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Narrating Science and Religion

Storytelling Strategies in *Journey of the Universe*¹

While scientific and religious narratives use distinct discourse strategies to reach different audiences, the documentary film *Journey of the Universe* combines scientific and humanistic perspectives to narrate the origin and evolution of the universe, life on Earth, and human consciousness. This science-based mythic telling of the universe story foregrounds science to enhance the story's plausibility while using mythic elements to invite an ethical response. We evaluate how this film blends scientific and mythic storytelling strategies to present a plausible story with moral force. *Journey of the Universe* presents an image of humanity as naturally emerging from an increasingly complex cosmos, capable of profound wonder, and poised to use its intellectual gifts to renew the face of the earth. We argue that narrative strategies aligning scientific content with the viewer's personal experiences of nature are generally effective, and that the film's focus on the local and terrestrial, even in the midst of the vastness of the cosmos, supports its ecological message.

1. Introduction

Whether fiction or non-fiction, scientific or religious, historical or mythic, the genre of a narrative carries within its structure meta-information that shapes how viewers are to understand the content. For example, a story that begins "Once upon a time..." signals to readers that the events depicted in the tale never happened at all. Nonetheless, it is not the content of the narrative that shapes attitudes and behaviors; rather, it is how the storytelling strategies engage their audiences. *Journey of the Universe* (Northcutt and Kennard 2011; hereinafter, *JotU*) draws on scientific and religious content as well as scientific and religious narrative strategies to recount the 14-billion-year history of the universe, from the Big Bang to the present. The one-hour documentary film was produced for a popular audience and screened widely on public broadcasting stations in the United States.

JotU unfolds over the course of a single day on the Greek island of Samos. Host-narrator and cosmologist Brian Swimme tells a story of wonder at the dynamic creativity and emerging complexity pervading the origin and evolution of the universe. Indeed, a sense of wonder is ever present as he describes the formation of galaxies, stars, and the solar system and the emergence of life and the human species, the development of symbolic consciousness, and the rise of humans as a planetary presence with widespread environmental impact. The goal that the audience's wonder should be transformed to action is made explicit as Swimme concludes his narration: "Over the course of 14 billion years,

hydrogen gas transformed itself into mountains, butterflies, the music of Bach, and you and me. And these energies coursing through us may indeed renew the face of the earth” (*JotU*, 52:08-52:30). A sense of wonder, inspired by the revelation that humans are a natural and integral part of this cosmic transformation, is intended to turn us away from destructive activities and toward actions that promote mutual human and ecological flourishing.

We analyze the content and narrative strategies in *JotU* with a primary focus on its integration of science and religion. We begin by discussing the decision to tell a narrative at all, using Jerome Bruner’s (1986) distinction between paradigmatic and narrative modes of understanding. We then turn explicitly to the religious and scientific content and narrative strategies in *JotU*, analyzing how these two distinctive discourse strategies with their different intended audiences are integrated in this film. We consider the emphasis the film places on wonder, distinguishing between scientific and religious dimensions of wonder and awe. Finally, we comment on the invitation to ethical action that concludes this film. Throughout this essay, in order to clarify and refine our analysis, we draw periodic comparisons to Carl Sagan’s *Cosmos: A Personal Voyage* (Druyan and Soter 1980; hereinafter, *Cosmos*), which also seeks to tell the story of cosmogenesis and to inspire a sense of wonder in an audience that does not necessarily identify with or appreciate science. The comparison to *Cosmos* brings into stark relief *JotU*’s distinctive focus on the planetary; whereas *Cosmos* repeatedly turns outward to the stars and galaxies beyond Earth, *JotU* keeps the ultimate focus on this terrestrial plane.

