

The View From the Center of the Universe

Joel Primack and Nancy Abrams
with Ashok Gangadean

Introduction by Ralph Abraham

Joel Primack studied physics at Princeton and Stanford universities, while Nancy Ellen Abrams studied philosophy and history of science at the University of Chicago and later law at the University of Michigan. They met while doing science policy work in Washington, DC in the 1970s. They married in 1977 and settled in Santa Cruz where Joel was already established as a professor of physics at the University of California at Santa Cruz and working on quantum field theory.

Eventually Joel's and Nancy's intellectual interests converged and joint papers began to appear in the 1990s. Joel's professional research turned to cosmology, which led to the discovery of Cold Dark Matter in the universe. Their joint ideas on cosmology, mythology, philosophy, and the view from the center later became an undergraduate course at UCSC in 1996. Originally it was taught jointly with Prof. Loki Pandey, a professor of anthropology well versed in Hinduism. Together they established a broad interdisciplinary picture and this evolved into Joel's and Nancy's groundbreaking book *The View from the Center of the Universe* (Riverhead Books, 2006). The book presents a revolutionary view of cosmology and the present paradigm of astrophysics integrated with world cultural history, mythology and spirituality. It also offers spectacular pedagogical devices for helping the reader and students in a classroom to shift their personal point of reference and experience themselves, our planet and the moment in history in which we live towards the center of the universe itself.

In this interview—actually a slightly asymmetric triologue—moderated by Ashok Gangadean, Professor of Philosophy at Haverford College, they delve deeply into their shared concerns about the future of humanity and the Earth and explore the interface between cosmology and culture for ushering in a new cosmological consciousness.



Ashok Gangadean: I have been deeply immersed in your book *The View from the Center of the Universe*, which I feel is at the frontier as your subtitle indicates, *Discovering Our Extraordinary Place in the Cosmos*. It has revolutionary implications. Joel, you have done incredible foundational work in helping to bring forth this new cosmology. And Nancy, as an accomplished lawyer, writer, and scholar in cultural history, you bring an important cultural dimension to this work. So I would like to open our dialogue on this important link you present between cosmology and culture, and invite each of you to offer an opening comment about the importance of this new cosmological science.

Nancy Abrams: A new picture of the Universe is an extremely rare event. There have only been two great cosmological revolutions before today: the shift from the flat Earth to the spherical Earth at the center of the Universe, and then the Copernican Revolution, which ushered in an end to the medieval view of Earth as the stable center of the Universe. That was the revolution that brought people into the modern, scientific age. Now we are in a third revolution on that same scale whereby we are discovering the Universe is not merely an extrapolation of Newtonian physics. Instead the Universe has many different size scales and size structures. For the first time we not only understand something about those many structures and how they fit together but we also understand the substances that most of the Universe is made of. We are also beginning to understand how we, as intelligent life, fit into this immense adventure. What scientists are now learning transcends the picture that Brian Swimme and Thomas Berry described in *The Universe Story*. That book was very important as the first modern attempt to mythologize the Universe, but much of the picture we're talking about here was not known then—especially the Double Dark theory of the Universe, based on dark matter and dark energy.

Ashok: We know the Copernican revolution was a bombshell on culture and it changed our entire way of understanding ourselves. So now there's another deep shift taking place. Joel, as a contributor to this new frontier, would you elaborate on Nancy's comments and explain what this shift is?

Joel Primack: There are two points I would like to make. First, as a consequence of the Copernican-Newtonian revolution, which basically began the Era of Enlightenment and modern science, both the collective picture of the larger Universe and the nature of reality itself dissolved. For over a thousand years, the peoples of the Mediterranean and Europe shared the same picture of the cosmos. Basically it was the Greek image of the Earth as a sphere surrounded by nested spheres carrying the Sun, Moon, and other planets, and an outer sphere

holding the stars and then heaven beyond that. When that picture was shattered by the discoveries of Galileo, Kepler, and their contemporaries, nothing replaced it. While the Newtonian picture applied to the Solar System, it was very unclear what lay beyond. And this has been pretty much the situation up until now.

During the 20th century there were many revolutions throughout most sciences, and they're now the foundation for our modern picture. But they're not popularly appreciated and they're certainly not part of our collective understanding. But they could be. The modern scientific picture is being created by scientists all over the world. So it's neither Western nor Eastern. It's a shared picture.

Ashok: Could you kindly be a little more precise for our readers about what is at the heart of this shift?

Joel: That is the second point I want to make. The title of our book, *The View from the Center of the Universe*, emphasizes the remarkable centrality emerging from our modern understanding of the cosmos. Centrality is one way of interpreting these new discoveries. But what is most important is interpreting them in a manner that makes the Universe friendlier and less alienating. For example, one of the most striking things we've discovered is that 99.5 percent of the Universe is invisible. When we use our best telescopes using not only visible light but all the frequencies of the electromagnetic spectrum, from radio to gamma rays, everything we see—all the stars, all the galaxies, all the dust, gas, planets, comets, and everything you have ever seen in photos—all of this represents only about a half of a percent!

Approximately 4.5 percent of the entire Universe's content is made of atoms. Astronomers are now fully confident that this is the correct accounting. As I mentioned, only a half of one percent is the visible stuff. The rest of the atoms appear to be between galaxies, but not the stars or the matter lit up by stars. We are sure this atomic matter is there because we can detect it at earlier stages of the Universe as well as by various indirect methods.

The vast majority of matter in the Universe is something quite mysterious. We call it Cold Dark Matter, a term I introduced back in 1983, because it describes the essential property that this type of matter must have. We call it "cold" because it moved very sluggishly during the early stages of the Universe. Contrarily, the hypothetical Hot Dark Matter would have moved nearly at the speed of light. However, now we know that most of the matter in the Universe is Cold Dark Matter.

