

***PASSPORT TO THE UNIVERSE***  
by Ann Druyan and Steven Soter

**PRE-SHOW**

Prologue [narration in **bold face**]

**“This is Tom Hanks. There comes a time in each of our lives when it first dawns on us that we are not the center of the universe . . . that we are part of something larger than ourselves. As it happens to each of us, so it is happening to our civilization . . . right now.”**

**“We are living in the golden age of astronomy. We are completing the spacecraft reconnaissance of our solar system . . . We are using other kinds of light to observe the life cycles of stars and galaxies, revealing wonders never before visible . . . We are mapping the grand structure of the universe, tracing its ancient past, finding our place in its great story. We are becoming citizens of the cosmos.”**

**“Citizenship has its rewards, but it also brings certain responsibilities. Among them is understanding where we are in the vastness of space and time and having some idea of the history and nature of our surroundings.”**

**“Each of you has been given your cosmic passport.”**

**“Be sure to keep it handy during your journey.”**

**“Now, please enter the great sphere, where our journey begins.”**

**INSIDE DOME:**

**MAIN SHOW**

**1. PRE-FLIGHT CHECK-LIST**

The Zeiss projector begins its ascent. We see the first of a succession of images representing the various astronomical data bases to be used in the show.

**“This is Tom Hanks. Rising into view is the most advanced star projector in the world, capable of reproducing a perfect night sky as seen from Earth. But our journey will take us *far* beyond Earth. To explore the universe in *three* dimensions, we will use a powerful computer, loaded with real astronomical data from the great observatories on Earth and in space. What**

*(more)*

**you are about to see is not an artist's fantasy, but a three-dimensional map of the *real* universe, carefully calculated and drawn from the best astronomical observations and data."**

**"Before we begin our journey, I need to run through a pre-flight check-list."**

**"Planet program: Celestial coordinates, check. Solar system orbits, check. Planets, moons and rings, check."**

**"Star program: Local star positions, colors and magnitudes, check."**

**"Galaxy program: Milky Way and galactic coordinates, check. Gas and dust nebulas, globular clusters, extra-solar planetary systems, pulsars, check."**

**"Universe program: Local Group of galaxies, check. Virgo Supercluster, check."**

**"Late breaking astronomical images, check."**

**"OK, we're ready to roll."**

## 2. THE ZEISS SKY

The Zeiss projector is now in position. The mist has cleared. The last schematic representation fades into the realistic Zeiss sky. Night sounds of crickets and whippoorwills. All the Zeiss stars have appeared, scintillating, together with the Milky Way in its splendor. The vault of the sky is slowly rotating around the pole star.

**"In the time before electricity, in a world lit only by fire, *this* was the sky that everyone knew. Back then, on a clear moonless night, it was *always* dark enough to see the faint band of the Milky Way arcing across the sky."**

**"For a thousand generations, our ancestors looked at the night sky and wondered what it was. The sky *looked* like the inside of an enormous bowl, slowly turning around an Earth believed to be at its center. The stars were like tiny points of light stuck to the inside of the bowl, and not so very far away. The ancient sky seemed *two dimensional*."**

Superimpose view of the constellation figures.

**"Our ancestors imagined that the stars formed pictures in the sky. They named these constellations after mythical creatures and heros."**

Fade out constellation figures.

**“But what *were* the stars, really? What was the Milky Way? For that matter, what was the *Earth*? And *where* was it? We had no way to know, until we devised the methods and tools of science.”**

### 3. TELESCOPES

**“Because our eyes are very small and the stars are far away, at best we can only see a few thousand of them, even on the darkest night.”**

**“But for every star we *can* see with the unaided eye, the night hides fifty million others, in our Milky Way Galaxy alone. To see what’s *really* out there, we need telescopes.”**

**“Using telescopes, we discovered that the sky has a *third* dimension – depth – and that the universe is far grander than *anyone* could have imagined.”**

### 4. THE COSMIC ADDRESS

**“During the last four hundred years, in a series of astonishing discoveries, we filled out our Cosmic Address. We learned that, far from being the center of the universe, the Earth is actually but one of the planets, moving in orbit around the Sun. Our Sun in turn is just an ordinary star. It is one of over a hundred billion stars in our Milky Way Galaxy. And our Milky Way Galaxy is one of several thousand galaxies in the Virgo Supercluster. Finally, this vast supercluster of galaxies is but a tiny part of the Observable Universe.”**

### 5. FROM EARTH TO SATURN

*POV LOOKING BACK, THEN FRONT*

Music up. The extended COSMIC ADDRESS reverts back to the module representing the Earth, our location at this moment. The whole Earth rises into view.

**“Using telescopes and the laws of physics, we are mapping the universe in three dimensions. And once you have a map . . .”**

The seats rumble, as the starry sky rapidly wheels about.

**“. . . you can know where you are . . .”**

The Earth recedes rapidly.

