

A BIG BANG BEGINNING

By Hasan Padamsee



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A Big Bang Beginning

A Full-Length Play in Two Acts

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by

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Synopsis

In the early part of the 20th century, boxing champ, war hero, and prodigy astronomer, Edwin Hubble unlocks the mystery of creation after winning an epic battle against the champion of science, Albert Einstein. Hubble is always up for the big fight - against authority, against established truth, against conventional wisdom and against the status quo. Hubble fights with his father, with his thesis advisor, against the Germans in World War I, with Harlow Shapley, the top astronomer at Harvard, before he finally goes head to head with Einstein.

Hubble finds many allies, who fight their own battles. Hubble learns about a breakthrough method for astronomical distances from Henrietta Leavitt, who slaves as a “human computer” for a male-chauvinist, Harvard astronomy chief. Leavitt is a trailblazer in her struggle to overturn the status quo for women in the early 1900’s, overlapping with the suffragist movement. Hubble finds an ally in Father George Lemaitre, a physicist-priest, who walks both the paths of religion and science, breaking the mold that the two paths are incompatible, even irreconcilable. Lemaitre aims to understand God’s plan for the universe using Einstein’s physics. He is not afraid to contradict authority, both of the Bible as literal truth, and of Einstein as unassailable truth. Hubble finds a partner in Milton Humason who defies prohibition and distracts Shapley with moonshine so Hubble can get time on the best telescope to pursue his nebulous objects. Humason refuses to be pigeon-holed by his perceived status as a janitor. He strives to be an astronomer, and successfully. Hubble meets a recently widowed Grace Lieb, and uplifts her spirits with the majesty of the heavens. They fall in love under the stars and the dome of the telescope. Grace uplifts Hubble’s spirit to fight for his dream despite the severe odds he faces.

In his grand triumph, Hubble reveals that the universe is not only bigger than anyone ever imagines, but getting bigger every moment. The runaway universe brings Hubble into direct collision with the towering icon of science, Albert Einstein, who roundly declares his powerful theory to show that the universe is eternally stable - non-expanding. Can an upstart, American astronomer with a janitor and a priest as collaborators, dare to challenge the world champion? Hubble is ready to go down in flames.

Hubble, Einstein and Lemaitre come face to face in the climax. Einstein rejects Hubble’s expanding universe. Why would God want to blow up His universe? Father Lemaitre jumps in to reveal a flaw in Einstein’s epic work. Without the flaw, Einstein’s own theory also leads to an expanding universe. After strong protests, Einstein reluctantly admits his great blunder to finally acknowledge Hubble’s victory, but still questions: What fuels the expansion?

Creation! A Big Bang detonation powers Hubble’s expanding universe. Hubble reveals the final grand consequence: the date of creation’s birthday. The discovery of the Big Bang brings the creation conflict to a climax.

This coming-of-age story is a tale of perseverance, of belief rewarded, and of a man who dared to live his dreams, at last.

About the Play

The play takes place in two acts with a total of 8 scenes. It runs under two hours. All characters can be played by eight actors according to the multicasting table below.

The settings are very simple. There is one large screen (preferably high up) which projects different scene backgrounds or astronomy slides and short video clips (all provided by the author). On stage are basic settings of tables, chairs, and other furniture, which can be quickly re-arranged for different scenes.

	Act1 - 1	Act 1 – 2	Act 1- 3	Act 1- 4	Act II - 1	Act II - 2	Act II-3	Act II-4
	Send-off	Astronomy Society Meet	Mt Wilson Observatory	Banquet	Resolution	Honeymoon	Expansion	Creation
Actors								
Male 1	Hubble	Hubble	Hubble	Hubble	Hubble	Hubble	Hubble	Hubble
Male 2		Shapley	Shapley	Shapley	Shapley			
Male 3	Grandpa	Frost	Humason				Humason	Humason
Male 4		Lemaitre	Hugo	Lemaitre	Lemaitre		Hugo	Lemaitre
Male 5				Einstein				Einstein
Male 6	Papa	Hale	Hale	Hale			Hale	Hale
Female 1	Lucy	Woman Astronomer	Grace	Student		Grace	Grace	Grace
Female 2	Betsy	Woman Astronomer		Student		Waitress	Betsy	
Female 3	Mama	Leavitt	Cecilia		Cecilia			Elsa

MAIN CHARACTERS (5)

EDWIN HUBBLE	(Born – 1889) His astronomic discovery at Mt Wilson of the expanding universe set the stage for the revelation that the universe burst into existence in the Big Bang.
ALBERT EINSTEIN	(Born – 1879) Hubble’s main rival. Adjusted his own ground-breaking theory to accommodate a static universe, in contradiction to Hubble’s expanding universe.
HARLOW SHAPLEY	(Born 1885) Chief astronomer at Mt Wilson Observatory. Blocks Hubble. Later becomes director of Harvard observatory and chair of astronomy department.
FATHER GEORGE LEMAITRE	(Born – 1894) Hubble’s ally. A Jesuit priest AND theoretical physicist who independently proves the expanding universe from Einstein’s theory, and realizes the Big Bang implication from Hubble’s expanding universe.
GRACE HUBBLE	(BORN 1889) Edwin Hubble’s wife, a literature enthusiast.

MINOR CHARACTERS

In order of appearance

Several roles played by the same performer.

BETSY HUBBLE	(BORN 1895) Hubble’s youngest sister, eager to learn from Hubble.
LUCY HUBBLE	(BORN 1887) Hubble’s older sister with strong religious views.
GRANDPA MARTIN	Edwin Hubble’s grandfather, inspires Hubble.
“PAPA”HUBBLE	(BORN 1865) Hubble’s dominating father, strong religious views.
“MAMA” HUBBLE	(BORN 1867) Hubble’s mother. Strong religious views.
EDWIN FROST	(Born – 1866) Hubble’s Ph.D. thesis advisor at the University of Chicago and Yerkes Observatory.

GEORGE HALE	(Born – 1868) Builder of ever more powerful telescopes, latest at Mt. Wilson, Ca, where Hubble works.
HENRIETTA LEAVITT	(Born 1868) “Human computer” at Harvard, studies millions of photographs. Hubble learns her breakthrough method for astronomic distance measurements.
MILTON HUMASON	(BORN 1891) Janitor and assistant at Mt Wilson Observatory. Hubble’s ally and co- discoverer of the expanding universe.
HUGO PRENTIS	GRADUATE STUDENT
CECILIA PAYNE	GRADUATE STUDENT
ELSA EINSTEIN	(BORN 1876) Einstein’s second wife.
REPORTERS	ONLY VOICES
PHOTOGRAPHER	ONLY VOICE
WAITRESS	

Act I- SCENE 1 – The Send-Off

RADIO VOICE

(with background 1910 music)

(Slide 1) A new century is born with hope and anticipation.

(Slide 2) American inventors thrill the world with technological miracles, promising a new way of life. Electricity, flying machines, movies...opportunities are opening for everyone.

(Slide 3) And yet, European scientists are way ahead of Americans. They've discovered x-rays,

(Slide 4) ...the electron, the nucleus, and radioactivity.

(Slide 5) It is already five years since a 26-year old unknown patent clerk—Albert Einstein—published famous papers on Quantum Physics and Relativity,

(Slide 6) developing startling new pictures about light, space, time, mass and energy.

