

COSMOGENESIS IN ANCIENT HINDU SCRIPTURES AND MODERN SCIENCE

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Abstract

This paper examines several cosmogonies, or creation stories, in the ancient Hindu Vedas and Upanishads and compares them to our modern scientific creation story, the expanding universe theory, which is known popularly as the big bang theory. Specifically, it attempts a critical interpretation of the Nasadiya Sukta in the Rig Veda and the instruction of the sage Uddalaka Aruni to his son Svetaketu in the Chandogya Upanishad, chapter 6, both texts from about the eighth century BCE. Then it compares the Chandogya text with popular, nontechnical accounts of the modern scientific expanding universe theory, noting similarities and differences. The thesis argued is that the 2,800 year old cosmogony of Uddalaka Aruni is remarkably similar to our present understanding of the origin of the universe.

In the beginning...

In his book *A Brief History of Time*, cosmologist Stephen Hawking wrote “We find ourselves in a bewildering world. We want to make sense of what we see around us and to ask: What is the nature of the universe? What is our place in it and where did it and we come from? And why is it the way it is?” (Hawking 171) Throughout human history people have tried to answer these questions. So it is not surprising, given the many creation myths from around the world and from different ages, that our modern scientific theories of cosmogenesis should have some resemblance to one or another of these earlier stories of the origin of the universe. Two years ago, while selecting texts for a course exploring the religious quests of people from prehistoric times down to the present, I came across the Nasadiya Sukta in the Hindu Rig Veda and the sage Uddalaka Aruni’s instruction to his son Svetaketu in chapter 6 of the Chandogya Upanishad and was struck by the similarities of these two ancient cosmogonies, especially that of Uddalaka Aruni, to our modern scientific creation story, the expanding universe theory, which is popularly known as the big bang theory. The present paper has grown out of a short paper I wrote for an online course from Oxford University on the Vedas and Upanishads. In the present paper, I will explore the cosmogonies in the Nasadiya Sukta and the Chandogya Upanishad 6.2-3 and compare the teaching of Uddalaka Aruni in the Chandogya Upanishad to the big bang theory of contemporary science, keeping in mind the caveat of both the Nasadiya Sukta and of modern science that the beginnings of the universe are inherently unknowable.

The Nasadiya Sukta: Rig Veda, Book 10, Hymn 129

Like many traditions, Hinduism has a number of different creation stories in the Vedas, which are its oldest and most authoritative scriptures. Other creation myths can be found in its great epics the

Ramayana and the Mahabharata, and in the Puranas. By my count, in the Vedas alone, of which the Upanishads are the latter part, there are at least fourteen different accounts of the origin of the universe.

The Nasadiya Sukta is one among the huge collection of 1,028 hymns that make up the Rig Veda, the oldest of the four Vedas. Most of these are hymns praising the Vedic gods, originally chanted during sacrificial rituals by Hindu priests. However, Book 10 of the Rig Veda, of which the Nasadiya is a part, appears to be a later addition to the collection and contains several hymns that do not appear to have a connection with Vedic ritual. While orthodox Hindus regard the Vedas as eternal, modern scholars generally date Book 10 to about the eighth century BCE, which is about the same time as the two earliest Upanishads: the Brihad Aranyaka Upanishad and the Chandogya Upanishad. (Brockington 41)

The Nasadiya Sukta

- 1a The non-existent did not exist, nor did the existent exist at that time.
There existed neither the midspace nor the heaven beyond.
- b What stirred? From where and in whose protection?
Did water exist, a deep depth?
- 2a Death did not exist nor deathlessness then.
There existed no sign of night nor of day.
- b That one breathed without wind through its inherent force.
There existed nothing else beyond that.
- 3a Darkness existed, hidden by darkness, in the beginning.
All this was a signless ocean.
- b When the thing coming into being was concealed by
emptiness, then was the one born by the power of heat.
- 4a Then, in the beginning, from thought there developed desire,
which existed as the primal semen.
- b Searching in their hearts through inspired thinking,
poets found the connection of the existent in the non-existent.
- 5a Their cord was stretched across.
Did something exist below it? Did something exist above?
- b There were placers of semen and there were powers.
There was inherent force below, offering above.
- 6a Who really knows? Who shall here proclaim it?—
from where was it born, from where this creation?
- b The gods are on this side of the creation of this world.
So then, who does know from where it came to be?
- 7a This creation—from where it came to
be, if it was produced or if not—
- b he who is the overseer of this world in the highest heaven,
he surely knows. Or if he does not know...? (Brereton 250-258)

What makes the most striking initial impression on the reader of the Nasadiya Sukta are its unanswered questions. These are much different from most cosmogonies that offer a clear answer to questions about the origin of the cosmos. Although it is usually classed as a cosmogony, Brereton points out that the Nasadiya is really an anti-cosmogony. (Brereton 249) It asks more questions than it offers answers. This led astronomer Carl Sagan to view it as an early example of India's "tradition of skeptical questioning and unselfconscious humility before the great cosmic mysteries." (Sagan 37:00) The Nasadiya has attracted a great number of commentaries with differing interpretations by both Hindu and Western scholars from ancient times down to the present. With some trepidation, I shall attempt one more.