**“. . . and, where you’re going.”**

The “Earth” module of the COSMIC ADDRESS changes to the the “Solar System” module. Mars emerges from a faint point at the zenith.

**“That’s Mars -- after the Earth, the next planet out from the Sun.”**

*(more)*

Mars approaches until we can see detailed surface features and then disappears below our horizon.

The planet Jupiter emerges from the distance, accompanied by its Galilean satellites.

**“The gas giant planet Jupiter is heavier than all the other planets put together. Its Great Red Spot is a storm that has raged for centuries. Each of its big moons is an unexplored world in its own right. One of them, Io, has volcanic eruptions at all times. Another, Europa, has a deep ocean of water hidden beneath an icy crust.”**

Saturn next looms out of the distance. We transit the ring plane and move under Saturn.

**“The planet Saturn has hundreds of thin rings made of countless orbiting snowballs. And its giant icy moon Titan has an atmosphere thicker than the Earth’s.”**

Saturn and its rings are now backlit by the distant Sun, as they rapidly recede.

**“With our computer on interplanetary drive, we’ve come this far in only a minute. Our fastest spacecraft actually take years.”**

We accelerate up and out of the plane of the solar system, until we are looking back on all of the planets against a background of stars.

## 6. PALE BLUE DOT *POV LOOKING BACK*

**“We’ve come a long way. Can you find the Earth?”**

Pause.

**“It’s so small we can hardly see it from here.”**

A heads-up laser pointer encircles the Earth.

**“It’s that one -- the pale blue dot. That’s *home*. Everyone you ever knew -- or ever heard of -- came from that tiny spot . . .”**

**“Seeing it like that always gets to me.”**

The elliptical solar system orbits fade in.

**“The planets of the solar system are huddled close to the Sun, like campers around a fire in a vast cold and dark plain.”**

The orbits fade out.

**“From out here, it’s obvious that our mighty Sun is just another star. But the familiar constellations still look the same . . . because even at this distance from Earth, the stars are still *enormously* far away.”**

## 7. SET-UP INTERSTELLAR FLIGHT

*POV LOOKING FRONT*

The sky has been rotating to center on Orion, whose stars are connected by lines.

**“Connect the dots and there’s Orion the Hunter. The three stars in the belt make this constellation easy to find in the winter sky. Below Orion’s belt you can see a faint wispy cloud.”**

**“It doesn’t look like much because it’s so far away, but just wait.”**

**“The stars are *millions* of times farther away than the planets. To move among the stars, we’ll have to shift to the *interstellar* drive.”**

## 8. FLIGHT TO ORION

*POV LOOKING FRONT*

The nearest stars begin to diverge and fly past us as our virtual flight path takes us into the stars of Orion.

**“As we move out into our Galaxy, the old two-dimensional patterns vanish, because the starry sky is *three* dimensional.”**

In the COSMIC ADDRESS device, the “Solar System” module changes to the “Milky Way Galaxy” module. We make directly for the Orion Nebula.

**“We’re heading for the Orion Nebula, about fifteen hundred light years from the Earth.”**

## 9. ORION NEBULA TOUR

With mounting enthusiasm.

**“The Orion Nebula is a recycling center for the stars of the Milky Way, a vast interstellar cloud of gas and dust, a place where stars are born. We’re entering a virtual landscape of the nebula, assembled from observations with the Hubble Space Telescope. No one has ever seen the Orion Nebula like *this* before.”**

*(more)*

We plunge into the heart of the Orion Nebula, piercing its outer veils of gas and dust, to reveal a vision of creation, worthy of a Michelangelo -- the stellar nursery within. We see the brilliant star cluster of the Trapezium.

**“The brightest stars illuminate the surface of the nebula from which they were born.”**

The Trapezium stars are surrounded by dozens of proplyds. These teardrop-shaped dust clouds, with their comet-like tails pointing away from the bright central stars of the nebula, look unlike anything we are accustomed to see floating in empty space.

**“Our solar system was made in a place like this -- a stellar nursery. That was a long time ago, of course, nearly five billion years, but it must have looked pretty much the same.”**

**“Each of these teardrop-shaped clouds is a blanket of gas and dust swaddling a newborn star and perhaps a family of growing planets.”**

We execute a slow spiral around the central region.

**“And what does all this have to do with us?”**

**“Take a deep breath . . . No, I’m serious. Really, everybody, do it.”**

**“Every atom of oxygen you just inhaled was made deep inside a star. The carbon in our muscles, the calcium in our bones, the iron in our blood -- in fact all the heavy elements -- were cooked in the hearts of stars. As Carl Sagan said, we are starstuff.”**

#### 10. PULL OUT FROM GALAXY *POV LOOKING BACK*

We accelerate rapidly away from the Orion Nebula, with stars streaming past us.