(Slide 7) Ah! These be sky-gaping days! Astronomers are gaining popularity. People are keeping their eye on the sky for Halley's comet.

(Slide 8) But not everyone shares the elation. Some fear the Earth will pass through deadly gases in the comet's tail. Flaming meteorites will rain down. It's a sure sign of the apocalypse!

(Slide 9) - Back porch of the Hubble home – with title for scene location and time:

"Wheaton, IL, Chicago suburb" 1910

Scene starts late afternoon and goes on to pitch dark.

HUBBLE (age 21) and his two sisters, LUCY (age 23) and BETSY (age 15) enter dribbling a basketball. There is a small telescope on stage, a small table with star charts and a chair for GRANDPA.

BETSY

How do you always manage to land that bank-shot, Edwin? Show me the trick.

HUBBLE

Takes a lot of practice, Betsy. You should work on your cross-dribble first... Lucy, here...

(HUBBLE demonstrates the cross-dribble to LUCY. BETSY tries to intercept. Enter GRANDPA waving a view-scope for the telescope.)

GRANDPA

I found it, Edwin!

HUBBLE

(takes the part from GRANDPA)

Great! That'll work! Let's set it up.

(HUBBLE walks over with GRANDPA to attach the view-scope to the telescope. LUCY and BETSY continue to dribble the basketball. GRANDPA fumbles to take a billfold out of his coat pocket, and slips it into HUBBLE'S pocket.)

GRANDPA

Are you excited about your big trip, lad?

HUBBLE

(peeking at the bills)

You really didn't have to, Grandpa, but thanks!

GRANDPA

Oh it's nothing. I know you've always managed to take care of yourself, but you might need a little extra on your long journey. It's going to be a great night! Mars looked spectacular last night!

HUBBLE

Find any canals, grandpa?

GRANDPA

(reacts to the taunt, and pretends to spar with HUBBLE, who plays along by boxing)

There just might be some canals. Lowell's no fool you know. You think you're ready to challenge our greatest astronomer's find, son?

HUBBLE

I do admire Lowell's work. But canals on Mars, I doubt that.

GRANDPA

Don't underestimate our clever boys! Look how they're showing the Europeans how to fly. Just wait, Edwin, even our astronomers will catch up one day, and show them- -

HUBBLE

Someday, grandpa! Someday. Lowell's truly our greatest explorer, hunting for new worlds. Maybe he will find his brand new Planet X after all. But it will be a long battle for - -

GRANDPA

Another planet! That would put America on the map for sure. But I thought Uranus and Neptune are the last.

(Enter PAPA, leaning on cane, MAMA trails behind. LUCY and BETSY approach PAPA to assist, then continue with basketball. GRANDPA goes to work on telescope, sits on chair occasionally.)

PAPA

Is grandpa filling your head with that astronomy nonsense again?

GRANDPA

(rising from the chair near the telescope)

It's not nonsense, John! The most beautiful things in the universe are stars and...

(Pulls out a flask from his pocket, takes a swig.

MAMA tries to shield the girls.)

whiskey, of- -.

(GRANDPA returns to work on the telescope)

PAPA

It's time for Edwin to grow up and take on real-life challenges. What are you going to tell the boxing promoters, son? Have you made up your mind yet?

HUBBLE

Almost, Papa.

GRANDPA

They are looking for a Great White Hope, eh?

PAPA

They want him to go up against Jack Johnson one day! And wipe that golden smile of Johnson's face for- -

HUBBLE

Tempting, but a long shot! It will take years before I get to face the champ. And even if I can beat Jack Johnson, it will be their dreams, not mine.

PAPA

But you do love the big challenge, don't you?

GRANDPA

Don't give it another thought, son. Your ship is sailing.

MAMA

Football and boxing are so brutally dangerous. You are to blame for getting him started, dear.

PAPA

Builds character, you know. Didn't you hear the promoters? Hundred thousand should take care of our family for life.

(LUCY stops dribbling to listen in. BETSY takes the basketball and joins GRANDPA on the telescope. GRANDPA picks up star-charts from the table and shows them to BETSY.)

MAMA

Won't be much help in the grave! There'll be other fights to win, and all kinds of champions for our Edwin to defeat. Look how he beat Hoffman for the Rhodes scholarship.

GRANDPA

Mama's right. Follow your stars, Edwin.

HUBBLE

I *would* rather tackle the mysteries of the universe, Papa. Oxford will be - -

(PAPA starts coughing uncontrollably, MAMA strokes his back, and offers him a hanky. LUCY and BETSY approach to help. PAPA recovers as he signals his daughters he is fine. MAMA signals that she has it under control. BETSY goes back to telescope. But LUCY stays nearby, in case.)

PAPA

And how will that put food on the table?

MAMA

Don't be so harsh on him, dear. He can study law at Oxford, and become a lawyer...like you always wanted to.

LUCY

That's a good idea, Mama!

PAPA

(slowly wipes his mouth with hanky)

I guess Oxford is a great place - for law.

HUBBLE

And astronomy.

PAPA

Now that's a hobby! Studying law will take all your time and energy.

HUBBLE

I can do both, Papa.

MAMA

He did pretty well with Latin, Greek, *and* science!

GRANDPA

He can study the *laws* of nature, John.

PAPA

(coughs again. LUCY offers him a hanky, but PAPA controls it quickly.)

I've never understood why you want to become an astronomer. It's just beyond me.

GRANDPA
(from the telescope)

Don't be so stubborn, John. We all know how the mystery of the stars has captured his heart.

PAPA
 It's all foolishness, son. Look at me! I have a large family, a large house, and Mama has plenty of help. Now, my health... We are going to need your help to - -

MAMA
 Enough of this awful, dreary talk. I am sure Edwin will do the right thing.

PAPA
 As long as he leaves the heavens to God. The Bible has all the answers to your mysteries.

HUBBLE
 Yes, Papa. But sometimes I don't find the answers in the Bible very satisfying. We have to read the Bible intelligently, Papa. Not with blind faith. I mean, science can be our guide.

LUCY
 Edwin thinks his Chicago degree gives him the right to question the Bible.

PAPA
 Nonsense! The Bible is the word of God. Trust in God for everything.

GRANDPA
 And in hard work!

HUBBLE
 Hard work won me the scholarship, Papa. And besides, my physics professors gave me those recommenda- -

MAMA
 I am sure God was watching over you, dear.

GRANDPA
 And don't forget all those Nobel Prize wizards at Chicago?

HUBBLE
 Michelson's the only one who got the Nobel Prize, Grandpa. Although Millikan will probably get one soon - for his experiments on the electron.

PAPA
 Electrons! Hogwash! Such things do not exist, son.

LUCY
 Have you ever seen an electron?

HUBBLE

You don't always need to see something to know it exists, Lucy. Isn't that a basic belief of our faith? You can't see air, can you? But you know air exists. I mean, you can test it by blowing on a piece of paper to - -

(Bell rings. LUCY and BETSY go inside.)

PAPA

Tests...tests... Character is the only real test, son. Build character by fighting temptations, Edwin.

(GRANDPA mockingly takes another swig.)

PAPA *(con't)*

And while you are in Oxford, I want you to promise that you will not touch alcohol in any form.