I have chosen Joel Brereton's more literal, though less elegant, translation over the better known rendering of Wendy Doniger O'Flaherty, because Brereton's proposal that the Nasadiya was intended more for meditation than instruction was the inspiration for my own interpretation. Initially, I thought that Brereton might have anticipated my own understanding of the hymn. But once I had read his article, I realized that was not the case.

The starting point for Brereton's argument is "the unresolved question which concludes the hymn. This question calls into doubt the possibility of any cosmogonic narrative, including the narrative that the hymn has just offered. The lack of resolution within the hymn causes the audience...to reflect. But in doing so, that audience is actually recovering the power of creation, for the hymn identifies thinking as the original creative activity. The solution to the hymn and to the question of the origin of things rests both in what the poem says and, even more, in the response it evokes from its audience." (Brereton 248) I think Brereton is correct when he says that the question that concludes the hymn "calls into doubt the possibility of any cosmogonic narrative, including the narrative that the hymn has just offered." But I do not agree that "the hymn identifies thinking as the original creative activity" any more than that it identifies "the one born by the power of heat" or the "placers of semen" and "powers" as the origin and cause of creation. These are myths that probably preexisted the Nasadiya and are challenged by it.

Brereton has done a careful rhetorical analysis of this hymn and shows that it is a ring composition, with the last verse echoing the first. Ring composition "normally functions to define and to close a unit of discourse by marking its beginning and end. In this case, however, the ring has the effect not of bringing the hymn to closure, but rather of suggesting that there has been no real solution to the questions posed at the beginning....Uncertainties at the beginning become uncertainties at the end." (Brereton 250) This is an important observation, because in the central portion of the hymn there *are* relative certainties.

I think that Brereton's interpretation that "thought" is the original creative principle and that the hymn causes its audience to "recreate the fundamental creative power, the act of thinking, and recapitulate the process of creation" does not take sufficiently into account the questions that frame and challenge the central cosmogonic myths. (Brereton 259) With the exception of verse 1a, the frame of the poem (verse 1 and verses 6 & 7) is entirely composed of unanswered questions. But the center of the poem (verses 2-5) is composed of declarative statements, with the exception the second half of verse 5a. Questions bracket and challenge the creation myths that are alluded to in the center of the poem.

There seem to be at least three different cosmogonic myths alluded to in the center of the poem, but each morphs into the next in such a way that they appear to be a single, although very complex, myth. Each myth is linked to the one that precedes by a chain of association. "The one born by the power of heat" in verses 2 & 3 leads to the "primal semen" in verse 4, which in turn leads to the "placers of

semen” in verse 5. This is a common mnemonic device in oral literature such as the Vedas originally were, and it is often carried over into written literature. Unlike Brereton, I think that these cosmogonic myths preexisted the poem. They are received wisdom that the Nasadiya quotes, questions, challenges, and effectively negates.

Verses 2 & 3 allude to the cosmogonic myth of a primal egg, here referred to as “the one” from which the world was born. This mytheme is also mentioned in Rig Veda 10.121.1 “In the beginning the golden embryo arose. Once he was born, he was the one lord of creation. He held in place the earth and this sky.” And in the Chandogya Upanishad 3.19.1 we read “In the beginning this world was simply non-being. It then developed and formed into an egg. It lay there for a full year and then it hatched.”

A second myth, the one Brereton considers the key to the poem, is alluded to in verse 4a. To quote Brereton “By concretizing desire as semen, the poem implies that desire is then the origin of all living beings and, by extension, of the world in general.” (Brereton 254) The link between desire and heat is a frequent mytheme in Vedic literature. In the second part of the verse, the creative process of poets who “found the connection of the existent in the non-existent” is likened to the origin of all living beings.

The third myth alluded to in verse 5 seems to continue the line of thought in verse 4b because the obscure phrase “Their cord was stretched across” appears to refer to the poets who were just mentioned. But I suggest this is simply a verbal link meant to tie together originally independent myths. Thus, the third cosmogonic myth alluded to is that of a primal couple, male “placers of semen” or “inherent force” below, and female “powers” or “offering” above. The myth of origin from a primal couple is well known from world literature, in Babylonia and Japan for example, and is attested closer to home in Rig Veda 10.72.2-6 “Being, in an earlier age of gods, from non-being sprang....Thereafter were the regions born. This sprang from the productive power. Earth sprang from the productive power the regions from the earth were born” and Rig Veda 10.90.5 “From Purusha (the primal man), Viraj (the active female creative principle) was born, and from Viraj came the Man.”

But what are we to make of the questions in the second part of verse 5a? “Did something exist below it? Did something exist above?” These are the only questions in the central part of the Nasadiya. If “their cord was stretched across” refers to the existent and non-existent of the preceding verse, then the questions challenge the assertion that existence is connected to non-existence. But if they refer to the following male/female couple, then the questions seem to challenge the myth of creation by a primal couple. Since there is another example in the Nasadiya (verse 1b) of questions preceding the myth they challenge, where the myth of a primal egg submerged in a signless ocean is preceded by the questions “What stirred? From where and in whose protection? Did water exist, a deep depth?” I believe the questions “Did something exist below it? Did something exist above?” should be understood as a challenge to the following cosmogonic myth of creation by a primal couple.