2. Telling a Story

In the first five minutes of *JotU*, Brian Swimme orients the viewer to the setting on Samos, describes the Big Bang, and emphasizes the dynamic nature of the cosmos, saying: “The universe has a story: a beginning, a middle where we are now, and perhaps – in some far, distant future – an end” (*JotU*, 4:26-4:35). The film then proceeds to tell the 14-billion-year history of the cosmos, ending with our current place in the story. The emphasis on the dynamic aspects of cosmic evolution reflects a conceptual shift that has taken place over the past century, from thinking of the universe as a fixed system to a view of the universe as constantly changing. Swimme presents a story, then, of the universe as it unfolds and evolves – a cosmogenesis – rather than a description and explanation of a static and unchanging universe. *JotU* chooses to narrate this story from beginning to end (or at least to the present) in a predominantly linear fashion. A different choice could have been made. Consider, for example, the PBS television series *Cosmos: A Personal Voyage*, narrated by Carl Sagan (Druyan and Soter 1980), which was recently updated as *Cosmos: A Spacetime Odyssey*, featuring Neil deGrasse Tyson (Druyan 2014); both the original and updated versions have a distinct and deliberate narrative style, but are episodic in struc-

ture. Or, one can perhaps imagine a video presentation of the knowledge modern science has revealed about cosmogenesis without any effort to present those objective, scientific facts as a narrative.

Bruner (1986, 11) argues that two distinctive modes of thought – the paradigmatic and the narrative – order experience and construct reality in complementary but irreducible ways. The paradigmatic mode is more characteristic of science; by explaining *causes for*, science constructs “a world that remains invariant across human intentions and human plights” (ibid., 50). The narrative mode is more characteristic of the humanities; by interpreting *reasons why* in light of the “vicissitudes of human intentions” (ibid., 16), the humanities “seek to understand the world as it reflects the requirements of living in it” (ibid., 50). But the mapping of the paradigmatic mode of understanding onto the sciences and the narrative mode onto the humanities must not be too rigidly drawn if the aim is to present a story that incorporates both what we have learned about the universe through science and offer meaningful guidance for human action. Science-based, mythic narratives of cosmogenesis – such as *JotU* – must combine the paradigmatic content of scientific knowledge and the narrative mode of understanding characteristic of the humanities.

Narratives organize our subjective experience of time by representing events and the characters (or entities) involved in those events (Abbott 2008). With respect to time, *JotU* narrates the 14-billion-year history of the universe (the actual duration of the universe story) as if it occurred in a single day (as the documentary presents the narration on the island of Samos) in one hour (the time it takes to watch the documentary); in this way, a story of unimaginable duration is collapsed into a metaphorical day and represented in a narrative discourse of a single hour. In *Cosmos*, which is more episodic than linear, the most memorable temporal analogy is the cosmic calendar; Sagan distributes the 14 billion years into the twelve calendar months, just over a billion years per month, and then places major milestones in cosmogenesis – the formation of our galaxy, the formation of our solar system, the first living organisms on Earth, and finally all of human history – within that twelve-month timeframe. The cosmic calendar is a true-scale timeline, distributing the 14 billion years of cosmic evolution equally across the twelve months; as a result, all of human history occurs in the last few seconds on December 31. While *JotU* makes occasional gestures toward a true-scale timeline, the events chosen to carry the story reflect a distorted-scale or human-centered timeline that skims quickly over long stretches of early cosmogenesis to get more quickly to matters of direct interest to human populations. In fact, *JotU* goes to great lengths to reassure viewers that humankind is not merely a late arrival in a cosmic drama that has mostly unfolded without us. Again, we’ll draw comparisons between *JotU* and Sagan’s *Cosmos* to illustrate our point.