(Looks disapprovingly at GRANDPA, who withholds a snicker. LUCY and BETSY return. BETSY re-joins GRANDPA.)

MAMA

Who was at the door, Lucy?

LUCY

Someone selling anti-comet-sickness pills.

GRANDPA

Now *that's* hogwash, if I ever heard any.

PAPA

Our neighbor's complaining his cattle are having lots of miscarriages lately. Blames it squarely on the comets, he does. We should start sealing our windows from the poisonous gases in the comet's tail.

GRANDPA

Just stop eating those beans, John! That will take care of all the poisonous gases 'round here.

LUCY

(displays the pills in her palm)

I bought a few.

(LUCY passes the pills around, MAMA and PAPA take some.)

LUCY

May God protect you!

(BETSY takes the pills, but puts the pills in her pocket. LUCY repeats her protection wish as she offers the pills. GRANDPA and HUBBLE pocket the pills when LUCY is not looking.)

PAPA

And, Edwin. I want you to stay away from your dastardly fraternity pranks. Why the devil you picked divinity students to throw raw eggs at is beyond me. Keep your rebellions in check. Be honest, truthful and sober. And you will accomplish great things.

(PAPA gives HUBBLE a hug; HUBBLE accepts reluctantly. PAPA exits slowly, using the cane and coughing. LUCY follows PAPA out. MAMA stays on stage.)

BETSY

(runs over to MAMA from the telescope)

Mama, can I please stay up late? I just have to see Halley's comet. Edwin says it only comes around once every 75 years. Mama, please!

GRANDPA

You must let her! You must!

HUBBLE

Tonight's going to be magical, Mama. And such a rare opportunity!

MAMA

As I live and breathe!

BETSY

Edwin's not going to be here much longer, Mama, please.

MAMA

Bless your little heart and cotton socks! You may stay up. But not too late, mind you. Now, I must tend to Papa.

(LUCY re-enters and signals to MAMA that PAPA needs her. MAMA exits. LUCY stays on stage.)

GRANDPA

(at the telescope)

It's just barely visible now.

BETSY

Show me the magic, Edwin!

(Music. Tall HUBBLE points to the sky. Home scene on screen changes to the night sky with comet Halley, Slide 10.)

HUBBLE

There, can you see it?

BETSY

Is that a star? Is it a planet?

HUBBLE

Betsy, there's so many stranger things in the universe than stars and planets. There's comets, the Milky Way, and nebulae of all shapes. The amazing thing is that Edmund Halley predicted that this comet will come around on this exact night - 150 years ago. To know of such things in advance makes an astronomer almost like a god.

(Music pauses)

LUCY

Don't let Mama hear you say that!

BETSY

Do astronomer's predictions always come true?

HUBBLE

Almost always; unless they make a mistake. Halley predicted this comet will return every 75 years. And it does.

LUCY

Oh really now! Tell Betsy how comets are bad stars, bringing major disa-stars - literally. This one's going to bring a terrible war, the Chicago Sentinel says.

GRANDPA

(making the sign of the cross in the air)

You know, the Pope had to excommunicate one comet!

HUBBLE

Lucy, those disasters are pure coincidences.

LUCY

Aha! You admit it! So comets do bring disasters.

HUBBLE

Look Lucy, people always remember comets when they come with disasters, but they ignore them when it's just the comets. That's all.

LUCY

Oh yea! The Daily News says your astronomers have made a mistake. This one's going to strike somewhere near Boston, knocking us all to kingdom come.

GRANDPA

(taking another swig)

Then why bother with the pills, Lucy?

HUBBLE

Lucy, people were always afraid of comets because they didn't come on a regular pattern, like stars and planets. Now, thanks to Halley, we can predict the coming of comets, like we can predict the tides.

LUCY

You just want to push science. Most people need to find a higher meaning - in religion, to believe in something greater than ourselves. Religion can be our guide through the dark truths of life. Faith gives us hope and strength in times of crisis.

HUBBLE

Science also searches for higher meaning. I do believe the Almighty reveals Himself through the majesty of our vast universe, through the beauty and harmony of nature. Through science we begin to know God.

GRANDPA

The telescope is ready; let's start our comet-party.

BETSY

Can I see it?

LUCY

Are you sure you want to stare in the face of evil? It looks like a dagger ready to strike at the earth.

BETSY

I'm not scared.

(Music continues. BETSY leans into the telescope to take a look. LUCY grabs the chair, plops it down away from the telescope enthusiasts, and sits, upset. After a short period of looking through the telescope, HUBBLE motions to BETSY to look directly at the night sky.)

HUBBLE

Now over here, Betsy, see if you can spot the Milky Way - out there.

(HUBBLE points to the Milky Way, Slide 11.)

BETSY

(Sweeps the sky, as she strains her eyes)

Just barely!

GRANDPA

Wait till your eyes get used to the darkness.

BETSY

I think I can see it now. It's kind of misty. What is that, fog?

HUBBLE

You'll see. It has mystified astronomers for ages. Now look at it through the telescope.

(HUBBLE re-orientes the telescope toward the Milky Way. BETSY looks through the telescope. Slide 12 shows the bright stars in the Milky Way.)

BETSY

There's so much light here!

HUBBLE

Astonishing, isn't it? The mist of milk turns into a million stars. That's our gal-a-xy - the Milky Way.

BETSY

Oh yes. Gala from Greek for milk. Gal-a-xy. Milky Way. I get it.

HUBBLE

Galileo was just as surprised when he saw this river of light through his small telescope! "Since they are infinitely stupendous, I am infinitely thankful to God who has deigned to make me the first observer of things so admirable and hidden to all past ages."

BETSY

He's your hero, isn't he? So, are you going to Oxford to study comets?

HUBBLE

No Betsy, I am going to study Law.

BETSY

But I thought you love astronomy. I know I do. I love this! Papa will take care of us.

LUCY

(gets up to move between HUBBLE and BETSY)

But he is sick now. He's going to need our help soon.

BETSY

How long will you be gone?

HUBBLE

Three years.

BETSY

(rushes to HUBBLE and hugs him)

Three years is a long time! You won't forget us; will you, Edwin?

HUBBLE

How can I forget you? You are my world of possibilities. Maybe you can become an astronomer - for the both of us. And someday you will journey to the planets in a space-ship!

GRANDPA

Just think of that!

(Blackout)

(End of Act 1 - Scene 1)

A short (less than 1 minute) slide show of Hubble Space Telescope pictures simulates a journey from the Earth to the Moon to Venus, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto, and out to the vast emptiness beyond.

Set changes for Scene 2 during video

Act I Scene 2 - Farther and Faster

RADIO VOICE

(Slide 13) When Woodrow Wilson arrives in Washington for his inauguration, he is mighty dismayed to find no huge crowds.

(Slide 14) People have gone to a bigger spectacle down on Pennsylvania Avenue: a women's suffrage parade. Five thousand women—sporting purple, violet and gold banners—unite under the leadership of Alice Paul to demand the right to vote.

(Slide 15) Overseas, a world war rages on.

(Slide 16) Thousands of miles of trenches link together to form underground cities. Soldiers live like rats in trenches, overpowered by the stench of dead bodies, but always on the alert for attack.

(Slide 17) At 29 years of age, George Hale conceives, designs and organizes the construction of a 40-inch aperture telescope with financing from Charles Yerkes, the railroad magnate who built the elevated loop around Chicago's financial district.