**“Stars are born in batches -- with dozens in every litter. The sibling stars of our Sun are now spread throughout the spiral arms of the Milky Way galaxy.”**

As we rise up and out of the plane of the Galaxy, its entire spiral structure becomes visible.

**“As we leave our Galaxy, the individual stars appear to blend together.”**

#### 11. LOOK BACK AT OUR GALAXY

The Milky Way module of the COSMIC ADDRESS appears.

**“Our Milky Way is really a vast spiral galaxy -- a congregation of hundreds of billions of suns. But you have to get out *here*, outside the galaxy, to see the whole thing. We’ve never had this view before.”**

**“Remember back on Earth, where we could only see a few thousand stars?”**

A laser image of a sphere appears marks the relatively small volume corresponding to the limits of Yale Bright Star Catalog.

**“Well, *all* of them lie within that tiny part of the Galaxy.”**

## 12. THE VIRGO SUPERCLUSTER

We continue our retreat from the Milky Way, which diminishes in size, joined by its two satellite Magellanic Clouds, then by galaxies of our Local Group.

**“Every one of those spots isn’t a star, but a whole *galaxy* with billions of stars.”**

**“We’re now in *intergalactic* drive, moving through virtual space at *millions* of light-years per second.**

**“That’s the Andromeda Galaxy, our nearest neighboring spiral galaxy. It’s the largest member of the so-called Local Group -- a collection of a few dozen galaxies.”**

The Virgo Supercluster now spans the dome. The “Milky Way” module in the COSMIC ADDRESS changes to the “Virgo Supercluster” module.

**“Our Local Group is a small part of the Virgo Supercluster -- a vast gathering of several *thousand* galaxies.”**

**“From out here, it’s hard to spot our own Milky Way Galaxy”.**

We use a laser cross-hair device to indicate the Milky Way.

**“Well, it’s *that* one. That’s home.”**

## 13. LARGE SCALE STRUCTURE

### *POV LOOKING BACK*

We pull back to reveal that the Virgo Supercluster is a tiny part of the large-scale structure of the universe, the so-called “bubbles and voids” formed by filaments and sheets of galaxy clusters. The “Virgo Supercluster” module on the COSMIC ADDRESS device changes to the “Observable Universe” module.

*(more)*

**“Our supercluster of galaxies is only a tiny part of the Observable Universe. On the largest scale we can see, the superclusters form the knots of a tangled network or web. The brightest knots are entire superclusters of thousands of galaxies, with each galaxy containing billions of suns.”**

**“This is the last line of our Cosmic Address . . . for now, anyway . . .”**

Softly:

**“We may just be little guys, living on a speck of dust. But we don’t think small. We managed to figure this much out.”**

**“And we’re still figuring . . . there are about a hundred billion galaxies in the universe we can see. But there are parts we *can’t* see.”**

Losing himself in a reverie:

**“And -- who knows? -- it may be that *all this*, the entire *observable* universe, is one tiny bubble in an *infinite* universe hidden beyond our cosmic horizon.”**

The music rises for an audio-visual moment of awe . . .

**“It’s time to be heading back. Let’s see if we can find a black hole around here somewhere . . .”**

#### 14. BLACK HOLE PLUNGE *POV LOOKING FRONT*

As the bubble-and-void pattern continues to drift across the dome, we see a region where the pattern is radially distorted and centered on a black hole. As it we approach it, the dome begins to flicker and the seats rumble.

**“Black holes are places where gravity is so strong that not even light can get out. Some theories imagine that they provide short-cuts to connect distant parts of the universe. No one knows what it might look like inside, so we’re free to imagine it.”**

We plunge into the trumpet-shaped tunnel of the worm hole.

#### 15. RETURN TO EARTH *POV LOOKING FRONT*

Emerging abruptly in our solar neighborhood, into a peaceful silence, we see the familiar Earth-based sky.

**“Well, we got off in the right neighborhood. The Earth can’t be far away because those are the familiar constellations.”**

**“You’ll want to take out your cosmic passports and have them ready for validation.”**

A distant point of light rises and rapidly grows to become recognizable as the Earth, half illuminated by an unseen Sun. As we approach the Earth, our planet hovers at the apex of the dome.

## 16. CONCLUSION

Expansively:

**“Welcome home, fellow citizens of the cosmos.”**

An image on each passport glows rhythmically with fluorescence induced by an invisible ultraviolet source reflected from the dome.

**“Your passports are now goof *everywhere* in the universe . . . among the planets of our solar system, the stars of our Milky Way galaxy, the other galaxies of our Supercluster, and on out to our cosmic horizon.”**

**“Next time you look up at the clear night sky, remember . . .”**

Star field begins to stream past us.

**“. . . you, me, and everybody -- we are starstuff. We are in the universe, and the universe is *in us* .”**

**“In the deepest sense, we are citizens of the cosmos.”**

THE END