There are numerous experiments taking place in laboratories around the world and Dark Matter—whatever it is—may be detected sometime soon. But the point is, about 25 percent of the Universe's mass is

some sort of mysterious stuff moving sluggishly in the early Universe and that holds the galaxies together. And most of the mass in our galaxy, as well as in all other galaxies, is Cold Dark Matter. Now we have only accounted for about 30 percent of the Universe's contents: roughly 4.5 percent ordinary atoms of which 0.5 percent is actually visible, about 0.5 percent neutrinos and the heat radiation from the Big Bang and all the energy in starlight, and then 25 percent of Cold Dark Matter. The remaining 70 percent is really mysterious.

Ashok: So what are astrophysicists saying about what this mysterious 70 percent might be?

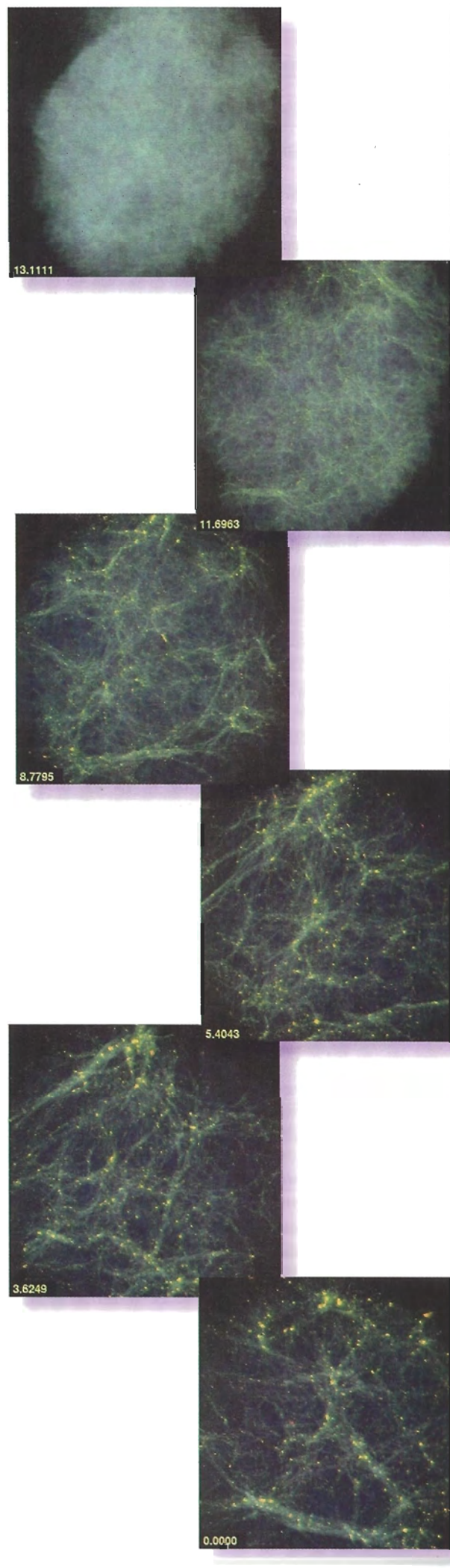
Joel: It's called Dark Energy. We know some of its properties but the crucial question is: what is it? Is it just a property of space? If so, then it would be what Einstein called the cosmological constant—just an unchanging property of the Universe.

Or is it some kind of dynamic quantum field? For example, the kind of energy that presumably caused cosmic inflation during the very earliest moments of the Universe. Astrophysicists think that cosmic inflation created the conditions for the Big Bang. And now the Universe seems to be entering a kind of slow inflation under the control of this Dark Energy. The original inflation process turned off. So for billions of years, the Universe evolved under the control of Dark Matter by slowing down expansion. But then a few billion years ago, the Universe started to speed up its expansion because now Dark Energy is the dominant component of the Universe.

We know enough about the crucial properties of Dark Matter and Dark Energy to determine the basic outlines of the history of the Universe. One reason why we are becoming confident in this determination is because there are many independent observations all confirming these basic ideas. For example, there are different ways to measure the rate of the Universe's expansion and they all give the same results. So for the first time we have a scientifically correct picture of its history.

Now, how do we humans fit into this? We are made of the rarest stuff in the Universe. This must be true of all intelligent life. Not only are we made from the half percent of visible matter, we are also made from something much rarer: stardust! We're made of the heavy elements that were forged in the stars: carbon, oxygen, nitrogen, iron, and so on. Of course, hydrogen is also a major constituent of our bodies and hydrogen came right out of the Big Bang. But hydrogen only represents about 10 percent of a person's weight. The largest component is oxygen and then carbon. Incidentally, that's also true for the Universe as a whole; among the heavy atoms, oxygen is the most common followed by carbon. So, in this respect our bodies reflect the atomic constituents of the Universe. But all these complex atoms put together only make up 0.01 percent of the Universe.

These images show the evolution of structure in Dark Matter from the beginning of the Universe to today in a region about 75 million light years across. This computer simulation was run on NASA's Columbia supercomputer. Dark Matter is invisible; here brightness represents density. The number at the lower left represents billions of years ago. The region shown was rotated so that each image shows a different orientation.



Ashok: Wow! So we really are rare creatures!

Joel: Yes, we are made of the rarest stuff in the Universe. And the Earth is made of the same stuff. Since we are surrounded by Earth, we tend to take it for granted and fail to appreciate that Earth is an extraordinarily rare chunk of the Universe. The stars are almost entirely made of helium and hydrogen. It's only the very special places, these rocky planets with liquid water on their surfaces, close enough to their stars, which could be abodes for life. But these represent just the tiniest fraction of all the stuff of the Universe.