October 1914.

(Slide 18) Northwestern University campus and the conference banner:

*"Annual Meeting of the Astronomical Society
Northwestern University, Evanston, IL."*

Occasional traffic noise, police sirens in the background. Long table on stage with wine glasses and bottles. Scene opens with astronomers assembled for a group photograph.

PHOTOGRAPHER' VOICE

Ready? 1, 2, 3. *(flash)* And another, 1,2,3. *(flash)* Thank you everyone!

*(After the photo, they break up into three small groups. 1. HALE, HUBBLE and FROST,
2. LEAVITT and TWO WOMEN ASTRONOMERS,
3. SHAPLEY & LEMAITRE.*

HALE

(welcomes the audience with a toast)

Thank you all for coming! Ladies and Gentlemen... Everyone, stay inside! The suffragists are on the march again. But do join the reception, and help yourself to the wine. Who knows how long we will be able to enjoy it.

*(Lights on FROST, HUBBLE and HALE group.
Lights down on the other two groups.)*

FROST

(lifting his glass)

Every time I read about the evils of drinking, I want to give up - reading!

HALE

Ha! Wilson will surely veto that abomination!

HUBBLE

(with an affected British accent)

But Congress will override him, for sure.

FROST

The purists are taking over the country! But I'm sure glad you overruled them, boss. No one wants a dry conference.

(HALE moves to the other male group to mingle, chats with them for a bit, then exits. Lights stay on HUBBLE AND FROST.)

FROST

I am very sorry to hear about your father, Hubble.

HUBBLE

Thank you, Professor Frost.

FROST

I'm sure glad you decided to stay with us at Yerkes. We sure can use a Rhodes scholar.

HUBBLE

(puffs on his pipe)

The summer has been just fascinating. Teaching high school back home was a trap; my dream was dying...Yerkes is where I truly belong.

FROST

And so much for that illustrious law education!

HUBBLE

I still cannot believe I failed the bar exam.

FROST

(Digs into a brief-case and waves a paper)

But your thesis proposal here. Now that's a long shot. No one has the slightest clue what those faint specks might be.

HUBBLE

All the more reason we should go after the spiral nebulae, sir.

FROST

Leading to a dead end, for sure.

HUBBLE

Professor Turner at Oxford is dead sure the spiral nebulae will lead us to the edge of the universe. The fainter they are, the farther they must be. Don't you see?

FROST

Perhaps, perhaps...

HUBBLE

(excited)

I personally believe that they could be island-universes, full of millions of stars.

FROST

Island universe...that's just a poetic description from a romantic philosopher. Good for a dreamer, not an astronomer.

HUBBLE

You must not write off Kant, sir. After all, he did figure out why our Milky Way is shaped like a band.

FROST

Ah, yes, the Milky Way! Now that's the place to be! Hale's just captured that Princeton whiz over at Mt Wilson - Harlow Shapley. Now he's at the jugular of the Milky Way. Consider that.

HUBBLE

All the more reason we should go for the nebulae, then.

FROST

How the devil are you going to get anywhere? Especially with our 40-inch, while Shapley's picking off the gems with their 60-inch. And now there's talk of a 100-inch. We are losing the telescope battle to Hale.

HUBBLE

Pah! Hale's ordered that giant disk from France. It will never get across the ocean past those German U-boats.

FROST

Look, Hale's going to put us out of business. He keeps stealing all our best astronomers.

HUBBLE

The war is bound to slow him down. And it won't be long before America's jumping in with Britannia. Wish I could be there!

FROST

Steady now, young man. It's simply a battle between worn-out empires. Wilson's going to keep America out, thank goodness.

HUBBLE

What did you think of Slipher's amazing news today, Professor Frost? And that standing ovation!

FROST

Outrageous! Such applause is just not fitting for an Astronomical Society meeting; and definitely not for some silly smudges of light. So what if they are drifting about!

HUBBLE

You mustn't underestimate the impact, sir. A nebula hurtling away from us at two and half million miles per hour. An astounding clip. It's an incredible find.

FROST

Nebulae, nebulae. That's all you talk about, Hubble. The Milky Way is the hot topic now. Shapley's moving real fast. You need to get a jump on it, Hubble.

HUBBLE

You are missing the point, sir! Nebulae moving away so fast must clearly get far outside our Milky Way. I must figure out how to measure their distances to get in the game.

FROST

That's going to be tough. We barely have a handle on the size of our Milky Way.

(SHAPLEY and LEMAITRE drift toward HUBBLE and FROST group.)

FROST

Get serious, Hubble! This is your chance to mingle with the best astronomers of the day.

(FROST turns to SHAPLEY.)

FROST

Ah! Shapley. Congratulations, young man. I hear you have become king at Wilson peak.

SHAPLEY

A king who must climb the mountain every day - on the backs of donkeys!

FROST

Must have been difficult to leave a secure faculty position at Princeton?

SHAPLEY

Princeton's a dead end. The frontier is where the action is. How could I pass up a chance at the 60-inch? Now look here Frost, I just ran into a theoretical physics student from Belgium, George Lemaitre.

LEMAITRE

(greets FROST with the correct French pronunciation of his name.)

Lemaitre.

SHAPLEY

He's following parallel careers as a physicist and a priest.

FROST

And I would like you to meet my protégé, Edwin Hubble - a Rhodes scholar from Oxford.

(SHAPLEY, LEMAITRE and HUBBLE shake hands.)

HUBBLE

Originally from Missouri.

SHAPLEY

Missouri. My home state. We should have much in common.

FROST

(to LEMAITRE)

George, such contradictory careers! How did you ever get interested in physics?

SHAPLEY

We do marvel at a man of the cloth becoming a scientist. How can you maintain any scientific credibility - and with that garb?

FROST

What mental gymnastics you must go through! Couldn't you just find all the answers you are seeking in religion?

LEMAITRE

(with a French accent)

Gentlemen, gentlemen - there are two ways of arriving at truth. And I decided to follow both.

HUBBLE

But how do you deal with all the conflicts?

LEMAITRE

Ah! It is my endeavor to reconcile the twin worlds.

SHAPLEY

Reconcile? Hah! Your Church will never reconcile. Look what they did to poor Galileo! And they've hardly changed since! I have absolutely no need, nor use for religion.

LEMAITRE

Ah yes! Galileo. A deeply religious man! But he clearly understood that the Bible is not a textbook of science.

FROST

And like Galileo, doesn't your pursuit of science get you in trouble with your religion?

LEMAITRE

I can be a Christian and pursue science without getting into difficulties, because my faith has nothing directly in common with my scientific activity. After all, as a Christian I do not have to behave differently from any non-believer when I am walking, or running, or swimming.

FROST

But doesn't science lead you to lose your religious beliefs.

LEMAITRE

Hardly! Should I reject the doctrine of Trinity because it bears no connection to Einstein's relativity? Being necessary for salvation, the Trinity doctrine is stated in the Bible. If the theory of relativity had also been necessary for salvation, it would have been revealed to Saint Paul, or to even to Moses in the tablets. And what are you working on at Yerkes, Hubble?

HUBBLE

(with strong English accent)

I am hankering after the true nature of the spiral nebulae.

SHAPLEY

Kind of a wispy topic for a PhD. How will you ever find a job? Frost you really ought to rein in your protégés.