In *Cosmos*, Sagan famously said “We are star stuff” (*Cosmos*, Episode 13, 14:06). In *JotU*, Swimme discusses star birth in the density waves that are the spiral arms of the Milky Way galaxy, then enters a church with depictions of stars on its ceiling. Echoing Sagan’s insight, he says: “Here’s the essence of the

universe story: the stars are our ancestors” (*JotU*, 10:15-10:19). As the narrative continues, Swimme comments that, if we conceive of the cosmos as a machine, as was common in recent centuries, then life seems to be an accident. However, drawing our attention to the patterning intrinsic to matter and the self-organizing attributes of life, Swimme proclaims: “From this new perspective, life is not an accident; life is inevitable” (*JotU*, 17:55-18:00). Sagan would seem to be in agreement. Given the abundance throughout the universe of the atoms and molecules that enabled life on Earth combined with several billion years of evolutionary experimentation, not only was terrestrial life inevitable, he suggests, but so is extraterrestrial life. Here is where *Cosmos* and *JotU* diverge in their narrative approach. Where Sagan continues looking outward, imagining those other life forms on planets in our solar system and in distant solar systems, *JotU* remains focused on the human on this planet. Near the end of the film, Swimme summarizes: “The body of the universe gave birth to our bodies. The self-organizing dynamics of the universe gave birth to our minds. We belong here. We’ve always belonged here” (*JotU*, 51:37-51:55).

These examples demonstrate storytelling strategies in *JotU* that present a narrative that places humans as integral aspects of the universe. This theme is already evident seven minutes into the film, when Swimme discusses the Big Bang and Edwin Hubble’s early twentieth-century discovery that the universe is expanding. The rate of expansion, he notes, is “exactly the rate necessary for life and structure to come forth.” He continues:

Even though we can’t call the early universe alive, we can understand it as life-generating. One of the physicists who has reflected upon this is the celebrated Freeman Dyson. He mused that the more he reflected on the structures of the early universe, the more he became convinced that, in some sense, the universe must have known from the very beginning that life was coming. (*JotU*, 6:30-7:08)

Why celebrate the human when engaging space and time at cosmic scales? Why make so many strategic choices in telling this narrative so as to produce a sense of belonging in the viewer? Clearly the authors are trying to counteract other views their audience may hold: that we are insignificant; that our impact on the planet is profoundly negative; that the Earth – and the cosmos – might be better off without us. The strategic effort of the narrative as a whole, then, is to embed us in the immensity of the cosmos and to encourage us to align our individual stories with this all-encompassing universe story.

That humans did not exist as explicit characters in any tangible way in the vast expanse of the 14-billion-year history of cosmogenesis presents a challenge for narrators of the universe story; narratives need characters with desires whose intentions carry the action of the plot, but we exist and act out of our diverse desires only in one recent and tiny instant of this 14-billion-year story. When we wrote earlier that narratives organize our subjective experience of time by representing events and the characters (or entities) involved in those events, the parenthetical mention of entities points to the storytelling strategy of ascribing intention and agency to non-human actors. This is more common than generally assumed in science writing and turns our focus – in the next

section – to storytelling in science, differences in how narratives work in science and religion, and the storytelling strategies used in *JotU* to integrate scientific and religious material.

3. Integrating Science and Religion

Narratives necessarily involve agents – human characters, anthropomorphized characters, or other entities – who act with some form of intentionality. Controversial (yet still common) in much science writing is the ascription of agency or intentionality to non-human entities (Abbott 2003). In *JotU*, this is apparent in statements such as “the universe must have known from the very beginning that life was coming” (*JotU*, 7:04-7:08) or, more obliquely, in Swimme’s animated questions, “What gave birth to all of this beauty? What was the form of creativity that brought this forth?” (*JotU*, 7:52-8:00). Other examples in *JotU* include comments about photons telling stories (*JotU*, 7:30), cells exhibiting “primitive discernment” (*JotU*, 19:39), or molecules engaged in photosynthesis that “resonate with the sun” (*JotU*, 21:09).

More commonly, science writers insert intentionality by telling a story of the human search for knowledge. In *JotU*, for example, Hubble is shown peering through his telescope and coming to realize that the universe was expanding. In *Cosmos*, Sagan frequently tells the story of how we know what we know with short vignettes that present actors portraying historical figures in science as they make connections and discoveries. Thus we see Johannes Kepler in his study trying desperately to explain planetary orbits using the numerology of the Pythagoreans and we see Sagan himself riding a bicycle in the Tuscan countryside as Albert Einstein once did when he first conceived of the questions that would lead to his theory of relativity.