Another aspect of human's centrality is that we are in the middle of all possible size scales. In modern physics, the smallest scale we can say anything meaningful about is a tiny distance called the Planck length, 10^{-33} centimeters, which is almost infinitesimally tiny. The largest scale that we know is the entire visible Universe, or about 10^{29} cm. And we humans—about a meter in size—are more or less in the middle of these two extremes. Moreover this is the only size scale where intelligent life can exist. Intelligent life can't be much larger than this because of the slow speed of communications. And we can't be much smaller because we have to be composed of lots of atoms. So we're in the middle of all possible size scales, and in that sense we are also central in the Universe.

Ashok: As an outsider, I would like to present a view from philosophy and ontology. Granted that we are rare and yet there is so much Dark Matter, but I would like to address the question of meaning in our lives and our own personal discovery of our centrality. I can still see a shift whereby we have been displaced by earlier paradigms and we become random events. For example, we are mere specks in the Universe without meaning. Not just materially in terms of the stuff we are made of, but also from the point of view of warm human feelings and meaning. This could seem to support existentialist philosophers like Albert Camus seeing the Universe as meaningless. So how can we affirm life? Why not just consider the question of suicide or the futility of life as in the myth of Sisyphus? Nancy, I'd like you to pick up here and speak about this meaning and relocating human life in this new picture.

Nancy: Let me first address this idea about there being so much Dark stuff in the Universe in the context of our history, and then this idea of Camus' existential despair.

The ancient Egyptians believed that the world was surrounded by a strange, mysterious substance, present at the beginning, called the Primeval Water. Egyptian civilization and life were largely geared toward maintaining order against this chaos. They believed this dark chaos was always out there and would always

threaten the world unless they performed rituals to sustain their religion and convince the deities to preserve order.

During the Middle Ages, the Universe was regarded as a set of nested spheres surrounding Earth, made of something otherworldly called Quintessence. Quintessence was not the elements—earth, air, fire and water—but something perfect. Beyond the spheres was God. So Earth was not surrounded by Primeval Water but by things equally mysterious to which people were nevertheless mythologically connected. These cultures found meaning in their cosmos because they saw themselves immersed in it.

Then the Copernican Revolution came along and by the end of it, with Newton's laws, people said, "Okay, we now know how physics works on Earth and it's got to be like this forever." The entire idea of our world and our lives being surrounded by something strange, which nevertheless affects our lives and gives them meaning, was abolished. People now assumed that what we see here on Earth is just the way it is and it will be that way forever and everywhere, regardless of how large the Universe is.

Ashok: That was a really cold, dark Universe!

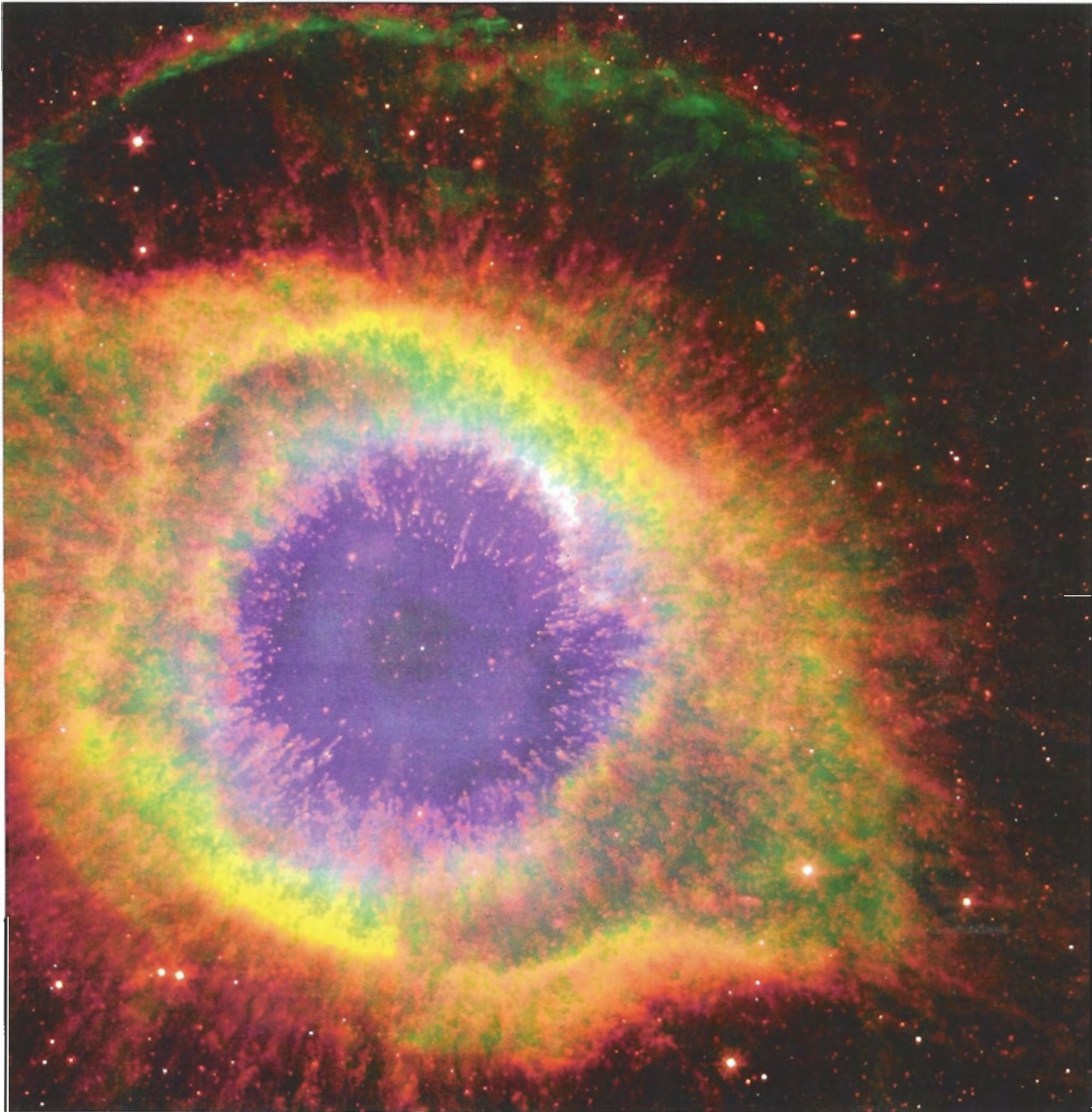
Nancy: That's it! That's the real darkness. The darkness is what D.H. Lawrence called "a dreary on and on without any meaning." There is no spirit to it. No otherness. There is no excitement or enchantment.