FROST

I've been pulling my hair out.

SHAPLEY

If there's any left!

HUBBLE

Personally, I believe it's a little too early to come to any hard and fast conclusions, Professor Shapley.

SHAPLEY

Look here, young man! I am sure your spirals are just rotating clouds of gas hanging in the Milky Way. It's a pitiful waste of time - -

HUBBLE

Don't you see? Slipher just got a standing ovation for his report. Nebulae move thirty times faster than stars. Such speeds are simply too great for spirals to remain inside our Milky Way.

SHAPLEY

Your imagination is running riot. These helter-skelter puffs of gas tell us absolutely nothing about the universe.

(SHAPLEY takes a sip of wine)

HUBBLE

But they could be island universes, galaxies like- -

SHAPLEY

Poetic humbug! The Milky Way is everything. The place to be. You mark my words...

(SHAPLEY walks away abruptly, while they all stare at him receding.)

FROST

He pisses more than he can drink.

(Chuckles)

HUBBLE

He does seem to have a hit-and-run approach - and to one of our greatest scientific questions. How can he be so sure, and with nary a clue to the nebulae distances?

FROST

Ah yes! Astronomical distances. A hot topic. I wonder, now where is Leavitt? She's made a breakthrough in measuring distances.

HUBBLE

I thought Leavitt's just another one of Pickering's star cataloging factories.

FROST

That's what people think. But Pickering's women at Harvard are leaving their mark on astronomy. The rooster has a productive hen-house after all.

LEMAITRE

A woman PhD from Harvard?

FROST

Hah! Women can never be students at Harvard. Would you believe that heartless Pickering hired Leavitt and twenty other women to be scanning machines. They examine tons and tons of photographs - at 25 cents an hour.

HUBBLE

Pah! That's less than my sister makes with her piano lessons. But just wait! Their time will come.

FROST

Pickering complains that men lack concentration. He swears his maid is far better at scanning photographic plates. He sacked his entire male team. Then put that very maid in charge. Now a house-maid is the leader of Pickering's harem - as they call it behind his back.

LEMAITRE

The very fact that he would hire women for astronomy is a giant step. Ah! Here she comes...

(LEAVITT drifts over to the group. Two WOMEN ASTRONOMERS trail behind.)

FROST

(loudly)

Henrietta! So glad you can join us.

LEAVITT

Sorry, we must be on our way. Pickering's called a meeting.

HUBBLE

Did you hear Slipher's amazing report today?

LEAVITT

(Joins reluctantly. As LEAVITT gets caught up in conversation she beckons one of the WOMEN ASTRONOMERS to go ahead. The other stays behind with a folder.)

I am amazed how he measured those incredible nebulae speeds - without knowing anything about their distances.

HUBBLE

If I may explain?

(LEAVITT draws closer to HUBBLE to hear better. HUBBLE raises his voice.)

HUBBLE *(con't)*

When a nebula moves away from us, all the lines in the spectrum of light from the nebula get shifted toward the red end. It's called red-shift. It is the same as the Doppler Effect for sound waves - from those sirens outside.

(LEAVITT sneaks an amused look towards the other WOMEN ASTRONOMER)

HUBBLE *(con't)*

As the car approaches, the pitch gets higher. As the car moves away, the pitch gets lower. The tone of the sound wave is like the color of the light wave. Both determined by the wavelength.

FROST

(taps HUBBLE on the shoulder)

You need not to go down to that level. Leavitt here has a high level physics education from Radcliffe; almost as good as a Harvard degree. And your analogy with sound waves. Most insensitive for - -

LEAVITT

That's quite all right. I get that a lot! Never underestimate the pleasure of hearing of what you already know – even if you only hear a little.

FROST

Hubble here is dying to find distances to the spiral nebulae. Pickering can wait a few moments. I hear you are working on distances yourself.

LEAVITT

So kind of you to ask! But I can't be late. It is my favorite topic! I've made a small discovery about Cepheid variable stars. Do you know anything about variable brightness stars, Dr. Hubble?

HUBBLE

Now that's a new one on me.

LEAVITT

They are stars that brighten rapidly, and dim slowly, and in a regular, clock-like fashion.

LEAVITT (*con't*)

Some cycle in a day, some in ten days, and some over weeks. I spent months scrutinizing thousands of variable stars, all from one and the same region of the southern sky – the Large Magellenic cloud - until I came across something curious.

(*LEAVITT turns to the WOMAN ASTRONOMER to take the folder and show it to HUBBLE.*)

Two stars with the same variation pattern show the exact same brightness. And, more importantly - the longer the period, the brighter the star.

LEMAITRE

Fascinating! The brightness of a Cepheid is proportional to the period.

HUBBLE

Fine and dandy. What does that have to do with distances?

LEAVITT

(*returns the folder to the WOMAN ASTRONOMER*)

I was getting to that. Suppose you find such a Cepheid variable star inside one of your favorite nebula.

HUBBLE

By Jove, that would be exciting. Imagine even finding just a single, ordinary star!

LEAVITT

And your Cepheid cycles over the exact same period as a Cepheid inside my Magellenic Cloud. So they both must have the same true brightness. Do you follow?

(*HUBBLE puffs on his pipe*)

LEAVITT (*con't*)

I mean, our Cepheids must both be as bright as, say - a hundred suns.

HUBBLE

But even so, my Cepheid would be far dimmer than your - much closer - Cepheid, right?

LEAVITT

Quite right, it would be barely discernible. Your Cepheid would appear nine times fainter than my Cepheid - if it was three times farther away. There's your distance connection!

LEMAITRE

What a cunning idea! Leavitt, you have dug up a real gem.

HUBBLE

But still, how do I get to the real distance to my Cepheid? Or even to your Cepheid, for that matter?

LEAVITT

That's the burning question. So far we've only been able to tell their relative distances. Now we just need the true distance to any one Cepheid in the entire sky.

HUBBLE

(toasts LEAVITT)

By Jove, if anyone is going to get that, it's going to be you. It will be your Rosetta stone.

FROST

(slaps HUBBLE on the shoulder)

And you will have in your hands a brand new cosmic yardstick for your darn nebulae.

LEAVITT

But there is a big problem. You see, all the Cepheids I found are simply too far away, even for our best distance measuring methods.

HUBBLE

So, can you get that distance?

LEAVITT

I would like to. But Pickering never allows me access to a telescope.

FROST

Pity! Pickering only wants his women to stare at photographs, not at deep space.

LEAVITT

Yes! We free up our male astronomers to stare at space, and they usually come up - empty. Excuse me, I see my boss is looking for me.

(LEAVITT and WOMAN ASTRONOMER exit.)

FROST

Her hearing keeps getting worse after her bout with the fever. She may be deaf, but she has the eye of a hawk.

LEMAITRE

Whenever God closes a door, he opens a window. You know what the Talmud says: the woman came from a man's rib. Not from his feet to be walked on. Not from his head to be superior, but from the side to be equal.

FROST

Pickering thinks that telescopes in cold dark observatories are not for the fairer sex. The thought of a man and woman working together late at night, staring up romantically at the stars, offends the Victorian. I say - astronomy in America finally has the chance to overtake Europe, and for two main reasons: Pickering discovered women, and Hale discovered money!

(HALE re-joins the group.)