The scientific process necessarily involves periodic pauses to tell the story of our progress in learning about nature. The mode of storytelling depends, of course, on the intended audience and can be in the form of articles in professional research journals, magazine or news articles, radio or television shows, blogs and vlogs, or film. Regardless of the mode of delivery, storytelling strategies in science often include descriptions of observational evidence in support of scientific theories with the latter carefully distinguished from hypotheses. In the scientific context, in particular when teaching about the scientific process, scientists commonly define a theory as an explanation of a natural phenomenon that is consistent with all available observational (often experimental) evidence (cf. Kennedy et al. 1988, 4-6). Science narratives, in particular those intended for nonscientist audiences, also tend to incorporate a celebration of the scientific process as a human activity aimed at learning about nature and specific natural phenomena. Finally, science narratives intended for more general audiences emphasize the beauty of nature and elegance of accurate scientific theories that humans have developed to explain nature. This narrative strategy

communicates two parallel stories: (1) the story of what we know about the universe and (2) the story of how we have come to know what we know about the universe.

We must not, therefore, simply think that paradigmatic modes of understanding are the realm of the sciences while narrative modes of understanding are used in the humanities. Science necessarily includes the paradigmatic, but for fields like evolutionary biology (and other historical sciences), for complex adaptive systems, and for the human sciences, “stories may well constitute the best scientific explanations” (Teske 2010, 93; cf. Dahlstrom 2014). These complex systems are nondeterministic and can only be explained by historical, interpretive stories. Science-based narratives, like *JotU* and *Cosmos*, focus on communicating scientific (paradigmatic) content to their audiences through storytelling.

The *JotU* and *Cosmos* projects share the primary thesis that a more personal, thorough, and intuitive appreciation of science is essential for citizens of planet Earth. Scientific content helps us understand the natural world, as well as the problems we’re facing and their possible solutions. However, at least in the United States, the viewing public is notoriously science illiterate (Pew Research Center 2015a, 58), in some cases because people believe that science is incompatible with religion (Pew Research Center 2015b, 19; Baker 2012) and, if they must choose between the two, they are more committed to religion. To reach these audiences, storytellers must employ narrative strategies to reassure viewers that the science is accessible and, for at least some viewers, that it is not necessarily in conflict with religious perspectives.

Swimme’s overarching strategy to make the science accessible to his viewers is by using objects, places, and experiences that most people are familiar with. For example, Swimme uses various rocks, root vegetables, and an egg to build a model of the solar system, with Earth as the egg representing a fragile living system. Sagan embraces a different strategy by which he seeks to demonstrate that science is a natural way humans learn about nature – indeed *the* natural way – and that people throughout history have learned in this way. In the very first episode, in which Sagan invites us to the wonders of the cosmos, he takes his viewers to Alexandria, Egypt, in the third century B.C.E. to tell the remarkable story of Eratosthenes of Cyrene and his accurate determination of the size of the earth using lengths of shadows and geometry. Sagan reminds his audience that people have been making systematic observations of nature for our entire existence as a species.

What role, then, does religion play in this scientific narrative of cosmogenesis? *JotU* is self-consciously a mythic telling of the scientific account of cosmogenesis and Sagan has been described as a religious figure: “Sitting at the instrument panel from which he shows us the wonders of the universe, he is a new kind of high priest, not only revealing the mysteries to us but telling us how we should live” (Barbour 1990, 5). But *JotU* and *Cosmos* approach religion differently. Consider the following two quotations. In the companion book to *Cosmos*, Sagan begins by writing:

Our ancestors were eager to understand the world but had not quite stumbled upon the method. They imagined a small, quaint, tidy universe in which the dominant forces were gods like Anu, Ea, and Shamash. [...] Today we have discovered a powerful and elegant way to understand the universe, a method called science. (Sagan 1980, xii)

Swimme begins his narration of *JotU* with:

Many of the world's greatest stories begin with a journey, a quest to answer life's most intimate questions: Where do we come from? Why are we here? From the dawn of time, all cultures have created stories to help explain the ultimate nature of things. And perhaps a new story is emerging in our time, one grounded in contemporary science and yet nourished by the ancient religious wisdom of our planet. (*JotU*, 0:07-0:41)

In these passages, Sagan gives the impression that science is replacing that aspect of religion that traditionally sought to explain our origins and physical experience. Swimme, on the other hand, asserts that the new story of the universe combines contemporary science and ancient religious wisdom.