Joel: And no change and no evolution.

Nancy: It is just dull, dead! That is the basis of the existentialist picture. It is grounded on the assumption that the Universe is just the same old thing forever and everywhere. So what's the point?

Now, what we've discovered is that it is not the same-old-same-old but, as we reach larger size scales, the Universe is completely different from the way it is here on Earth. Not only is it made of different substances—this Dark Matter and Dark Energy—but on a large size scale that is all that really matters. So we are right back to being surrounded by the Primeval Water or Quintessence or something completely other. Beyond that, even beyond our Big Bang, we're surrounded by something possibly even weirder—Eternal Inflation. We now know from the laws of physics, which control events on these size scales, that there are different laws functioning on size scales different from the middle size scales we live on. It is so different out there in the Universe from how it is here. Yet we are all seamlessly connected and we are again back to a place where the Universe can indeed be seen as enchanted.

Now, how did earlier cultures relate to this "otherness" that was out there? That was the basis of their spirituality. You don't just feel spiritual about ordinary objects. You feel spiritual when you look



This is the Helix Planetary Nebula, the death cloud of a star about the same size as our Sun. Planetary nebulas are the main source of carbon on Earth. This image is a composite of data from Hubble Space Telescope and Spitzer Space Telescope.

through the ordinary objects and discover meaning that lies beyond them, in a world you think of as spiritual.

Ashok: Well, in the Classical world, the Tao or Hindu Aum, the sunyata or emptiness of Buddhism, or Yahweh or Allah, whatever the name for this primal, infinite force, regardless whether you call it God or not, we are surrounded by that. In ancient cultures, it was the source of their mystery that provided the source of life.

Nancy: It is the mystery that is the source of everything. Now, we don't have to think of Dark Energy and Dark Matter as God. In fact, it doesn't really make sense to think of them that way. Nor do we need to think of Eternal Inflation as God. But we need to start realizing

that we come from a mysterious source. It will not be figured out intuitively and it's not going to come to us through revelation. The only way we can begin to relate to it is through science.

Throughout the history of humanity, including all of the great religious teachers, nobody ever intuited Dark Matter and Dark Energy. Nobody ever understood how the Universe formed. Science unveiled this "otherness." However, that alone is very intellectual. So for us to be able to access it, actually feel ourselves part of it, this is where our spirituality comes in. Yet it's a new kind of spirituality. It isn't tied to a religion. Rather it's tied to a direct connection between us and our source.

Ashok: I would love to explore this. This is a key point in your vision and it certainly resonates among the

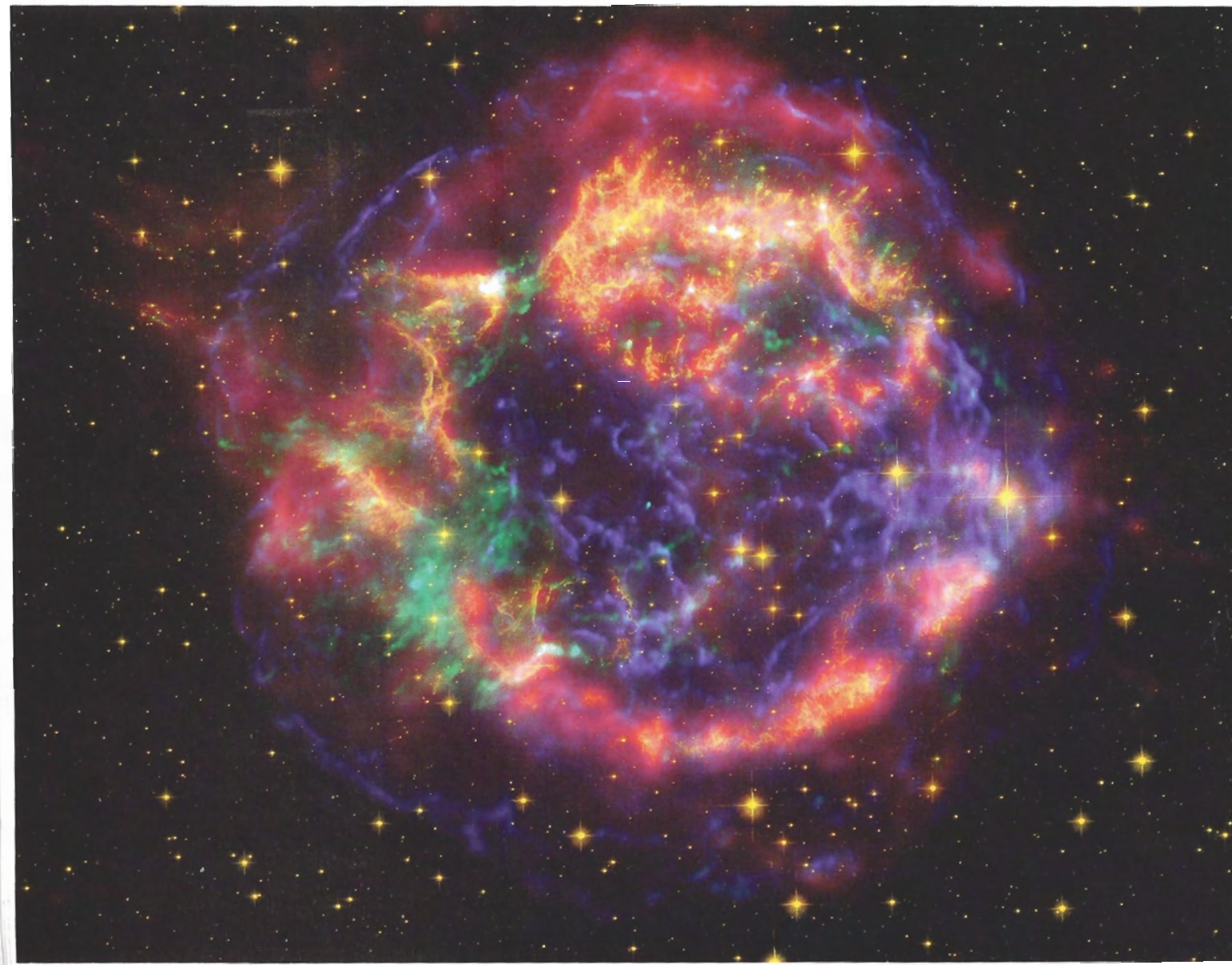
circles I move in—such as the World Commission on Global Spirituality—which are trying to get away from the old religious ways of looking at life and are exploring new frontiers. This seems to be a high point for where we are on the planet at this time in our evolution. So please, either one of you, please take this further in terms of a new spirituality grounded in science.