FROST (*con't*)

And how is the quest for the new 100-inch my friend; how did you get that tycoon to cough up his millions?

HALE

Ha! That's a good story! I told John Hooker that a giant, shiny, white dome on top of Mount Wilson would be a fitting monument - his everlasting legacy to California.

LEMAITRE

The larger the telescope, the better; that's America!

HUBBLE

Do you have a finish date?

HALE

Grinding that awful hunk of French glass is taking forever. My wife says I am going to have a breakdown. She keeps wishing that abominable disk had sunk to the bottom of the ocean.

FROST

I hear that glass is full of bubbles. Why take the risk to grind such a faulty disk, George?

HALE

Our quest to fathom the depths of the universe demands great risks, my friend. Think what I had to go through to install our 60-inch. Just look at this picture!

(Pulls out a picture from his pocket - Slide 19 - of mules pulling the telescope to the top of Mt Wilson.)

HALE (*con't*)

One misplaced wheel and the entire 60-inch could plummet right to the bottom of the canyon. But we made it!

FROST

Mules dragging a mighty instrument up treacherous roads! Must make quite an impression on your benefactors. And what have you to show for dragging all my best people out to California? Any staggering discoveries?

HALE

Our expert Shapley is at it. So you watch out!

FROST

We'll see about that! I have a sharp young lad right here. I'd like you to meet Edwin Hubble. A Rhodes' scholar from Oxford.

HALE

An impressive catch! Hubble, someday you should join us in sunny California - a real telescope.

FROST

(breaking in)

No need to steal him just yet. He has much to learn.

HALE

I hear Shapley's skeptical about the track you're on, Hubble – something about spiral nebulae, barely visible specks. You can't go very far with that, can you?

(HUBBLE tries to respond)

FROST

We'll see. We'll see. Hubble's a real fighter!

HALE

But why not harvest the fascinating treasures of our Milky Way?

(HUBBLE tries to respond)

FROST

Ah! The Milky Way is just too small for our Edwin.

(Blackout)

(End of Act I - Scene 2)

Short video of a Hubble Space Telescope picture-voyage through fascinating regions of our Milky Way Galaxy runs during transition to next scene.

**Act I Scene 3 - Lifelong Partners
The Janitor and the Lover**

RADIO VOICE

(Slide 20) After four years of bloody conflict, the Great War finally comes to an end. The Kaiser abdicates. Germany will never be a threat again.

(Slide 21) All the world over, people celebrate, dance in the streets, and hail the armistice.

(Slide 22) Supporters of Prohibition declare alcohol to be the root of immorality.

(Slide 23) Temperance groups, farmers and women rally for Prohibition.

(Slide 24) Saloons close down.

(Slide 25) Moonshine sales are second only to the booming automobile industry.

(Slide 26) Congress passes the 19th Amendment. It's up to the states to grant women their right to vote.

*(Slide 27) Mt Wilson Observatory Dormitory.
October 1919*

Twilight. Coyotes occasionally howl in the background. Messy card table and several chairs in one corner. Shot glasses, liquor flask on table.

MILTON HUMASON – janitor (and later - assistant astronomer) sweeps the floor.

Enter HUGO PRENTIS, graduate astronomy student.

HUGO

(looks at the messy card table)

Big game, Milt?

HUMASON

(grins and rests the broom.)

Nearly lost my shirt to Shapley.

HUGO

He cheats you know. Did you show him your surprise?

HUMASON

We were both soused. I'll try again today.

(Enter SHAPLEY with a swagger)

SHAPLEY

Conditions should be great tonight. Do you have everything ready, Milt?

HUMASON

Top priority, sir.

SHAPLEY

(helps himself to the liquor on the table)

How about a nip of that panther juice? By the way, who made the mess in the dark room?

HUGO

I developed one photograph, sir.

SHAPLEY

(downs the glass in one gulp.)

You were real sloppy in there. I found hyposulfite on the ceiling! Milt, can you clean up *(pause)* by morning.

HUGO

That's all right, I'll take care of it.

SHAPLEY

Milt, you wanted to show me something?

HUMASON

One moment, I'll get it!

(He goes off stage to bring back two plates, places one on a table, and proudly brings the other to SHAPLEY.)

SHAPLEY

(to HUGO)

You should help Milt in the dark room. You'll pick up better training.

HUMASON

I've been tracking a variable brightness star in the Andromeda nebula. See my mark?

SHAPLEY

(takes a quick look)

You shouldn't go marking up plates. That's an astronomer's job.

(SHAPLEY pulls out his handkerchief, and slowly wipes the photograph clean.)

HUMASON

But it blinks like a metronome over--

SHAPLEY

Nonsense! Don't waste precious time. There are no stars in Andromeda. I'll settle this at the debate. It's a beautiful photograph, though. Good work, Milt. Have another one for me! Can you wake me at dusk?

(SHAPLEY takes another quick swig, and exits.)

HUGO

The bigger they get the harder they'll fall.

HUMASON

Oh well, back to the grindstone.

(Enter HUBBLE, wearing army uniform, British Jodhpurs, and high-top military boots.)

HUBBLE

What ho!

HUMASON

Ah, Doctor Hubble, finally. *(They shake hands.)* Milton Humason at your service; you can call me, "Milt." And this is Hugo Prentis, our brilliant student from Pomona College. *(pause)* Surely you did not come straight from the war-zone?

HUBBLE

They discharged me months ago. I made it here as fast as possible. Got a bit attached to my Jodhpurs, I'm afraid.

HUGO

Did you see much action?

HUBBLE

Most of the time we spent in the trenches - graves for the living. Shells coming at us every minute.

HUGO

Hiding in trenches?

HUBBLE

Hardly! When the whistle went, we leapt over the top to cover a few hundred yards. It was hard to see men under my command fall injured. And then to keep moving forward. Kill or be killed. The sounds of screams. It gave me nightmares.

HUMASON

You're in one piece, I trust?

HUBBLE

I escaped with only a minor injury from a grenade explosion. But I still jump every time I hear a car back-fire.

HUMASON

Thank God, it's over. Millions of lives lost for Kaisers and Kings. A generation of young men evaporated. What for?

HUBBLE

We all went to fight for the right. Is the world a better place now? I am not so sure. Fortunately our losses were not as great as others. They shipped our division to the front near the end.

HUGO

You were in charge of a whole division!?

HUBBLE

Oh no, just a major of a battalion – commander of 600 men and 25 officers.

HUMASON

(saluting)

Then, I hope you don't mind if I call you Major Hubble.

HUBBLE

That won't be necessary.

HUGO

But it suits your garb!

HUBBLE

Still not necessary. I say, this place must be infested with rattlesnakes. I had to shoot ten or twelve just to make my way up here.

HUGO

What luck! Another sharp-shooter in our dangerous terrain.

HUBBLE

I could shoot ten bull's eyes out of 10 to my commander's six.

HUGO

Ah! Milt here is notorious in these parts as our resident lion-killer.

HUBBLE

What ho! Lion-killer?

HUGO

Oh yes! You should hear about his adventures. From bell-boy to mule driver to janitor to astronomer. Just four days of high school under his belt, mind you! He drove the mules that brought the telescopes up here.

HUMASON

One solitary road, two feet wide, zigzagging all the way up, six thousand feet. Every ascent an adventure, I tell you. Never lost a soul. When the 60-inch was finally finished, Hale needed a janitor up here. I gladly took the job.

