



BEYOND THE HORIZON

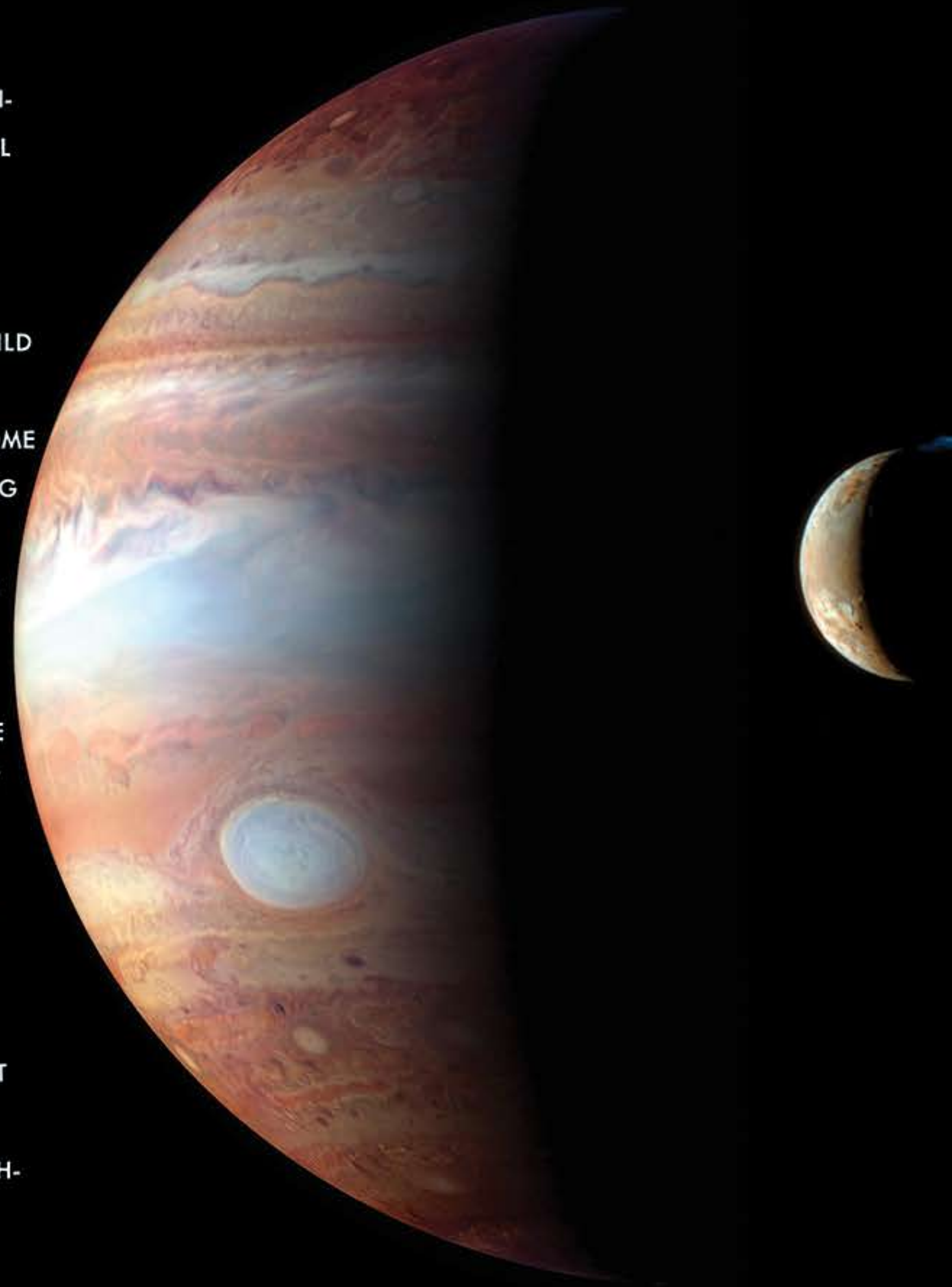
BEYOND THE HORIZON

ON JANUARY 19, 2006, NASA LAUNCHED A SCIENTIFIC INSTRUMENT NAMED *NEW HORIZONS* ON A TEN-YEAR JOURNEY TO STUDY PLUTO AND THE KUIPER BELT—AN INCONCEIVABLY LARGE CLOUD OF PROTO-PLANETS, ASTEROIDS, AND COMETS SURROUNDING THE SUN AT DISTANCES OF BILLIONS OF MILES.