Mary Evelyn Tucker, co-creator with Brian Swimme of *JotU*, has asserted that *JotU* seeks to integrate scientific and religious perspectives (Tucker 2015). Her use of the term integration evokes the four models of science-religion interaction in Ian Barbour's (1990) classic typology for theorizing science-religion interrelationships: independence, conflict, dialogue, and integration. As we use the terms here, *independence* assumes science and religion address distinct topics with no bearing upon or relevance to one another, *conflict* assumes they offer competing understandings of the same subject matter, *dialogue* assumes they offer distinct but complementary perspectives on matters of shared interest, and *integration* assumes some form of interconnection or overlap between scientific and religious understandings.

Sagan sees religion (he sometimes calls it "myth making") as a necessary step in the evolution of the scientific process. He suggests that as we learn more about nature through science, we replace the mythic explanations, but that the science is no less awe inspiring or wondrous:

Tradition is a precious thing, a kind of distillation of ten or hundreds of thousands of generations of humans. It is a gift from our ancestors. But it is essential to remember that tradition is invented by human beings and for perfectly pragmatic purposes. If instead you believe that the traditions are from an exhortatory god and hold that the traditional wisdom is handed down directly from a deity, then we are much scandalized at the idea of challenging the conventions. But when the world is changing very fast, I suggest survival may depend precisely on our ability to change rapidly in the face of changing conditions. We live in precisely such a time. (Sagan 2006, 191)

By suggesting that science is replacing religion, Sagan reveals his acceptance of the conflict model, wherein the errors made by earlier human communities – imagining divine agents in order to explain their observations of phenomena in the natural world – have been corrected by scientific knowledge; for him, it seems, scientific theories of the Big Bang and of evolution have updated the mistaken assertions of the creation accounts of Genesis. Sagan's cosmogenesis includes the story of these religious roots, this evolution of human exploration of nature from the mythic to the scientific. In *Cosmos*, Sagan has made a deliberate choice to tell the universe story as an eager and encouraging tour guide showing us the awe-inspiring universe, which we can even more fully appreci-

ate when we understand both the paradigmatic truth about the causes of natural phenomena and the process by which we have come to know those truths.

JotU's mythic telling of our modern scientific understanding of cosmogenesis, in contrast, retains a place for "ancient religious wisdom" (*JotU*, 0:41). Rather than conflict, this is a model of integration, which depends on a particular understanding of myth as a genre of writing that is largely unconcerned with historical facticity. In fact, as John A. Teske (2010, 92) argues, some of those who might argue that myths assert truthful, paradigmatic claims, may be seeking to undermine religion: "That religion is about propositional beliefs is a canard regularly put forth by antireligious polemicists attempting to cast religion as paradigmatically defective." Teske continues:

[I]t is a mistake to pretend that religion provides an alternative explanatory account of the natural phenomena with which science concerns itself. The questions that matter are about what the stories of a religion mean. Even the paradigmatic accounts of science itself require a wider framework in which those accounts can be said to have meaning or sense for human life. (Ibid., 92; cf. Hyers 1982)

Because *JotU* integrates scientific and mythic perspectives, Swimme can use science to explain natural phenomena and shape the viewers' reflections on how to live meaningfully in this natural world.