Joel: Let me offer a different aspect of this, which is time. One feature Nancy mentioned about the post-Newtonian conception is that there was no clear concept of time. For all that Newton knew, the Universe had been the same forever.

What we are now learning is that the Universe has undergone many fundamental transitions and it will continue to go through other transitions. The future is

going to be very different from the present just as the present is very different from the past. There is a way to think symbolically about how we fit into the past and future, which we have attempted to define and outline. For example, one of these symbols is the Cosmic Spheres of Time. The medieval image has humans and the Earth at the center of a spherical Universe. And from the modern physical conception, we are at this center. When we gaze out, we are surrounded by spheres of time, containing galaxies at earlier and earlier stages of the evolution of the Universe. In fact, looking out into space is looking back in time, because the further you look out into space, the more time light has traveled before reaching us. So these pictures of galaxies are really light that left those galaxies long ago and therefore their pictures are capturing a much earlier time. So for us

This image of Cassiopeia A is a composite of data from three of NASA's great observatories. Infrared data from the Spitzer Space Telescope are colored red; visible data from the Hubble Space Telescope are yellow; and X-ray data from the Chandra X-ray Observatory are green and blue. These composite images are newer and in many cases prettier than the images from Hubble Space Telescope alone. Cassiopeia A is a supernova remnant from a Type 2 supernova, the explosion of a star much more massive than the Sun. Most of the oxygen in the Universe comes from such supernovas.



astronomers, the past is very much alive. We are seeing the past all the time, different eras all the way back to the Big Bang.

Another way of looking at time is to appreciate that we are in the middle of time. Just recently the expansion of the Universe transitioned from slowing down to speeding up. That will change the nature of the Universe on large size scales. The most distant galaxies are disappearing over the cosmic horizon. And we are living right near the middle of that epoch. So, in some ways, we have the best possible view of the distant Universe. But it is still a multi-billion year process.

Ashok: Yeah, but we still have to hurry to see it!

Joel: Absolutely! Next, we also live at the middle of our solar system's lifetime. The Sun and all the planets formed about four and a half billion years ago. The Sun is in middle age, and like all other stars of this type, its temperature is slowly increasing. In another five or six billion years, it will turn into a red giant star and swallow the inner planets. If the Earth happens to survive, it will be baked to a crisp. Then the Sun will turn into a white dwarf star and finally just fade away. We're living in the middle of this grand ten billion year process. The Earth acquired an oxygen-rich atmosphere half a billion years ago, and at its present distance from the Sun, the Earth will probably be uninhabitable for large creatures in another half billion years. So in that sense, we are also living in the middle of the best period of the Sun and the solar system we are part of.

But we have more important things to worry about, which bring us to the most pressing aspect of our time. We live at the end of exponential human expansion on Earth. Our population exploded during the last century. It's the only time in human history that the population increased by a factor of four in a century. This can't happen again. Earth can't possibly support another doubling of its population. Although the growth rate has been slowing since the mid 1970's, our use of resources and our impact on the planet have not slowed at all. So this has to be brought under control during the next several decades or else we are doomed.

Nancy: As an aside, it is important to realize that when growth rates slow down it doesn't mean that growth turns around. There is still growth but it is slower.

Joel: Yes. So we need to bring the growth rate of resource use under control. This is a tremendous challenge. And I believe a cosmic perspective—thinking about the evolution of the planetary system and the Universe as a whole—can help us appreciate what a remarkable moment we are in.

The whole future, not only of our planet, but also of our galaxy and possibly of our entire visible Universe, may depend on what we do in the next few decades.