As mentioned previously, verse 1 and verses 6 & 7 form a frame or ring around the cosmogonic myths of the central section. They are questions which challenge the received wisdom of these cosmogonies. In fact, they challenge the very idea that the origin of the world can be known by humans, by the gods, and perhaps even by the mysterious “overseer of this world in the highest heaven.” So it is not surprising then, that the opening verse of the hymn presents the paradoxical statement that “The non-existent did not exist, nor did the existent exist at that time.” This statement effectively refutes *all* of the creation myths that follow. It even denies the view that existence proceeded from non-existence as is stated in verse 4b, because it says that in the beginning “the non-existent did not exist.”

I believe the questions and negations that frame the cosmogonic myths of the central section of the poem are the key to understanding the poem as a whole. What Wendy Doniger O’Flaherty says about Rig Veda 10.72, Aditi and the Birth of the Gods, can be applied to the Nasadiya Sukta as well. “This creation hymn poses several different and paradoxical answers to the riddle of origins. It is evident from the tone of the very first verse that the poet regards creation as a mysterious subject, and a desperate series of eclectic hypotheses (perhaps quoted from various sources) tumbles out right away.” (O’Flaherty 37-38)

Brereton observed “For a hymn that is generally classified as a cosmogony, RV 10.129 is remarkably contrary. In a sense it is really an antic cosmogony, for the hymn itself rules out the possibility of constructing a final description of the origins of the world.” (Brereton 249) That, I would argue, is its purpose. I believe the Nasadiya should be considered more as a meditation than a hymn. It seems intended to lead its audience from the relative certainties of the cosmogonic myths that it alludes to, which are received wisdom from the past, into complete uncertainty and silence before the mystery of origins that are not this, not that (*neti, neti*). It provides no answers—just unknowing.

The antecedents of this sort of meditation can be found in the subtle debate (*brahmodya*) engaged in by learned Brahmins, occasionally by nobles, and sometimes by women. George Thompson noted that the Nasadiya displays *brahmodya* features such as “elaborate interrogation sequences, cosmogonic themes, and a remarkable scepticism concerning ultimate truths.” (Thompson 31) One such debate, in which Gargi, a woman, challenged the famous Brahmin sage Yajnavalkya is described in the Brihad Aranyaka Upanishad 3.8. Gargi asked Yajnavalkya “On what are all things woven back and forth?” Not satisfied with his answer that all things are woven on space, Gargi asked “On what, then, is space woven back and forth?” Yajnavalkya replied “On the imperishable which is neither this, nor that (*neti, neti*), which sees but can’t be seen, hears but can’t be heard, thinks but can’t be thought of, perceives but can’t be perceived.” In other words, one arrives at knowledge of ultimate reality, here called the “imperishable,” by systematically negating all that is *not* ultimate reality. In later Jnana yoga meditation this led to the practice of the “*neti neti* search” whose purpose was to negate rationalizations and other distractions from the non-conceptual meditative awareness of reality. (Devanand 119) By systematically stripping away the assertions of received wisdom—just as the Nasadiya Sukta does—one arrives at a “higher” (or, if you prefer, “deeper”) realization, a realization that cannot be put into words.

Uddalaka Aruni’s Instruction To Svetaketu: Chandogya Upanishad, Chapter 6

The Upanishads are a collection of philosophical texts which form the theoretical basis for the Hindu religion. They are known as Vedanta, which means the end or completion of the Veda, because they comprise the last of the four sections of each of the four Vedas. They are teachings said to have been given by ancient sages to their students. More than 200 Upanishads are known, of which the first dozen or so are the oldest and most important. The Chandogya Upanishad is one of the oldest and longest of these and is roughly the same age as Book 10 of the Rig Veda which contains the Nasadiya Sukta. The Chandogya is a collection of teachings and stories by and about various sages, some of whom are named and others not. Chapter 6 is the most influential text in the entire corpus of the Upanishads for the philosophy of Advaita (non-dual) Vedanta. (Deutsch & Dalvi 8) It contains a rather lengthy account of the instruction which the sage Uddalaka Aruni gave to his son Svetaketu upon his son’s return from twelve years of education by another sage. Svetaketu came back “conceited, arrogant and regarding himself as very learned.” So Uddalaka, like many a parent, asked him “What did you learn? Do you

know the teaching by which the unheard becomes heard, the unthought becomes thought, and the unknown becomes known?” When Svetaketu admitted that he did not, Uddalaka proceeded to give him a lengthy instruction which began “Just as by knowing one lump of clay, we come to know all things made out of clay, that they differ only in name and form, by knowing a single gold ornament, we come to know all things made out of gold, and by knowing a single iron tool, we come to know all things made out of iron....so we come to know that all of life is one.” (Chandogya Upanishad 6.1.2-6)

The cosmogony that Uddalaka then taught Svetaketu provides the rationale behind this teaching. And the whole instruction leads up to the repeated assertion “That you are.” (*tat twam asi*). This is one of the “great sayings” upon which the philosophy of Advaita Vedanta is based. Advaita Vedanta is a monistic system, expounded by the philosopher Adi Shankara among others, which regards all of reality as one (*brahman*) and the physical universe that we inhabit as a collective illusion (*maya*) based on ignorance. In this system, the human self (*atman*) is considered to be one with *brahman*.