HUGO

He's no janitor, I can assure you. Rather an expert photographer. He takes the best plates. And the man has one heck of a magic touch. You can count on him to fix any of the clockwork mechanisms.

HUBBLE

Then I look forward to working with you, Humason. I want to take hundreds of pictures, as soon as I get my chance at the mighty 100-inch, that is.

HUGO

Well that depends. Do you play poker, major?

HUBBLE

I play some.

HUGO

And how about a little moonshine?

HUBBLE

Bien sur! Where can I get my hands on some?

HUGO

You just have to try Milt's panther-juice. No more nightmares, I can assure you.

HUMASON

Would you care for a quick hand of poker, major?

(They sit at the table. HUMASON deals. HUGO offers a shot to both. HUBBLE sips gingerly.)

HUBBLE

Ugh! Makes you see double - and feel single.

HUMASON

You better get used to that. Too bad Hale doesn't allow any pretty ladies up here—

HUBBLE

(toasting the skies)

Oh what's the starlight of a woman's glances compared to the stars above.

(Enter HALE, HUBBLE rises)

HALE

Spoken like a born stargazer. So here you are - finally. Welcome to Mt Wilson. I'm still reeling from your telegram; "Cannot accept your invitation. Stop. Off to war. Stop."

HUBBLE

I beg your pardon. I'm a scientist, not a poet. Britain is my spiritual home. I was duty bound- -

HALE

to abandon your chance at the greatest telescope in the world?

HUBBLE

I do apologize. In my defense, it was the war to end all wars. But I hurried back to accept your kind offer - as soon as they discharged me.

HALE

We admire your sacrifice for the country, young man. We are duty bound to have something to offer America's hero. Are you finally ready to spar with the universe?

HUBBLE

I'm dying to get started.

HALE

Atmospheric conditions are excellent up here, 200 nights a year.

HUBBLE

(points to the 100-inch on the screen)

And this beauty should be perfect for picking out the faintest spirals.

HALE

Why bother with faint specks? With millions of gems to pick from our galaxy.

HUBBLE

Spiral nebulae are the scattered beacons that hold the key to the structure and the limits of our cosmos - if it has any limits. I feel like an adventurer on the shores of the cosmic ocean.

HALE

And you had the nerve to tell me you weren't a poet!

HUBBLE

Your 100-inch is pushing the limits. I will use it to find the edge of the universe.

HALE

Ah! Big thinker! You'll need hundreds of pictures. Milt will help you. With that spectroscope he can drain every last bit from the faintest light. You will be a great help to Shapley. Team work is our credo here.

HUBBLE

(lights his pipe in a short contemplative silence)

So, when can I get a crack at your magic mirror?

HALE

Scheduling details! My nerves are just too shot for all that now. I've put Adams in charge. Besides, Shapley needs all the dark time he can get to win the Academy debate. Einstein's going to be there, you know. Milt, you need to straighten up around here.

HUMASON

(nudges Hugo, and starts to clean up)

Right away, sir!

HALE

Friends of mine are riding up to plan our inauguration for the 100-inch. I'll bring them over for a tour. Grace Lieb's father's a long-time friend and a millionaire banker. I have asked Grace to compose an ode to our new telescope. She's a literature buff from Stanford. But Grace is a recent widow, and vulnerable. So treat her kindly. And prepare some tea.

HUMASON

Count on us to put on a good show.

HUGO

As much as you can count on your bankers

(Exit HALE)

HUBBLE

(turning to the 100-inch on Slide 27)

The 100-inch will be our giant leap into the yawning cosmos.

HUMASON

I doubt they'll ever give you a shot. Maybe if you want to work over Christmas.

HUBBLE

Jolly good then; I will wish Merry Christmas to all the Universe from here.

HUMASON

Shapley's the whole show here. And Adams is in cahoots with Shapley. You'll never get on the schedule. And Hale's going to put you right under Shapley.

HUGO

Good luck with that. He just wiped off Milt's variable star in Andromeda. Poof!

HUBBLE

What? You found a star in Andromeda? A variable at that? I must see it.

HUGO

Yea, but now it's gone! And he'll steamroll over you as well.

HUMASON

Not to worry, major. Count on me to sneak you in to the 100-inch. First chance I get.

HUGO

I say we liquor him up, and steal all his dark time.

HUMASON

Won't take much hooch!

HUGO

(pretending to talk like HALE)

I've been meaning to talk to you about this, Milt. You're being pretty free with that panther-juice. Now prohibition is prohibition; and you are a religious man at that.

HUMASON

(raises his private flask, and takes a swig)

Blood of Christ. *(pause)* I pray that the Lord to make me pure and holy

(takes another swig)

but not just yet...Major, I must show you a strange nebula I found in the Pegasus cluster. The red-shifts are more than three times larger than ever reported.

HUBBLE

In the name of anything high or low, that must be racing off at incredible speeds. May I see that spectrograph?

(HUMASON grabs the remaining plate from the table and hands it to HUBBLE who takes it to a lamp to examine it in the light. HUMASON follows HUBBLE. Slide 28 of red-shift from distant spiral nebula.)

HUMASON

Can you make heads or tails of that?

HUBBLE

By heavens I tell you, that's a truly shocking red shift.

(HUBBLE continues to stare at the plate in the light. Enter HALE and GRACE LIEB with SHAPLEY and CECILIA PAYNE. The women are dressed in riding coat, breeches and high riding boots. HUMASON goes to the table.)

GRACE

Father sends his greetings and congratulations.

HALE

I can't believe you rode all the way up.

CECILIA

Such spectacular views! Thank God, Grace is an expert rider; she saved me on that last hair-pin turn. What a sheer drop! I'm still shaking.

SHAPLEY

It's far safer by car.

GRACE

But oh so dull! Now the hard part was renting horses. People seem a bit rude to women around here.

HALE

I'm not surprised! The two of you are pushing fashion in these parts. It will take much longer to overcome the Mormon influence than winning the vote, I'm afraid.

GRACE

We'll see about that. I for one am sure that women will heal your competitive and corrupt male state.

SHAPLEY

A bold conjecture! As long as your vote does not destroy our families.

HUMASON

(takes a swig)

I for one am not too fond of your temperance movement and its parched ideas.

SHAPLEY

What kind of astronomy are you interested in, Cecilia?

CECILIA

I would like to work with the spectrograph.

SHAPLEY

An excellent choice. We have the best instruments up here. And Milt here keeps them in tip-top shape.

HUBBLE

I was just admiring a spectrograph that Milt Humason here took of a fast moving nebula. It's a real beauty! Would you care to take a first look?

CECILIA

Absolutely. Come Grace. I know this stuff is hardly your cup of tea, but being up here among the clouds - demands the unusual.

(GRACE and CECILIA move toward HUBBLE to examine red-shift plate in the lamp. HALE beckons SHAPLEY to the table.)

GRACE

My goodness, that's such a dense forest of black lines. Why do you call that beautiful?

HUBBLE

Ah, the beauty is hidden. You see up here - the rainbow colors from the sun. And below you have the same rainbow from the distant nebula.

GRACE

But your rainbows are marred by ugly black lines.