We have a very difficult challenge ahead: change the whole nature of our interaction with our planet, switch from mindless exploitation to what we hope will be sustainable prosperity. But the possibility of achieving sustainable prosperity will recede rapidly unless important steps are taken soon. So Nancy and I believe it is of utmost importance for people to try to understand the Universe on the big size scales, to recognize our special place in history, and to realize the special challenge facing us.

Ashok: This is very helpful. What you have both outlined about time, the accessibility of "otherness" and the centrality of humanity and the Earth in the universal scheme, builds a bridge from this new cosmology to modern culture. When Nancy said that we need science to access this new "otherness" that surrounds us, and that the older religions can't provide that connection, there is still this new spirituality touching a nerve of meaning. As Joel noted, what we do matters. We have to change our mindless ways in order to move into a sustainable civilization. So I would like to explore this new spirituality more.

Nancy: Let me begin by defining how Joel and I are using the term spirituality. For us, it means the way that we experience our personal connection to the Universe. That is all. It doesn't have anything to do with any religion. It is not studying the Universe; that is science's role. We are all inevitably connected with it. We are the Universe on our particular size scale. You are the Universe sitting on your chair at this moment. So there is no question about our definite connection to the Universe.

The important question then is: do we experience that connection or do we completely ignore it? Spirituality would be the extent to which we experience the Universe and then cultivate that experience. It is not the same as science; however, science can be a great path leading to that. Obviously there is no way to experience a universe that you aren't aware even exists. If you know nothing about the Universe emerging from modern science then you can only experience the imaginary universe you inherited, which is based on the notions of a prior era.

Ashok: This is a great point. This is the link for why science and a kind of new scientific spirituality are so vital today. How do we experience this now? Although we should not return to older cultural ways, and we are not speaking about an infinite God-based spirituality, still you see meaning as we discover our centrality in the Universe.

Nancy: Absolutely. But I will return to what Joel stated. We have a huge responsibility to turn things around during the next few decades. Actually, it is not just a



Star Formation and dust in the galactic plane: the Galactic Snake image shows a region where stars and planetary systems are forming. This is from Spitzer Space Telescope.

responsibility, it is an opportunity. If we realize how we fit into this Universe, we then realize we are much greater, deeper, and more interesting beings than we could ever have imagined before. We aren't simply little packages of skin, bones and organs walking on the Earth's surface. Rather each of us is the tip of an iceberg of an enormous cosmic and cultural history that is coalescing in us.

It took billions of years, lots of luck, and many chance events for evolution to arrive at human beings. We are the apex of all those events. It is not necessary that we were intended. Nevertheless we are extremely precious and totally unique beings. What we do know is that we embody our cosmic history in our cells. Not only are our bodies comprised of cosmic stardust but every atom in our body has an immense story of journeying behind it, perhaps from some exploding star far across

the Galaxy. Yet all of these far-flung particles amazingly came together to form us. When we can start to realize that, and how our decisions now could affect future millions of our descendents, we can acknowledge that we are tremendously important.

Ashok: This is very important to pursue further. Because what you have beautifully elucidated is that we are not just a center, not just central to time and size scales in the cosmic drama as if we are spectators, but we are in fact the locus of the cosmic drama in our bodies. That is an amazing thought. So how we use our minds and make decisions will make a profound difference for the future. We are not just victims on a speck of dust in a dark universe. Instead we are empowered beings.

Nancy: Those people who see humans as victims are largely functioning in an obsolete picture of the Universe.

Once we realize how the Universe works and how we fit into it integrally, we tremendously expand our identities and our sense of potential. We see things anew.

Ashok: I can't resist asking a question from a philosophical point of view. Throughout the centuries, philosophers have struggled over the question of mind or consciousness versus matter and have seen a disconnection between them. The story you are developing, that we are precious and integral to the Universe, seems to address this struggle. So is consciousness still a mystery?

Joel: Simply, we don't know how consciousness arises. We have this sense of ourselves as inhabiting our bodies and being distinct individuals. But cognitive neuroscience tells us that at least some aspects of this are illusory. The way the brain constructs the ego is still mysterious. But let me address the more fundamental concept of dualism that you refer to.

Of course, Plato was one of the great proponents of the distinction between form and matter. Then René Descartes spoke about the soul-body dualism. Consciously or unconsciously, these are the dualisms we moderns tend to have in mind. But what Nancy and I argue is that both of these dualisms—Platonic and Cartesian—are in direct conflict with our modern scientific understanding. For example, Plato thought material objects could only approximate a perfect form such as a sphere. But there is no distinction between form and matter on the size scale of electrons in atoms. Quantum theory at first seems weird. If you try to understand quantum ideas according to everyday human language, you run into contradictions. For example, how can an electron be both a particle and a wave? But once a person understands quantum ideas in their proper mathematical language, all these apparent contradictions disappear. The beautiful simplicity of the theory shines forth, and this is how we now understand matter.

Matter is really far more complicated than Plato and Descartes realized. Neither of them gave matter nearly enough credit. But as far as we can tell, the Universe appears to be One, in the sense that there is no fundamental distinction between soul or spirit on the one hand and the material Universe on the other. Rather there is a process of emergence, where consciousness is some sort of emergent property.

I think we have all suffered from this divided Universe, trying to separate the spiritual from the material. But if we can start to understand the spiritual as something intimately connected with the material, then this enters the domain where scientists think. Incidentally, I feel this realm is much closer to traditional or indigenous religion, the kind that native peoples practice around the world.

Ashok: You mean those cultures and traditions who understand nature as sacred.

Joel: Yes. But also with the understanding that nature comes out of the Earth. For example, in the creation stories among the Southwest Native Americans, human beings emerged from holes in the ground. In the kiva ceremonies among the Pueblo, there is a sacred spot representing their people's emergence from the Earth. They don't see themselves as having been placed on Earth by some kind of sky god. Well, the fact is that we humans did emerge from the Earth itself. We are made of the same heavy elements that are products of the Universe. Seeing ourselves in that way is also a whole lot healthier. It may help us treat the Earth with respect and as something absolutely extraordinary.