While the Nasadiya Sukta is a poem for meditation, Chandogya 6 is a dialogue between Uddalaka Aruni and his son Svetaketu. I have provided a translation of the cosmogony that Uddalaka Aruni teaches and not his further instruction that leads to the refrain “That you are.” There are many translations of this text and all differ slightly in their rendering of several key verses. I have provided the running translation of Swahananda because it is fairly literal. Swahananda also provides the original Sanskrit text, a word-for-word English translation, and notes based on the commentary of Shankara. In some places I have given Swahananda’s word-for-word translation rather than his running translation.

Chandogya Upanishad 6.2-3

- 2.1a In the beginning, dear boy, this [universe] was being alone,
one only, without a second.
- b Some say that, “In the beginning, this was non-being alone,
one only without a second. From that non-being arose being.”
- 2a Aruni said, “But how, indeed, dear boy, could it be so?
How could being arise from non-being?
- b In truth, dear boy, in the beginning, there was being alone,
one only, without a second.
- 3a That [being] perceived “I will become many, I will grow
forth.” It sent forth fire.
- b The fire perceived “I will become many, I will grow forth.”
It sent forth water.
- c So, whenever a person grieves or perspires,
then, from fire [heat], water is produced.
- 4a The water perceived “I will become many, I will grow forth.”
It sent forth food [earth].
- b So, wherever it rains, abundant food grows there,
it is from water that food for eating is produced.

- 3.1a Of the aforesaid beings [fire, water, earth] there are only three origins:
 - b those born from eggs, those born from living beings, and those born from sprouts or seeds.
- 2a That deity [being] perceived “Well, through this living self,
 - b entering into these three deities [fire, water, earth] let me differentiate name and form.”
- 3a “Of these [three deities] let me make each one threefold.”
 - b So, this deity entered into these three deities, through its living self, and differentiated their names and forms. (Swahananda 416-423)

Unlike the beginning of the Nasadiya Sukta which asserts a logical paradox, the opening line of Uddalaka Aruni’s instruction is quite logical “In the beginning, there was only being.” He flatly denies the view that in the beginning there was only non-being, and that being arose from non-being. It is clear from what he says that there was debate among the ancient Hindu sages about the state of things “in the beginning.” Three different positions can be discerned: 1. the view of the Nasadiya that in the beginning there was neither non-being nor being, 2. the view of texts like Rig Veda 10.72.2, Brihad Aranyaka Upanishad 1.2.1, and Chandogya Upanishad 3.19.1 that in the beginning there was simply non-being, and 3. the view of Uddalaka Aruni and others that there was some sort of primal being which was variously identified. Let us look at these in turn.

1. The Nasadiya Sukta appears to be alone in asserting that in the beginning there was neither non-being nor being. Moreover, as we saw, the Nasadiya seeks to subvert the possibility of *any* knowledge of the origin of the cosmos. It is *neti, neti*, not this, not that.
2. There are several texts that assert that in the beginning there was only non-being. For example, Rig Veda 10.72.2 says: “Being, in an earlier age of gods, from non-being sprang,” Brihad Aranyaka Upanishad 1.2.1 asserts “In the beginning there was nothing here at all.” And Chandogya Upanishad 3.19.1 reads “In the beginning this world was simply non-being.”
3. Texts which posit a primal being of some sort are the Rig Veda 10.90 which tells of a primal person or man (*purusha*) from whose sacrifice the world was created. *Purusha* is also mentioned in the Mundaka Upanishad 2.1.2-3. Brihad Aranyaka Upanishad 1.4.10 says “In the beginning this world was only *brahman* and it knew only itself, thinking ‘I am *brahman*.’ As a result it became the whole.” While the Brihad Aranyaka Upanishad 1.5.21 mentions a creator god named *prajapati*. And Brihad Aranyaka Upanishad 5.5.1 speaks of a primal ocean which created the real (*satyam*) which then created *brahman*—“that is *prajapati*, and *prajapati* created the gods.” The Aitareya Upanishad 1.1.1 says “In the beginning this world was the self (*atman*), one alone, and there was no other being at all that blinked an eye. He thought to himself ‘Let me create the worlds.’” And, finally, the text we are considering, Chandogya Upanishad 6.2.1, says “in the beginning, there was only being (*sat*).”

Whereas many texts use the concrete language of myth to name the primal being, Uddalaka Aruni tries, at least at the beginning of his cosmogony, to use more abstract philosophical language. He uses the word *sat*, which may be translated as being, existence, or the existent. However, as Deutsch & Dalvi point out “Although the text does not use the term *brahman*, the Vedanta tradition is that the existent (*sat*) referred to is no other than *brahman*.” (Deutsch & Dalvi 8) In the West, we would refer to

brahman as God, with it being understood that by “God” is meant impersonal absolute being, rather than the personal God of the Judeo-Christian-Muslim tradition. The Hindu belief is that the only thing that can be said of *brahman* is that it is being-consciousness-bliss (*sat-chit-ananda*), although that is certainly going beyond what Uddalaka Aruni said, for he only spoke of *sat*.