HUBBLE

No, no. The black lines are beautiful. Each pattern is unique as a fingerprint. It tells us intimate secrets about the composition of the sun and the nebula. The same patterns here mean that both the sun and the nebula have the element calcium.

GRACE

I don't quite understand this! Are you telling me the sun is made up of the elements that we find here on earth?

HUBBLE

Now *that's* the beauty of nature; the all encompassing unity. Heaven and earth have the same elements.

CECILIA

It's been known for some time now, Grace. Twinkle, twinkle little star, we *no longer* wonder what you are.

GRACE

But these two patterns don't really match. So how can they both be calcium?

HALE

(from the table)

I told you! She's Stanford!

HUBBLE

Ah! Excellent question! Now if you look closely, you will find that the two patterns are actually quite the same; but every line from the nebula below is simply shifted toward the red end. We call that the red-shift.

GRACE

And I suppose you are going to tell me that your red shift reveals another secret.

HUBBLE

Indeed it does. Such a shift means that nebula is moving away from us, and fast. You could fly from here to London in a couple of seconds.

(SHAPLEY and HALE rise from the table and approach)

SHAPLEY

Enough about red-shifts! Cecilia - the 100-inch awaits.

HALE

And we should come up with a topic for her spectrographs.

(HALE grabs the spectrograph from HUBBLE. HALE, SHAPLEY AND CECILIA walk to another part of the stage to tour the telescope, then exit.)

HUBBLE

The first stars are out. We should admire our pristine sky.

(Soft music plays to the end of the scene. Lights dim. HUBBLE and GRACE walk outside. HUMASON and HUGO clean up. The screen shows the 100-

inch dome at night-time, with a crescent moon, Side 29.)

GRACE

(strains her neck over the edge of the stage)

From this high summit, I can almost see the lights of Hollywood.

HUBBLE

Ah, but their stars pale in comparison.

GRACE

(turns toward the screen showing the dome)

Tell me, what is it like to be under that dome, staring at the face of heaven?

HUBBLE

I'm afraid it's not as romantic as your literature may suggest, Mrs. Lieb. We are usually shivering in our Eskimo suits - eyelashes frozen to the eyepiece, as the wind howls around the slit of the dome.

GRACE

My former husband's work with geology was similarly trying. He spent all his days suffocating in dingy mineshafts, collecting mineral samples - looked all the same to me.

HUBBLE

His passing must have been quite a shock. I am so sorry about - -

GRACE

Thank you. I'm doing better now. We had our whole life planned out. Then came that terrible coal mine accident. He fell down one of those steep shafts. It brought my life to an end.

HUBBLE

How awful! When did this happen?

GRACE

About two years ago.

HUBBLE

Life can be cruel.

GRACE

I didn't know where to turn. Cecilia, was a great solace, along with strength from my faith.

HUBBLE

God is closest to the brokenhearted.

GRACE

How touching! A scientist who recites the Psalms! I hope you don't mind my asking.
(she stares at his Jodhpurs)

You were in the war? That must have been horrible!

HUBBLE

It was hard to see civilized human beings turn into savages. But the horror was short for me. Our battalion arrived in France one month before the armistice was signed.

GRACE

That was most fortunate. I am so glad.

HUBBLE

I am not ashamed to say I was actually eager to get into action. Our battalion was anxious to get to France before the war was over. War was to be exciting, honorable. I was so proud to lead my men into battle. And I even got a chance to teach my trainees how to use the stars to guide our night marches.

GRACE

(with a giggle)

Calling out the constellations, one by one. Why am I not surprised?

HUBBLE

And with their perfect light, the stars served a mighty dual purpose, amidst all that mindless, deathly turmoil. Night after night, century after century they shine with eternal peace. High in the heavens they shine - with all the thoughts and hopes and dreams of mankind.

(takes a puff on his pipe)

Does astronomy interest you at all?

GRACE

I am drawn to the poetry and romance of the stars. Unfortunately, so much of the mystery and wonder from nature's beauty vanishes - with your cold, mechanical explanations. I feel that science alienates humanity from God.

HUBBLE

(clears his throat)

"When Science from Creation's face
Enchantment's veil withdraws
What lovely visions yield their place
To cold Material Laws!"

GRACE

Ah ! Thomas Campbell. I see you love poetry!

HUBBLE

It's a provocative piece. But it bothers me when poets complain how scientific understanding deprives the creative imagination from dreaming up romantic explanations. Just look at our beautiful crescent moon tonight.

(They turn to admire the crescent moon on Slide 29)

HUBBLE (*con't*)

The Hindus have a wonderful myth for the phases of the moon. Dead souls from earth rise to the moon, which swells with the light of their breath through the first half of the month, till it is full to the brim.

GRACE

(*draws closer to HUBBLE.*)

India! What a fascinating, poetic image! It's a comforting myth.

HUBBLE

As the moon wanes, it transfers the same light of departed souls to the sun. So much about the moon's phases entices poets and romantics.

GRACE

(*looks into HUBBLE'S eyes.*)

My favorite - the full moon smites the moonstruck with love.

HUBBLE

But has science really robbed heaven of its beauty? That Hindu myth about the moon transferring souls to moon, and then to the sun. It shows that the Hindus recognized the reason for the moon's phases. I mean, the simple geometric link between the moon's position and the sun's position. May I show you?

(*GRACE nods. HUBBLE stretches out both her arms together so that her fists represent the sun and the moon.*)

HUBBLE (*con't*)

When the moon is on the same side of the sky as the sun it is nearly empty in its crescent phase. The moon has transferred the souls to the sun.

(*He goes behind GRACE, takes one of her stretched hands and moves it slowly across to the opposite side, to show how the moon crosses the sky from its position near the sun, to the opposite side of the horizon when the moon is in full phase. GRACE turns her face towards HUBBLE.*)

HUBBLE (*con't*)

As the moon moves across the sky to the opposite side, it slowly fills with the light of souls, till it is full to the brim. The mythical explanation is poetic. But at the same time it keeps track of the relative position of the moon and the sun. The geometry is scientifically correct, for sure.

GRACE

You weave the human struggle, the thrill of discovery, the romance and the lure of astronomy, all together.

HUBBLE

And Grace - may I call you Grace?

GRACE

Of course, Edwin.

HUBBLE

Where there is beauty, there is God. Science brings me closer to God.

GRACE

You do know how to uplift a woman's soul! But will your astronomy help us with our desire for a purpose to the universe?

HUBBLE

I do believe that astronomy can lead to deep cosmological implications.

(puffs on his pipe)

I think it is the purpose of the cosmos to develop the human mind to penetrate the ultimate beauty, the ultimate rationality in the universe, and so to appreciate God and his beautiful creation to the fullest extent of our understanding.

GRACE

How profound! Huxley?

HUBBLE

No, Hubble.

GRACE

So, Mr. Hubble, are you ready for the grueling hours to lead you to your nirvana?

HUBBLE

I can't wait to get my turn at the 100-inch. I will launch an all out attack on the spirals.

GRACE

Spoken like a Major going into battle.

HUBBLE

For now, my hopes are doomed. The top astronomers here will not let me near the best telescope. It makes me angry inside.

GRACE

"Hope has two daughters: anger and courage: anger sees things the way they are, and courage makes things the way they ought to be"

HUBBLE

That's uplifting. Who said that?

GRACE

St. Augustine. And what do you hope to find?



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