Ashok: Yes, I agree. And it is also very timely for the crises we are facing on the planet today. Nancy, returning to your beautiful explanation of our accessibility to the "otherness," how are you proposing that humans can actually experience this new connection to the Universe? Do we need a new mythology, a new story?

Nancy: Yes, we do need a new story. But the wonderful thing is that it is being handed to us on a silver platter.

Ashok: In what way?

Nancy: By the scientists, like Joel and his colleagues. It is true this new story is not yet in a very accessible form—the way the scientists give it to us non-scientists. That is because their stories are largely about the Universe "out there," and we are supposed to figure out what it means for us here.

Throughout all of human history, people have invented mythologies to connect them to whatever universe they believed existed. But they had no scientific theories nor data to know what Universe existed—until literally right now. Today our picture of the Universe is coherent. For the first time we have data taking us back to the beginning, all the way to the Big Bang, and forward, showing how the Universe evolved. The challenge then becomes: how do I experience my connection to that? I know I am connected but how do I experience it? As Joel said, we can learn from how other peoples have done this. What is most important is to feel connected to the Big Bang, because it continues in us. We need new metaphors to realize that the forces of nature are in us and really are in a sense our ancestors.

Ashok: To build upon that, one of the great crises of the twenty-first century, as we enter this so called "global village," is these intense interactions between cultures and world views and conflicting perspectives leading to violence and clashes like

9/11. So I wonder whether this new story—our connection with the environment, with nature and with the cosmos—would help connect us with each other.

Nancy: Certainly, because all of these fights are over very recent differences. If you go far enough back, we are actually all children of the exact same woman, Eve. I don't mean our mitochondrial Eve from the Bible, but the Eve who lived about 150,000 years ago and from whom all living humans are genetically descended.

Ashok: Yes, that was big news!

Nancy: Amazing. But going further back, every one of us has the identical cosmic genealogy. We all evolved out of this Earth together. But all these small, minor differences that have arisen in recent history are the excuses for killing each other. We don't stop to notice that we could be the only intelligent creatures in the Universe nor to consider how each one of us is incredibly precious from the vantage point of the Universe. There may be other intelligent life on many other worlds, but compared to everything else in the Universe—all the Dark Matter and Dark Energy and all the vast reaches of the Universe—every intelligent being is remarkably rare and incredibly precious.

We also need to see ourselves as ancestors. It is not sufficient to just think of the forces of Nature as our ancestors. Rather we need to see ourselves fitting into this long flow of hundreds of millions of years of life on this planet, which could go on for billions more years. So we can play this crucial role in preserving Earth and create something fabulous for the future, or in the next several years it is equally in our power to destroy the whole thing.

Ashok: This is remarkable, because for the circles I work with, part of them being interfaith dialogue, people realize that we need to find common ground.

Nancy: Yes, it can be found. But the common ground among religions is a small patch of morality that works on a small size scale. No religion has a global solution. We need something much larger, much grander. We need something that is shared by everybody on this planet. We need an accurate map of reality.

Ashok: So you are saying that reality is the common ground?

Nancy: Absolutely. We need a map of reality that shows how all of us fit in and that treats everyone as equal, which we are from the perspective of our planet.

Ashok: I would like to hear each of your comments on the last part of your book—The Meaning of the Universe:

Think Cosmically, Act Globally. Given the crises facing humanity and the Earth, you offer a wonderful, optimistic picture of us as children of the cosmos now emerging from this new science. As this becomes better known, and as we begin to experience our connection to the Universe, do you have any prognosis for our crises?

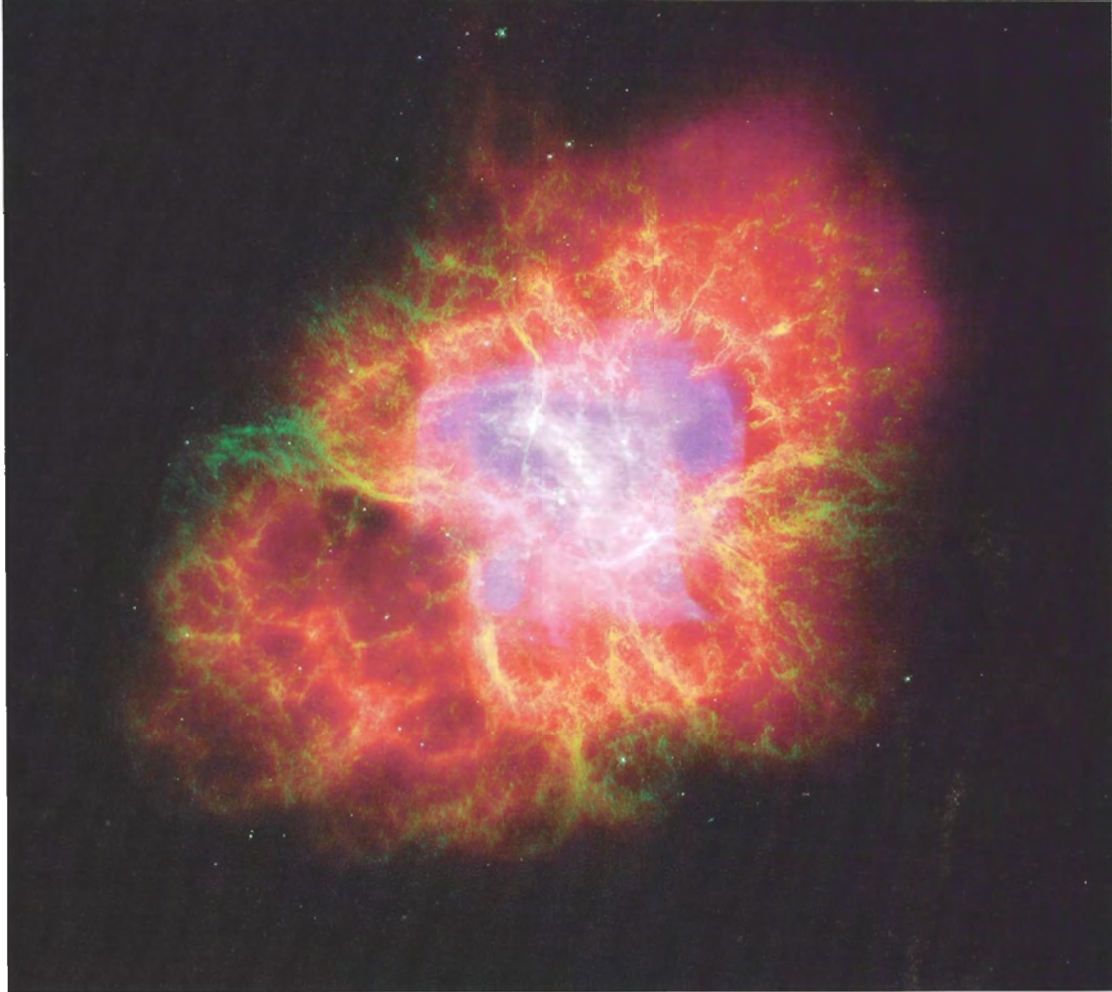
Nancy: Many people who have read our book or heard us speak say, "Oh, but so many people will never buy this idea. So how do you think this is going to change anything?" This is a very long term project. We are not attempting to convert everyone to see the Universe the way we see it. We are simply planting seeds. All we need to do is affect a certain percentage of people who are the leaders of culture. Those are the people who will really make a difference.