Uddalaka Aruni’s cosmogony is firmly on the side of those who posit a primal being as the cause of the universe, but at first, he refuses to personalize this being or otherwise describe it. It is simply being or existence (*sat*). However, the difficulty of describing an impersonal cosmogenesis without resorting to the concrete language of myth and anthropomorphism becomes apparent in the following verses in which Uddalaka Aruni attempts to describe the process by which being (*sat*) brought forth the cosmos. Here abstract language gives way to the anthropomorphic language of myth.

I have departed from the translation of Swahananda in the rendering of the beginning of verse 3, which is a key verse. He translated “That [being] willed, saw and thought...” But Max Muller, one of the earliest translators of the Upanishads, pointed out that the verb is literally “it saw” which he noted shows that the *sat* is conscious, not unconscious. (Muller 94) A better English rendering, and the one I have used in the translation above, might be “perceived” which implies both physical sight and conscious awareness, understanding and envisioning the future. Consciousness is a characteristic of humans (and of animals), and the latter part of the verse, “I will become many, I will grow forth,” seems to describe human foresight and intent. However translated, the language is clearly anthropomorphic. Unfortunately, commentators have had very little to say about the meaning of this verse, perhaps feeling that it is adequately explained by the emanation, or sort of primitive evolutionary process, which is then described. In this process, that (being) produced fire, fire, in the same way, produced water, and water produced food, meaning the earth. We might note that the Taittiriya Upanishad 2.1.3 envisions a somewhat more complex evolution: space > air > fire > water > earth > plants > food > humans.

Uddalaka Aruni’s cosmogony concludes, after what seems to be a digression in 6.3.1 about the origins of living beings, with being (*sat*), which is here named as “that deity” (*deva*) entering into the three deities (*devas*) of fire, water, and earth in order to make each threefold and hence create the multiplicity of names and forms which constitute the complex reality of the cosmos.

Some translators paraphrase this creative process simply as “Out of himself he projected the universe; and having projected out of himself the universe, he entered into every being.” (Prabhavananda & Manchester 68-69) While Eknath Easwaran, perhaps with an eye to the big bang theory, paraphrases it as “Out of himself he brought forth the cosmos and entered into everything in it.” (Easwaran 133)

Uddalaka Aruni tries, but does not wholly succeed, to describe an impersonal process by which the one being (*sat*) became the many, that is “this whole world.” A world that is not apart from it, because it, “entered into them” becoming their very self (*atman*). Since everything that exists has arisen from the one (*sat* or *brahman*), by knowing any part of the whole, a person knows the one, and by knowing the one, a person knows all that has arisen from it. Moreover, since all individual beings come from the one (*brahman*), as Uddalaka Aruni repeatedly taught his son Svetaketu “That you are!” (*tat tvam asi*).

Before moving on to compare this ancient Hindu cosmogony to that of modern science, it will be helpful have Eknath Easwaran’s succinct, modern paraphrase of this text before us, because it makes clearer the similarities of this ancient Sanskrit text to contemporary presentations of the expanding universe theory.

Chandogya Upanishad 6.2-3

In the beginning was only being,
One without a second.
Out of himself he brought forth the cosmos,
And entered into everything in it.
There is nothing that does not come from him.
Of everything he is the inmost self.
He is the truth; he is the self supreme.
You are that, Svetaketu, you are that. (Easwaran 133)

By way of an aside, we might note that the late Roman philosopher Plotinus who lived in the third century CE taught that there is a transcendent One which is the source of the world. Everything in the world emanates from the One in succeeding stages of lesser and lesser perfection. But, according to Plotinus, the One is in no way affected or diminished by these emanations. (Stace 110–123) While this is in agreement with the teaching of Advaita Vedanta, it is otherwise when we examine the big bang theory.

The Big Bang Theory

Like the ancient Hindu Scriptures, modern science has had several conflicting cosmogonies. As recently as the 1960s, there were two main theories: the steady state theory and the expanding universe theory, which became popularly known as the big bang theory. (Kragh 318) The expanding universe theory was first proposed in 1927 by Georges Lemaitre, a Catholic priest, astronomer and professor of physics. He suggested that all the energy of the universe was originally contained in a single quantum or “primeval atom” (he also called it the “cosmic egg”) which exploded at the moment of creation. (Lemaitre 706) Although Lemaitre’s theory was not initially accepted by many of the leading scientists of his day including Eddington and Einstein, evidence has since mounted that the universe is indeed expanding rapidly, making the big bang theory the prevailing cosmological model at present for the origin of the universe, although the model continues to be refined. In 1951, Pope Pius XII stated that the expanding universe theory was not in conflict with Catholic teaching about the Bible, although more conservative churches, and even many Catholics, continue to hold to a more literal interpretation of the Biblical creation stories. (Ferris 274, 438)

Cynthia Brown provides a brief description of the big bang at the beginning of her book, *Big History: From the Big Bang to the Present*.