Having adopted a conflict model of the relationship between science and religion, Sagan tells the universe story as a tour guide, energetically inviting the viewers' reflection on the wonders of the natural world and the natural human process of producing such knowledge. For Sagan, the accuracy of his account matters; it must be consistent with the objective facts as we know them. Swimme, in contrast, tells the universe story *as* a story – as a myth – almost as if we are sitting together around a campfire. The mythic element of Swimme's story is what it tells us about ourselves. Rather than offering a message of misanthropic despair at widespread anthropogenic environmental degradation, Swimme proclaims that we belong here, we've always belonged here, and our evolved consciousness may yet renew the face of the earth. For Swimme, the story must have authenticity and plausibility; it must be consistent with our experience, not so much perhaps as we've known it, but as we can imagine it and choose to live within it.

4. Evoking Wonder

JotU's mythic narrative of cosmogenesis is intended to evoke wonder. In the closing passage of the film, Swimme says: "As we float in the midst of such mysterious immensities, is there any deep wisdom that might help us align our consciousness with the grain of cosmic evolution? Wonder will guide us" (*JotU*, 51:08-51:25). Similarly, in an interview about *JotU*, Mary Evelyn Tucker speaks of awe and wonder as she describes what she hopes viewers will take from the film:

We are trying to avoid presenting doom and gloom in terms of the news of our times about social and environmental destruction. People are already shut down with despair and disempowerment regarding the immense challenges we are facing, especially regarding ecological diminishment and the loss of community ties. (Blomberg 2011, 16)

Instead, Tucker continues, she and Swimme aim “to ignite hope and inspire energy for the transformation ahead. If we lose hope, we lose so much. We wish to awaken awe and wonder in relation to the universe and Earth” (ibid.). The wonder evoked by our embeddedness in cosmic and planetary processes is intended to counteract despair in the face of social and ecological challenges, and motivate us to responsible action.

Sagan also intends to evoke awe and wonder in part by appearing himself to be in awe of the concepts and observations he is describing and summarizing. The introductory monologue in episode one provides an example. Sagan, standing high on the northern California coast with surf crashing on rock formations behind him, exclaims:

The cosmos is all that is or ever was or ever will be. Our contemplations of the cosmos stir us – there is a tingling in the spine, a catch in the voice, a faint sensation, as if a distant memory, of falling from a great height. We know we are approaching the grandest of mysteries. The size and age of the cosmos are beyond ordinary human understanding; lost somewhere between immensity and eternity is our tiny planetary home, the earth. For the first time we have the power to decide the fate of our planet and ourselves. This is a time of great danger, but our species is young and curious and brave; it shows much promise. In the last few millennia we have made the most astonishing and unexpected discoveries about the cosmos and our place within it. I believe our future depends powerfully on how well we understand this cosmos in which we float like a moat of dust in the morning sky. [...] The cosmos is full beyond measure of elegant truths, of exquisite interrelationships, of the awesome machinery of nature. (*Cosmos*, Episode 1, 3:13-4:30, 5:37-5:46)

Sagan goes on to invite the viewer on a journey through the cosmos in space and time while simultaneously preparing us for the wonder and awe we will encounter along the way. When he states that “our future depends powerfully on how well we understand this cosmos” he foreshadows an appeal, in the final episode of *Cosmos*, to use our new understanding of the cosmos and our place in it to avert nuclear holocaust (*Cosmos* aired during the height of the cold war) and to correct our neglect and destruction of Earth’s ecosystems.

While Swimme and Sagan both evidently intend the wonder and awe evoked by contemplation and study of the cosmos to result in action, religious environmental ethicist Lisa Sideris (2015) asserts that the narrative strategies taken in *JotU* and similar projects undermine the storytellers’ ultimate social and environmental goals. Sideris doesn’t explicitly include Sagan’s *Cosmos* in her analysis, though she does include *JotU* and a number of other science-based spiritualities that go by such names as “The Epic of Evolution”, “The Universe Story”, “Big History”, “The New Story”, and “The Great Story” (cf. Barlow 1997, Chaisson 2005, Christian 2004, Dowd 2009, Goodenough 1998, Rue 2000, and Swimme and Berry 1992). A set of intersecting claims grounds her critique of these mythic narratives of cosmogenesis. First, these narratives misdirect the reader/viewer’s response of awe and wonder toward science and scientific information and away from the natural world itself. Second, the