Joel: We are trying to emphasize the challenges we face in the context of the exponentially increasing impact of technology. One that we are constantly being reminded of is the increase of carbon dioxide in the atmosphere, which is now more than it has ever been for the last six hundred thousand years, based on the analyses of ancient atmospheres trapped in tiny bubbles in the ice cores of Antarctica and Greenland. So we know for certain that humanity is now in new territory. Furthermore, the rate at which carbon dioxide is increasing is so great that around the middle of the century we will have doubled its amount in the entire atmosphere!

Nancy: Although Al Gore's movie, *An Inconvenient Truth*, convincingly shows humans as responsible for much of global warming and morally responsible for doing something to stop it, the film didn't tell us how we acquire the motivation to deal with it. Joel and I feel a new shared cosmology could give us all a real motivation. It will connect us to something larger—and real—to belong to. Something to stand for in our lives.

Joel: In order to see the Earth in its proper context we must see it in the context of the Universe. In some sense that is the big message we're trying to convey. The little messages concern the creation and use of new cosmic metaphors in order to help us see our problems in a different light.

Nancy: A shared, centering cosmology based on science can also make us happier and more effective. It can make us feel at home and discover a deeper meaning in our lives. It can help us create real community among like minded people, which extends around the world. This would be a community of people who realize that we humans really matter and that we are actually important cosmically. When we reflect on the effects of that belief on earlier cultures, we conclude it is a good thing. It is what allowed many earlier cultures to build great



This Crab Nebula image is a composite of data from Chandra, Hubble, and Spitzer Space Telescopes. Like the Cassiopeia A image, it was also produced by a Type 2 supernova.

civilizations. To matter to the Universe is tremendously motivating. But it is also a little scary. For example, Egyptians must have been petrified by the thought that if they discontinued their traditions, the order of the Universe could collapse at any moment and chaos could return. On the other hand, it kept their civilization going for three thousand years. And we could go on for thousands more years too, if we realize the uniqueness of our central place in the Double Dark Universe and that everything we do at this cosmically pivotal moment really does matter.

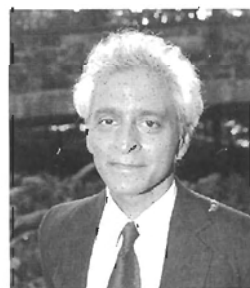
Ashok: Well, that's a wonderful way to conclude our conversation: realizing that matter is sacred and much more remarkable and important than we ever thought. As you said Joel, there is a great need to get this message out given the urgent state of this planet and the need for us to find our common humanity in a common cosmos. Opening up our lenses, shifting our perspectives to a larger scale, is so important and timely.

I want to end by thanking you both. You are a model of a wonderful couple, the way your voices dance together and augment each other. You set a great

standard and your book is surely a breakthrough. So I want to congratulate you both and thank you for joining us in this dialogue. I learned so much from you.



Ashok Gangadean is Professor and Chair of Philosophy at Haverford College where he has pioneered "global philosophy" for over forty years. Ashok is Founder-Director of the Global Dialogue Institute and a Co-Convener of the World Commission on Global Consciousness and Spirituality. His published books and essays open the way to global and meditative reason and the development of a universal grammar for global culture and deep spirituality based on the common ground across religious and cultural worlds. Ashok's forthcoming book *The Awakening of the Global Mind* develops these themes. www.awakeningmind.org



Issue Four - Spring 2007

ELIXIR

Consciousness, Conscience, and Culture

JULES CASHFORD
JOEL PRIMACK
NANCY ABRAMS
JENNIFER MORGAN
RICHARD GROSSINGER
VICTOR MANSFIELD
GREGORY SHAW
PIR VILAYAT KHAN
JEAN-YVES LELOUP

STARRY WISDOM