It all began with an inconceivable event: the big bang. (This name was given by the British astrophysicist Fred Hoyle on a BBC radio broadcast in 1952) The universe erupted from a single point, perhaps the size of an atom, in which all known matter and energy and space and time were squeezed together in unimaginable density. Compressed space unfurled like a tidal wave, expanding in all directions and cooling, carrying along matter and energy to this very day. The power in this initial expansion was sufficient to fling a hundred billion galaxies for 13.7 billion years and counting. The billowing universe was under way. (Brown 4)

The reasoning behind the big bang theory is fairly simple. *If* the universe is expanding, as Georges Lemaitre predicted and Edwin Hubble later proved, *then* it must have begun at a time, which is presently calculated to have been 13.8 billion years ago, when everything in the universe was concentrated in a single point or “singularity.” This point was described by Stephen Hawking, who formulated a mathematical theorem proving the expanding universe theory, as “infinitesimally small and infinitely dense” or “zero size” and “infinitely hot.” (Hawking 8, 117) “The temperature of this atom-sized universe was many trillions of degrees. At this temperature, matter and energy are interchangeable—as Einstein showed, matter is really little more than a congealed form of energy.” (Christian 24) And, as we now know, matter is energy that has been slowed down by the Higgs boson, which is colloquially known as the “God particle.” But little more can be said about the primordial universe, because “under such conditions all the laws of science...would break down.” (Hawking 8) That is essentially the same point made by the Nasadiya Sukta 2,800 years previously—the origins of the universe are unknowable.

However, modern science can say with some confidence what happened immediately after the big bang. At the moment of creation, within a small fraction of a second, the universe exploded (or “inflated”) from an infinitesimally small point to a size larger than a galaxy. As it expanded, its original symmetry was broken and energy and matter began to assume forms that we can recognize today. Particles of matter and antimatter formed, but most annihilated each other and their mass was transformed into energy. Only about one in a billion particles of matter survived to form the material universe. Less than 10 seconds after the big bang, matter formed a very thin microscopic precipitate suspended in a macroscopic fog of dense, brilliant radiation. Then the pace of evolution slowed. After about 300,000 years, the temperature of the universe cooled sufficiently that huge clouds of hydrogen and helium formed, drifting through mostly empty space, charged with an immense amount of energy. All the basic ingredients of our universe were present: space, time, energy, and the basic particles of the material universe. Over the next 13 billion years, nothing has really changed. These same ingredients have arranged themselves in different patterns, which constantly form and dissipate. As David Christian wrote “the rest of the modern creation myth is merely the story of these different patterns.” (Christian 24-26) But these patterns were not contained in, or determined by, the primordial atom. As Lemaitre had pointed out: “Clearly the initial quantum could not conceal in itself the whole course of evolution; but, according to the principle of indeterminacy, that is not necessary. Our world is now understood to be a world where something really happens; the whole story of the world need not have been written down in the first quantum like a song on the disc of a phonograph. The whole matter of the world must have been present at the beginning, but the story it has to tell may be written step by step.” (Lemaitre 706)

Ancient Wisdom and Modern Science

Stephen Hawking observed “Ever since the dawn of civilization, people have not been content to see events as unconnected and inexplicable. They have craved an understanding of the underlying order in the world. Today we still yearn to know why we are here and where we came from.” (Hawking 13) This yearning to know probably predates even the dawn of civilization and may go back to the emergence of our species nearly 200,000 years ago. But without written records it is impossible to know what early people were thinking about these questions, although their surviving artifacts provide tantalizing clues. We know, for example, that although they did not possess the precise instruments of modern science,

they were keen observers of the world around them as the painted caves of Ice Age Europe bear eloquent witness.

The fact that early creation myths often employ zoomorphic or anthropomorphic imagery indicates that their creators drew analogies between the creation of the world and animal and human behavior. Forces of nature and heavenly bodies were thought of as gods or goddesses and were often represented with anthropomorphic or zoomorphic imagery, or a combination of both. The beginning of the world might be thought of as the hatching of a cosmic egg, or the coupling of a god and goddess as in the Babylonian myth of Apsu and Tiamat and some of the Vedic myths we have looked at. Or the creator was thought of as a master builder laying the foundations of the world, confining the seas, shaping the mountains, and forming humans from clay as in some of the Biblical myths.

The ancient myth makers seem to have been able to entertain considerable diversity and conflicting imagery with relative ease. Contradictory creation myths, such as those in Genesis 1.1-2.4a and Genesis 2.4b-25 in the Bible, could be set side by side. And in the Hindu Vedas and Upanishads there are at least fourteen different accounts of the origins of the cosmos. Sages, perhaps as early as the eighth century BCE, as the Upanishads evidence, sharpened their conclusions by lively debates within the community of the wise. Conclusions were tested and honed by intellectual contests, much as scientific theories are tested and refined in publications and conferences today. The author of the Nasadiya Sukta challenged earlier views that may have become hardened into dogmas regarded as authoritative or revealed truth (*sruti*) and Uddalaka Aruni rejected the view that the universe arose from non-being.