STARING INTO THE SKY IS A DEEP PHILOSOPHICAL AND SPIRITUAL EXERCISE. THE UNIVERSE IS CURIOUS IN THAT IT IS FULL OF MYRIAD EXISTENTIAL POSSIBILITIES, YET IT SEEMS TO BE GOVERNED BY QUANTIFIABLE NATURAL LAWS.

WHEN I WAS SIX, I LIVED IN FLORIDA. EVERY SCHOOL CHILD AND TEACHER HAD BEEN FOLLOWING THE PROGRESS OF CHRISTA McAULIFFE, THE FIRST SCHOOL TEACHER TO BECOME A MEMBER OF A SPACE SHUTTLE CREW. I DREAMED OF RIDING IN THE CHALLENGER ORBITER WITH HER AND THE ASTRONAUTS HUNDREDS OF MILES ABOVE THE EARTH. WHEN THE LAUNCH HAPPENED, MY CLASS STOOD OUTSIDE TO WATCH. THOUGH I LIVED IN CLEARWATER, ON THE OTHER SIDE OF THE STATE, WE COULD SEE THE EXHAUST TRAIL EASILY IN THE CLEAR BLUE SKY. AT ONE POINT THE ROCKET EXHAUST SPLIT INTO A BLOSSOM-LIKE PLUME. I REMEMBER IT BEING QUITE BEAUTIFUL. MY TEACHER QUICKLY TOOK US ALL INSIDE. A SHORT TIME LATER, PRESIDENT REAGAN LET US KNOW THAT THE SHUTTLE EXPLODED AND THE CREW WAS LOST.

ANY VENTURE CARRIES RISK. WE LIVE FOR ADVENTURE. YET WITH OUR TOOLS, AND OUR ART, WE CAN EXTEND OUR SENSES AND OUR IMAGINATIONS INTO THE UNKNOWN WITHOUT LOSING THOSE WE LOVE. USING MUSIC, DANCE, AND ACTUAL IMAGES OF SPACE COLLECTED BY NASA AND THE EUROPEAN SPACE AGENCY, BEYOND THE HORIZON IS A 50-MINUTE MULTIMEDIA PERFORMANCE THAT IMAGINES WHAT IT WOULD BE LIKE TO TRAVEL WITH THE *NEW HORIZONS* SPACECRAFT THREE BILLION MILES TO PLUTO.



TIMELINE (PROGRAM)

PRELUDE (PLUTO THEME)

LEAVING HOME

- LAUNCH DATE 1/19/2006
- CROSSED MARS ORBIT 4/7/2006
- TRACKED ASTEROID APL IN JUNE 2006

ENCOUNTER WITH JUPITER

- ENCOUNTER WITH JUPITER 2/28/2007 AT 51,000 MILES PER HOUR WITHIN 1.4 MILLION MILES OF THE PLANET

LONG SLEEP: BEFORE THE BANG

- 8 YEARS OF SLEEP AND ANNUAL INSTRUMENT CALIBRATIONS/SPACECRAFT CHECKOUTS, TRAJECTORY CORRECTIONS, PLUTO ENCOUNTER REHEARSALS

LONG SLEEP: BIRTH OF THE UNIVERSE

- CROSSED ORBIT OF SATURN ON 6/8/2008

LONG SLEEP: STRANGE PHENOMENA

- CROSSED ORBIT OF URANUS ON 3/18/2011
- CROSSED ORBIT OF NEPTUNE ON 8/25/2014

ENCOUNTER WITH PLUTO

- START OF SEVERAL APPROACH PHASES IN JANUARY 2015
- CLOSE-UP FLYBY OF PLUTO ON 7/14/2015 AT CLOSEST APPROACH THE CRAFT WAS WITHIN 7750 MILES OF PLUTO AND 17900 MILES OF CHARON

POSTLUDE: STAIRWAY TO THE STARS (MALNECK & SIGNORELLI - LYRICS BY PARISH)

IN THE PAST 70 YEARS, WE HAVE SENT MANY ROBOTIC EXPLORERS TO DO WHAT WE CAN'T DO, TRAVEL MILLIONS OF MILES THROUGH SPACE TO EXPLORE OUR SOLAR SYSTEM. THESE MACHINES SEE WHAT WE CAN'T SEE, HEAR WHAT WE CAN'T HEAR, AND SMELL WHAT WE CAN'T SMELL. THEY ARE AVATARS OF OUR CURIOSITY, OUR DESIRE FOR ADVENTURE, AND OUR INSATIABLE NEED TO UNDERSTAND.