elevation of science and scientific information – especially as it describes and explains topics like the Big Bang and the subsequent 14 billion years of both cosmic and biological evolution – shifts the locus of the real to that which is inaccessible to direct experience and thus necessarily mediated by scientific experts. Along the way, these narratives play into a common misunderstanding of the nature of myth – overlooking its lack of concern with historical facticity – as origin stories are re-cast in light of scientific knowledge. Finally, the consequent disparagement of place-based personal experience undermines the forces of love and care that motivate environmental activism. As a result, Sideris wonders whether the general approach taken by these science-based narratives can indeed produce environmental action.

JotU is a science-based mythic narrative, but we disagree with Sideris that the wonder evoked by *JotU* is misdirected away from the natural world of human experience. Rather, we argue that *JotU* successfully employs narrative strategies that align scientific content and evidence (observations) with the viewer's personal experience (and observations) of nature. The scientific process is grounded in the use of observational evidence to evaluate the efficacy of theories (explanations of nature and natural processes), so a narrative lacking that fundamental aspect of science will not be convincing to an audience that sees empirical observation as the primary method of obtaining knowledge. Equally important, though, in inspiring ethical reflection (and later ethical action) is a narrative that appeals to the viewers' understanding of natural phenomena that has arisen from their experience of living in the universe.

JotU makes such an appeal to the physical intuition of its audience. In the fields of science, technology, engineering, and mathematics, it is common to refer to human understanding of the universe based on our own experiences, observations, and perceptions as physical intuition (cf. Feynman et al. 2013, Davis and Hersh 1981). Our physical intuition can be informed by experiences as straightforward as a lifetime of living with the force of gravity; with seasonal changes; or seeing the sun, moon and stars. It can be informed by experiences as complex as learning about nature by studying the experiences of others and their conclusions based on those experiences: a deeper intuition of gravity through Newton's Laws of motion; the details of seasonal changes and what they tell us about our place in our solar system; and the physical nature of the sun, moon, planets, and stars. We may develop physical intuition with or without conscious analysis; ultimately, we experience our intuition as ready knowledge seemingly without the process of learning (Keller 2000).

The narrative strategy of *JotU* assumes its audience shares physical intuitions, what Charles Peirce (1991) calls indexical or direct physical connections between what we know and what we experience. The shared physical intuitions assumed in *JotU* are:

- the universe sometimes looks or seems very big and sometimes looks or seems very small depending on where and how we look;
- the universe is characterized by a hierarchy of systems;

- the universe is full of patterns and some of these patterns appear to be related to or affect one another;
- life on earth is ubiquitous and can be both tenacious and fragile;
- life elsewhere in the universe is possible, or at least the idea of extra-terrestrial life is compelling;
- the universe changes over time and some of those changes are periodic or cyclical so they may not appear to indicate evolution;
- some systems in the universe are dying or changing in ways that appear destructive to some pattern or structure.

JotU reminds us of these intuitive insights in a manner that assumes their shared nature and invites us to conclude from our shared intuition that the universe is like a living organism, and in some ways like a conscious organism. In the companion book to the documentary video, Swimme asserts that the universe is creative and innovative and that small components of the universe have significance to the larger system: “However insignificant we may feel with respect to the age and size of the universe, we are, even so, beings in whom the universe shivers in wonder at itself” (Swimme and Tucker 2011, 114). The earth, according to Swimme, has the properties of a living and evolving system with self-preserving properties. He also observes that – while death and destruction are necessary processes in the origin and evolution of the universe, and of life on earth in particular – the creative process of the universe can be circumvented. He suggests that humans, with our symbolic consciousness shaped over millennia of experiences, have evolved the power to become both wildly creative and tremendously destructive. The antidote to using our powers for evil, according to *JotU*, is telling and retelling the Universe Story – the narrative of our origins in and connectedness with the universe and all of its constituent systems and patterns – appealing to the awe and wonder that both the observations (our intuition) and the story inspire: “By following this wonder we have discovered the ongoing story of the universe, a story that we tell, but a story that is also telling us” (ibid.).