Modern scientific theory, of course, does not employ anthropomorphisms or zoomorphisms as did the ancient myth makers. Nor does it use the abstract philosophical language of the beginning of Chandogya 6.2 or of Plotinus. When we move from the ancient thought world of the Vedas to that of modern science, the most noticeable change is in language. Not simply the change from ancient Sanskrit to modern English, although that may be a factor, because there are only a limited range of concepts that any language can express. But rather the movement from mythopoetic language, and occasionally abstract philosophical language, to modern scientific language that speaks in terms of energy, matter, space and time, atoms, subatomic particles and forces, galaxies and black holes, as well as antimatter, dark matter, and dark energy.

Contemporary science has incredible tools with which to study the universe and consequently its observations and calculations are far more precise than was possible in ancient times and we can have more confidence in its conclusions. However, as Hawking pointed out “A [scientific] theory is just a model of the universe, or a restricted part of it, and a set of rules that relate quantities in the model to observations that we make. It exists only in our minds and does not have any other reality....Any physical theory is always provisional, in the sense that it is only a hypothesis: you can never prove it.” (Hawking 9-10) The same can be said of the ancient creation myths or the cosmogonies of the Vedas and Upanishads. They are hypotheses about the underlying order of the world, and as the Nasadiya Sukta pointed out very clearly, they are only provisional—“Who really knows?” No doubt in the future the scientific theories of today will seem rather primitive, just as ancient creation myths and the speculations of the sages of the Upanishads seem to us today. But we should keep in mind that the scientific theories of the future will build on the scientific theories of the present, just as present scientific theories have built on the science and wisdom of the past.

Uddalaka Aruni's Cosmogony and the Big Bang Theory

In 1988, Stephen Hawking wrote "In less than half a century, man's view of the universe, formed over millennia, has been transformed. Hubble's discovery that the universe was expanding, and the realization of the insignificance of our own planet in the vastness of the universe, were just the starting point. As experimental and theoretical evidence mounted, it became more and more clear that the universe must have had a beginning in time, until in 1970 this was finally proved by Penrose and myself, on the basis of Einstein's general theory of relativity." (Hawking 50) However, as we have seen, roughly 2,800 years earlier, Uddalaka Aruni had taught his son Svetaketu a similar view of the origins of the universe.

Beginning from the common sense principle that something cannot come from nothing, Aruni rejected the view that "in the beginning, there was non-being alone....from that non-being arose being." He then proposed a theory of evolution which, while rather primitive by modern scientific standards, bears some resemblance to modern evolutionary theory—being sent forth fire, fire sent forth water, and water sent forth earth. Of course in Uddalaka Aruni's ancient world view, being, fire, water, and earth were personified as deities (*devas*) with the ability to determine "I will become many, I will grow forth." But both Uddalaka Aruni and the big bang theory assert that everything in the universe evolved from a single source—the one became many.

About the source of the universe, the primordial atom within which was contained everything in the universe, modern science is able to say relatively little. Hawking said it was "infinitesimally small and infinitely dense." (Hawking 8) And Brown described it as a "cosmic plasma" of energy and matter so hot it had no structure. (Brown 4) But Uddalaka Aruni had said even less. All he said was "in the beginning there was only being (*sat*)." Later Advaita Vedanta philosophy identified *sat* with *brahman*, an impersonal absolute being often referred to as *sat-chit-ananda* or "being-consciousness-bliss." But I am not sure that this identification does not go beyond Uddalaka Aruni's original teaching, because *brahman* is not mentioned in his discourse. Only the term *sat* is used, although in 6.3.2. ff. *sat* is said to have a living self (*jivatman*), which may be intended to indicate that *sat* is active or "living." This is also indicated by the anthropomorphism in 6.2.3 that *sat* "perceived, 'I will become many, I will grow forth.'" While the big bang theory does not suggest that the primordial atom was conscious, and it certainly does not consider it a deity, it does conceive of it as the source of all the energy, matter, forces and activity in the universe, so in some sense perhaps it can be said to be "living." It is interesting to note that Stephen Hawking, who professes himself an atheist, predicted (perhaps factiously) "if we do discover a complete theory [of the universe]...we would know the mind of God." (Hawking 175) For Uddalaka Aruni the thought in the mind of God was simply "I will become many, I will grow forth."

In Uddalaka Aruni's cosmogony there was no sense of the immense time scale involved in the evolution of the universe, nor was there "a realization of the insignificance of our own planet in the vastness of the universe." (Hawking 50) But perhaps the greatest difference between Aruni's cosmogony and that of modern science is that the big bang theory envisions the moment of creation as an eruption or explosion, while Uddalaka Aruni spoke of a growing forth, an emanation of creation from its source. With respect to the violence of the moment of creation, the initial rapid expansion or "inflation" of the universe which was proposed by Alan Guth, the big bang theory resembles the Purusha hymn in the Rig Veda, Book 10, Hymn 90. (Hawking 127) In this hymn, *purusha*, the primal person, brings forth the universe through a violent, sacrificial dismemberment of himself. As Capra pointed out "a basic recurring theme in Hindu mythology is the creation of the world by the self-sacrifice of God—'sacrifice'

in the original sense of ‘making sacred’—whereby God becomes the world which, in the end, becomes again God.” (Capra 87) This self-sacrifice is alluded to, although not its violence, in verse 3 of Uddalaka Aruni’s cosmogony which says “I will become many, I will grow forth.” Or as Easwaran put it “Out of himself he brought forth the cosmos.” (Easwaran 133)

Some Conclusions

The Nasadiya Sukta advised silence in the face of the great questions of life: “What is the nature of the universe? What is our place in it and where did it and we come from? And why is it the way it is?” Admittedly, this is the greater wisdom. Yet most of us still yearn for answers. And we are willing to entertain *possible* answers no matter how tentative, partial, and provisional they may be. The teaching of Uddalaka Aruni to his son Svetaketu and the big bang theory of contemporary science offer tentative answers to these questions from greatly different time periods, cultures, and intellectual perspectives.

