical phenomena which is happening around. So, the simple question that one can raise to a person who believes that some Asura comes and swallows the sun – if an Asura is a certain human being with certain bad qualities or you can call Devata swallows whichever it is – the problem is – we have a free will to do what we want to do and therefore, nothing can prevent us from swallowing any time we want to swallow.

And, therefore, this eclipse which is a certain phenomenon which happens only with certain physical conditions satisfied so, cannot be the act of a human being who would like to perform things as and when he likes. So, since it is periodic and it can be predicted – any human activity cannot be predicted.

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Allegation on Hindu mathematicians

- Continuing with the reasoning Lalla observes –
 - In a solar eclipse, people at different parts (of the Earth) observe different portions of the Sun eclipsed. Some do not see the eclipse at all. Knowing this who can maintain that an eclipse is cause by Rāhu?
- These arguments are purely based on logical reasoning.
- Notwithstanding this, some historians opine:⁷
 - They (Hindus) **delighted more on tricks, than in the thoughts the mind could produce**, so that neither Euclidean geometry nor Aristotelian logic made a strong impression upon them. . . .
- Such statements are not only misleading but also, to a great extent, obscure the contribution of a rich tradition.

 C. B. Boyer in his *History of Calculus and its conceptual Development*, p. 62.

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Therefore, these are all things which will not be accepted and will not hold water the kind of explanation that demon comes and swallows so on. So, finally, I would like to point out of a few quotations and this is very important to understand when we try to study the Indian science. So, particularly history – a very important historian who writes

about the development of mathematics from ancient times to modern times. His name is C B Boyer. So, when he tries to write a text on history of calculus and its conceptual development.

So, the remark that he makes: "...the Hindus delighted more on tricks than in the thoughts the mind could produce, so that neither Euclidean geometry nor Aristotelian logic made strong impressions on them." So, he's sort of dismissive – this is what it looks like – Hindus delighted more on tricks – I making this statement just to convey an important point that in the Indian tradition things have been authored in the form of sutras. If we look at the ancient texts 2000 years back, the style of writing was called Sutra and it is be very terse in nature.

There is also another reason has to why people had to write in such terse form. The knowledge was transmitted orally and therefore, if you have keep things in memory – we did not have devices in those days to write it and then whenever we want, we can pick up that and read. So this came much later. Being oral tradition things were sort of memorized and, therefore you keep them in terse form as far as possible but it does not mean that the teacher did not explain the phenomenon to the taught.

So when they say they "delighted more on tricks" this kind of statement is primarily based upon looking at some of these primary texts which have been very terse in nature but not looking into the commentaries which actually explain the kind of rationale which they had in trying to arrive at a certain result. When the result is sort of presented, you do not how they worked at that. So therefore, some of the historians have been misled, it looks like, and therefore they make these kind of statements. And this has been repeated by so many people and I just want to cite a few more examples.


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Infelicitous Remarks

Patrick Moore observes:⁸

- The Chinese were careful sky-watchers ...
- Mesopotamians, Babylonians ... did regular observations ...
- Egyptians were remarkable people capable of carrying out very accurate measurements
- Greeks were the first to change the astronomy from a mystical cult into a true science
- The Vedic priests in India believed the world to be supported upon twelve massive pillars ... serpent floating on limitless ocean. One cannot help feeling rather sorry for the serpent.

Stops! – as if it is the be-all and end-all of Indian Astronomy.

 The author of over 60 books in Astronomy born in 1923.

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So in the context of astronomy, for instance, they say Chinese were careful sky watchers. Mesopotamians, Babylonians did regular observations, Egyptians were remarkable people capable of carrying out very accurate measurements; Greeks were the first to change the astronomy from mystical cult into true science. So, when he comes to describe about the Indian contribution he said, the Vedic priests in India believed the world to be supported upon 12 massive pillars... serpent floating on limitless ocean. One cannot help feeling rather sorry for the serpent.


So I'm just saying this is a book which has been authored by Patrick Moore who has written dozens of works on astronomy. So this person, when he's trying to describe the contribution of various civilizations, coming to India he just dismisses it by simply quoting some statement which is found in Purana. That's why I just cited the sloka from Bhaskaracharya – when these people themselves have dismissed the idea that it is supported by something else. So he stops as if that is the be all and end all of Indian astronomy.

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Concluding Remarks
History vs. Myth-making

Finally, again, I would like to conclude with the words of Claude Alvares⁹ –

- All History is elaborate efforts in myth-making. ...
- If we must continue to live with myths, however, it is far better we choose to live with those of our own making rather than by those invented by others for their own purposes.
- That much at least we owe as an independent Society and Nation !!

 In his introduction to *The Indian Science and Technology in the 18th Century*, Other India Press, Goa.

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So in trying to study the contribution of a certain civilization is extremely important that one tries to get into not only some of these source works which are written in terse form but also the commentaries which have been authored much later.

And finally, I would like to conclude with a certain statement which has been made by Claude Alvares which I found very interesting. So, he says history is all efforts in myth-making. It is true in the sense that we will not be able to find out what was happening 1500 years back. We get some bits-and-pieces of information and we try to integrate them and present a whole picture. So this is the effort which is made by historians. And, making in such efforts some myths will also be there so which have to be accepted and therefore, he says so, if we must continue to live with myths however, it is far better we choose to live with those of our own making rather than those invented by others for their own purposes.

So, that much at least we owe as an independent society and nation. So I'm making this statement because there has been a certain purpose for which certain studies have been made particularly in the Indian context. So, these books which are authored to try to see how the modern science was accepted in the Indian society. So, this is the very important thing that one needs to understand for one to have a certain success in trying to force a certain different system of education into a certain continent so, there are various tricks which have been adopted.

So, which I will not be getting into, but the point is that is what Cloud Alvares means invented by others for their own purposes. This is how certain things have been written and, whatever has been written has been simply accepted for various reasons and therefore, it is important for one to present the history of one's own nation by their own people instead of some alien who has not understood how the fabric here is weaved.

So, with these few remarks I would end my session, thank you.

Thank you so much, Prof. Ramasubramanian for this exegesis and as I said it earlier it will indeed add to our journey and our debates and discussion. And, I think finally, to more creative writing. I do want to finally say that our attempt in this session has been linked to a new writer's search for form and fresh themes. We are greatly interested in locating the connection between creativity and knowledge-building. Science and technology within our cultural context offer rich possibilities not only for this discipline but also for creative writing. So, this is the journey that we'll undertake from now on.

Thank you.