PLUTO HAS BEEN A BELOVED MEMBER OF OUR SOLAR COMMUNITY SINCE IT WAS DISCOVERED IN 1930. ONCE THE NINTH PLANET, IT IS NOW CONSIDERED A DWARF PLANET. THE FACT THAT SOME OBJECTS IN THE KUIPER BELT ARE LARGER THAN PLUTO SPURRED THE INTERNATIONAL ASTRONOMICAL UNION TO CREATE THE CLASS KNOWN AS DWARF PLANETS. PLUTO'S RADIUS IS A MERE 737.6 MILES. TO PUT THAT IN PERSPECTIVE, OUR MOON'S RADIUS IS 1,079 MILES.

PLUTO AND ITS FIVE MOONS ARE SO SMALL THAT THEY ARE VIRTUALLY IMPOSSIBLE TO SEE CLEARLY FROM EARTH, EVEN BY THE POWERFUL HUBBLE SPACE TELESCOPE. WE HAD MANY QUESTIONS ABOUT PLUTO TO ANSWER, THE MOST OBVIOUS BEING "WHAT DOES IT LOOK LIKE?" HOWEVER, WHAT MAKES PLUTO AND OTHER KUIPER BELT OBJECTS SO INTERESTING IS THAT WE BELIEVE MOST OF THEM TO BE TIME CAPSULES, FROZEN SINCE THE BEGINNING OF OUR SOLAR SYSTEM.

WE DISCOVERED IN JULY OF 2015, WHEN *NEW HORIZONS* REACHED PLUTO, THAT THE DWARF PLANET IS ACTUALLY A DYNAMIC WORLD. DESPITE BEING SO FAR FROM THE SUN, PLUTO HAS A THIN ATMOSPHERE AND INTERNAL FORCES THAT REFRESH ITS SURFACE. THIS WAS AN UNEXPECTED AND EXCITING DISCOVERY. FINDING THE UNANTICIPATED GIVES US THE REASON TO ASK MORE QUESTIONS AND CONTINUE THE SEARCH. SURPRISING REALIZATIONS POWER OUR CURIOSITY. TODAY *NEW HORIZONS* IS CONTINUING ITS MISSION TO AN OBJECT EVEN FARTHER AWAY IN THE KUIPER BELT.

VISUALLY, I WANTED TO CREATE AN EXPERIENCE FROM THE POINT OF VIEW OF THE SPACECRAFT. I ASKED WHAT WOULD IT LOOK LIKE TO SIT ON THE SPACECRAFT AND LOOK OUT INTO THE STARS OF THE MILKY WAY. THOUGH *NEW HORIZONS* WAS MOVING SO FAST, SPACE IS IMMENSE. APPROACHING JUPITER TOOK JUST OVER A YEAR. WHAT WOULD IT LOOK LIKE TO EVER-SO-SLOWLY APPROACH THE GAS GIANT?

FOR MUCH OF ITS JOURNEY *NEW HORIZONS* WAS ASLEEP. I TOOK ADVANTAGE OF THOSE POINTS TO CREATE DREAM SEQUENCES OF FASCINATING PHENOMENA THAT THE CRAFT DIDN'T EXPERIENCE: MARS, SATURN, URANUS, AND NEPTUNE; AS WELL AS BREATHTAKING IMAGES OF THE UNIVERSE TAKEN BY THE HUBBLE SPACE TELESCOPE AND THE EUROPEAN SOUTHERN OBSERVATORY IN CHILE. *NEW HORIZONS* BEGAN PRELIMINARY APPROACH PHASES SIX MONTHS BEFORE ITS CLOSEST APPROACH OF PLUTO. LIKE WITH JUPITER, I WANTED TO CREATE A SENSE OF ANTICIPATION AS PLUTO SLOWLY CAME INTO FOCUS.