Yet, as I have tried to show in this paper, they are remarkably similar. A synthesis of the insights of Uddalaka Aruni and of the big bang theory, although a synthesis that tends to privilege the philosophical and mythopoetic language of Uddalaka Aruni more than that of modern science, might be as follows.

By applying the insights of Uddalaka Aruni’s cosmogony in Chandogya 6 to our contemporary theory of creation, the expanding universe or big bang theory, we conclude that we are part of a rapidly expanding universe that *sat*, the impersonal *brahman*, or, as we would say in the West, “God” brought forth out of itself some 13.8 billion years ago. To put it simply, God became the universe.

If we apply the insights of the big bang theory to the cosmogony of Uddalaka Aruni, we would conclude that the physical world that we inhabit is not an illusion as Shankara held. The physical world is real.

What is illusory is the physical world’s apparent stability and unchangeableness. The world is dynamic, impermanent, and ever-changing as the Buddha taught in his First Noble Truth. S. Radhakrishnan wrote “How do we come to think of things, rather than of processes in this absolute flux? By shutting our eyes to the successive events. It is an artificial attitude that makes sections in the stream of change, and calls them things.... Life is no thing or state of a thing, but a continuous movement or change.” (quoted in Capra 278) It is an ongoing process of cosmogenesis. A process that began with what might best be described as a violent explosion of the primordial atom. One that has powered an ever-expanding universe of a hundred billion galaxies for 13.8 billion years. An explosion that is reminiscent of the theme of the self-sacrifice of God in the Hindu scriptures.

But the process of cosmogenesis will eventually come to an end. According to some recent discoveries of science, such as the instability of the Higgs boson, at some time in the far distant future the expansion of the universe will cease and the universe will then collapse in a “big crunch” and return to its original state. (Das 1) The return of the many to the one is a frequent theme in Hindu thought and mythology. And a cataclysmic end of the world is also a common theme in many of the world’s mythologies.

So, while keeping in mind the caution of both the Nasadiya Sukta and of modern science that the beginning of the universe and also its end are essentially unknowable, I would like to conclude this paper with the following reflection that encapsulates the admittedly tentative insights that can be gained by comparing the the ancient cosmogony of Uddalaka Aruni in Chandogya Upanishad, chapter 6 with the modern scientific theory of the expanding universe, which is commonly called the big bang theory.

In the beginning, God sacrificed itself in the big bang, becoming this whole world of dynamic, ongoing processes of cosmogenesis of which we are a part. Thus, we are kin to everything in the universe from the most distant galaxies rushing still further away, to the black holes fiercely devouring whatever is sucked into them, to the myriad living beings on this small planet, to the inanimate grains of sand on the seashore. They all, including ourselves, are not independent, static “things” but are inter-dependent processes in flux, an ever-changing stream. Moreover, modern science, many of the world’s myths, and several Upanishads agree that at some time in the far distant future cosmogenesis will come to an end, and the many will return to the one.

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As in modern physics, Hindu cosmology envisaged the universe as having a cyclical nature. The end of each kalpa brought about by Shiva's dance is also the beginning of the next. Within this matrix there are many myths of cosmogenesis. The Sanskrit word for creation is srishti, which means projecting a gross thing from a subtle substance. Srishti does not mean bringing out existence from non-existence or creating something from nothing. A 9th century Hindu scripture, The Mahapurana by Jinasena claims the something as modern as the following: (translation from [5]). "Some foolish men declare that a Creator made the world." (source: Astronomy and Mathematics in Ancient India). (Refer to Visions of the End of the World - By Dr. Subhash Kak - sulekha.com). For instance, modern scientists put forward the idea of the existence of multiple universes in string theory. It states we live in a multiverse "there are many universes that exist in parallel. The Hindu Vedas clearly echo this "modern" concept by mentioning the existence of cyclical infinite worlds in the ancient Hindu cosmology. The sacred texts in the Vedas and the Bhagavad Gita were perfect in their understanding of the universe. In fact, Albert Einstein once said: "When I read the Bhagavad Gita and reflect about how God created this universe everything else seems superfluous." 4. Foundat... The Vedas give us an insight into ancient science and astronomy. Epics like Mahabharata and Ramayana narrate divine stories of the never-ending battle between good and evil. Cosmogenesis in ancient hindu scriptures and modern science. Robert L. Humphrey. Art. 2015. This paper examines several cosmogonies, or creation stories, in the ancient Hindu Vedas and Upanishads and compares them to our modern scientific creation story, the expanding universe theory, which Expand. 1. Open Access. Save. Alert. Cite.