5. Conclusion: Motivating Action

Both *Cosmos* and *JotU* end with an appeal for action. The final episode of Sagan’s *Cosmos* is titled “Who Speaks for Earth?” In the concluding passage, his answer to that question is clear, inviting us to be part of the solution to our ecological and social problems:

We who embody the local eyes and ears and thoughts and feelings of the cosmos, we’ve begun at last to contemplate our origins: starstuff contemplating the stars; organized collections of ten billion billion billion atoms contemplating the evolution of matter; tracing that long path by which it arrived at consciousness here on the planet Earth and perhaps throughout the cosmos. Our loyalties are to the species and the planet. We speak for Earth. Our obligation to survive and

flourish is owed not just to ourselves but also to that cosmos, ancient and vast, from which we spring. (*Cosmos*, Episode 13, 53:58-54:47)

Reflecting his historical moment, Sagan was deeply concerned with the cold war arms race between the United States and USSR, with its attendant nuclear threat:

From an extraterrestrial perspective, our global civilization is clearly on the edge of failure in the most important task it faces: preserving the lives and well-being of its citizens and the future habitability of the planet. But if we are willing to live with the growing likelihood of nuclear war, shouldn't we also be willing to explore vigorously every possible means to prevent nuclear war? (*Cosmos*, Episode 13, 22:35-23:01)

JotU also asserts that our consciousness, the culmination of 14 billion years of cosmic evolution, confers upon us an environmental responsibility. Today, however, we are more concerned with climate change than with nuclear war. In the final minutes of the film, we see glaciers melting, coral reefs bleaching, species going extinct, and other signs of environmental disaster, and then Swimme challenges the viewer: "We are faced with a collective challenge no previous generation even contemplated. How are we to use this symbolic consciousness to create a human presence that will enhance the well-being of the earth community?" (*JotU*, 49:36-50:10).

The film doesn't explicitly answer that question. Regardless, an analysis of the success of *JotU* in producing environmental action goes beyond the scope of this manuscript and its focus on the storytelling strategies in *JotU*. Sideris is right to be concerned that science-based mythic tellings of cosmogenesis may not produce the environmental outcomes they intend, but – as we argued above – we believe her critique about the misdirection of wonder toward science rather than the natural world of experience and human observation is unwarranted. That said, one final narrative strategy in *JotU* suggests it may be more effective than *Cosmos* in predisposing its audience to environmental action. Sagan's *Cosmos* features a traveling spaceship – the spaceship of the imagination – to symbolize the ongoing voyage of discovery. *JotU*, in contrast, features a boat trip on the Mediterranean and an exploration of human discovery on the Greek island of Samos. Sagan invites us to view the universe outward, drawing inspiration for action by focusing on the planetary and galactic, even the cosmic; Swimme encourages a more inward view, focusing on symbolic consciousness and our intrinsic kinship with the natural systems of the Earth. While Sagan's approach might lead to a sense of responsibility as citizens of the cosmos from which we sprang, *JotU*'s more terrestrial, inwardly-focused, local perspective is more likely to elicit an organic environmental response. *JotU* casts us as part of a living and evolving organism; we therefore have a natural and physical need, not just a responsibility, to act as stewards and help sustain the organism.

JotU presents a scientifically-informed vision of the cosmos bringing forth human life, which is characterized by symbolic consciousness and a profound capacity for wonder, and which bears, in consequence, a certain grateful responsibility. The image painted by the film is positive and open toward the future, proclaiming the integral role of humanity in the continued unfolding of

the universe and suggesting a hopeful confidence in our future ecological well-being. Despite the very late arrival of the human species in the 14-billion-year history of the cosmos, the storytelling strategies in *JotU* effectively embed the human narrative in the broader narrative of cosmogenesis, blending scientific and mythic elements to inspire wonder and motivate ecological action.

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