BEING AN ARTIST, I TOOK SOME LIBERTY WITH TIME AND HOW THE IMAGES ARE PRESENTED. YET, I TRIED TO ADHERE TO ASTRONOMICAL OBSERVATIONS. I RESEARCHED WHERE JUPITER AND PLUTO WERE IN THE NIGHT SKY RELATIVE TO THE EARTH, SUN, AND THE MILKY WAY WHEN *NEW HORIZONS* ENCOUNTERED THEM. I DISCOVERED THE ANGLE OF THE ECLIP-TIC (SOLAR PLANE) RELATIVE TO THE GALACTIC PLANE TO CORRECTLY ANGLE THE GALAXY AS IT HANGS IN THE BACKGROUND. IN THE ANIMATIONS THAT I CREATED, I TOOK CARE TO UNDERSTAND THE ROTATION AND ORBITS OF THE PLANETS.

NEW HORIZON'S IMAGINED JOURNEY CAN APPEAR BOTH AWE-INSPIRING AND STERILE. IT IS OUR HOPES AND DREAMS THAT MAKE WHAT WE SEE PROFOUND. FOR *NEW HORIZONS*, THE TRIP WAS TEN YEARS OF MOSTLY EMPTINESS WITH BRIEF MOMENTS OF FURIOUS ACTION.

MUSICALLY, I TRY TO IMAGINE WHAT IT WOULD BE LIKE TO FEEL THIS TRIP. IMAGINE WHAT IT FEELS LIKE TO LIFT OFF EARTH AND HURDLE AWAY AT 36,373 MILES-PER-HOUR. WHAT WOULD IT FEEL LIKE TO FINALLY REACH JUPITER? WHILE DREAMING OF THE BIG BANG, WHICH IS THE THEORETICAL GENESIS OF THE UNIVERSE, I ASKED WHAT WOULD IT FEEL LIKE TO BE THERE AT THE BEGINNING OF EVERYTHING? FINALLY, WHAT WOULD IT FEEL LIKE TO ACCOMPLISH THE MISSION AND SEE PLUTO FOR THE FIRST TIME?

AGAIN, I BROUGHT SOME ASTRONOMICAL AND MATHEMATICAL CONCEPTS INTO THE DESIGN OF THE SCORE. I LOOSELY BASED THE KEY CENTERS THROUGHOUT THE PIECE ON THE GOLDEN RATIO. I ROUNDED THE RATIO TO ARRIVE AT KEY CENTERS A MAJOR THIRD APART: C, E, AND Ab. I ALSO BASED THE ARC OF INTENSITY FOR THE ENTIRE PIECE ON THE GOLDEN RATIO. THE USE OF DIFFERENT MODES: AEOLIAN/IONIAN (6TH/1ST OF MAJOR), PHRYGIAN DOMINANT (5TH OF HARMONIC MINOR), AND LYDIAN #5/PHRYGIAN (3RD OF MELODIC MINOR/3RD OF MAJOR) CORRESPOND TO EARTH, JUPITER, AND PLUTO RESPECTIVELY.

THE PRESENTATION OF DANCE IN BEYOND THE HORIZON IS MEANT TO JOIN WHAT WE SEE OBJECTIVELY IN THE IMAGES TOGETHER WITH WHAT WE FEEL IN THE MUSIC. DANCE DEMONSTRATES THAT WE ARE PHYSICALLY GROUNDED TO THE EARTH. YET WITH LEAPS, TURNS, AND GRACEFUL MOVEMENT, WE STRUGGLE TO BREAK FREE FROM GRAVITY. MUCH IN THE SAME WAY THAT OUR IMAGINATION BREAKS FREE FROM REALITY TO IMAGINE THAT WHICH WE HAVE YET TO EXPERIENCE. DANCE IS THE PERFECT HARMONY OF THE VISCERAL, THE EMOTIONAL, AND THE INTELLECTUAL.



IMAGE CREDITS

EARTH

- "New Horizon Launch" - NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute
- "Sun-Earth Day 2008 Space Weather Around the World" - NASA
- "Over planet Earth (artist's impression)" - ESA/Hubble (M. Kornmesser & L. L. Christensen)
- "The Earth in 4k" - NASA/M.Kornmesser/Music: Johan B. Monell (www.johanmonell.com)
- "Earth Hour (artist's impression)" - ESA/Hubble (M. Kornmesser)
- "The Milky Way Panorama" - ESO/S. Brunier (image cropped)

MARS

- "Time-lapse Video of Comet Holmes Fading" - NASA, ESA, and H. Weaver (The Johns Hopkins University Applied Physics Laboratory)
- "Mars in 4k" - NASA/M.Kornmesser/Music: Johan B. Monell (www.johanmonell.com)

video spliced with:

- "Flight Over Craters and Canyons on Mars" - ESA/Hubble (M. Kornmesser & L. L. Christensen)
- "The Milky Way Panorama" - ESO/S. Brunier (image cropped)
- "Asteroid Lutetia" - ESA 2010 MPS for OSIRIS Team MPS/UPD/LAM/IAA/RSSD/INTA/UPM/DASP/IDA

JUPITER

- "The Milky Way Panorama" - ESO/S. Brunier (image cropped)
- "New Horizons Soldiers On (Jupiter and Io)" - NASA, JHU-APL, Southwest Research Institute (image cropped/Io fades in and out)
- "Flying Past Europa's Plumes" (artist's impression)" - NASA, ESA, and M. Kornmesser (video reflected vertically)
- "Illustrated Fly-by of Europa's Plumes" (artist's impression) - NASA, ESA, and M. Kornmesser (video reflected vertically)
- "Jupiter at a Glance" - NASA, ESA, A. Simon (GSFC), M. Wong (UC Berkeley), and G. Orton (JPL-Caltech)
- "Jupiter's Great Red Spot Viewed by Voyager 1" - NASA's Goddard Space Flight Center. Video and images courtesy of NASA/JPL
- "Jupiter Dark Side" - NASA, JPL, Galileo Project, (NOAO), J. Burns (Cornell) et al

DREAM SEQUENCE

- "Time-lapse Video of Comet Holmes Fading" - NASA, ESA, and H. Weaver (The Johns Hopkins University Applied Physics Laboratory)
- "Barred Spiral Galaxy NGC 6217" - NASA, ESA and the Hubble SM4 ERO Team
- "Saturn's Rings" - ESA/Hubble (M. Kornmesser & L. L. Christensen)
- "Saturn" - ESA/Hubble (M. Kornmesser & L. L. Christensen)
- "Animation of the Sun Passing Behind Saturn" - ESA/Hubble (M. Kornmesser & L. Calçada) (video reflected vertically)
- "Westerlund 2" — Hubble's 25th anniversary image NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team
- "Hubble's Sharpest View of the Orion Nebula" - NASA, ESA, M. Robberto (Space Telescope Science Institute/ESA) and the Hubble Space Telescope Orion Treasury Project Team
- "3D Visualisation of the Horsehead Nebula" - NASA, ESA, the Hubble Heritage Team (STScI/AURA); G. Bacon, T. Davis, L. Frattare, Z. Levay, and F. Summers (Viz 3D team, STScI); ESO.
- "3D Animation Bubble Nebula" - ESA/Hubble, M. Kornmesser
- "Hubble Captures Full View of Uranus' Rings on Edge" - NASA, ESA, M. Showalter (SETI Institute) and Z. Levay (STScI) (image cropped)
- "A 3D Animation of the Most Distant Quasar" - ESO/M. Kornmesser
- "Butterfly Emerges from Stellar Demise in Planetary Nebula NGC 6302" - NASA, ESA and the Hubble SM4 ERO Team
- "Neptune and Its Moons" - NASA, ESA, the Hubble Heritage Team (STScI/OPO) and G. Bacon (STScI)
- "Triton (artist's impression)" - ESO/L. Calçada
- "Matter Accreting Around a Supermassive Black Hole (artist's impression)" - ESA/Hubble (M. Kornmesser)
- "New View of the Pillars of Creation — Visible" - NASA, ESA/Hubble and the Hubble Heritage Team

PLUTO

- "The Milky Way Panorama" - ESO/S. Brunier (image cropped)
- "The Rich Color Variations of Pluto" - NASA/JHUAPL/SwRI (image cropped)
- "Pluto" - NASA/APL/SwRI & ESA
- "Charon in Enhanced Color" - NASA/JHUAPL/SwRI (image cropped)
- "Pluto's Brilliant 'Heart'" - NASA/JHUAPL/SwRI
- "A Full View of Pluto's Stunning Crescent" - NASA/JHUAPL/SwRI
- "Pluto's Haze in Bands of Blue" - NASA/JHUAPL/SwRI
- "Pluto's Breathtaking Farewell to New Horizons" - NASA/JHUAPL/SwRI

ABOVE: "Westerlund 2" — Hubble's 25th anniversary image NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team (cropped)

PERFORMERS

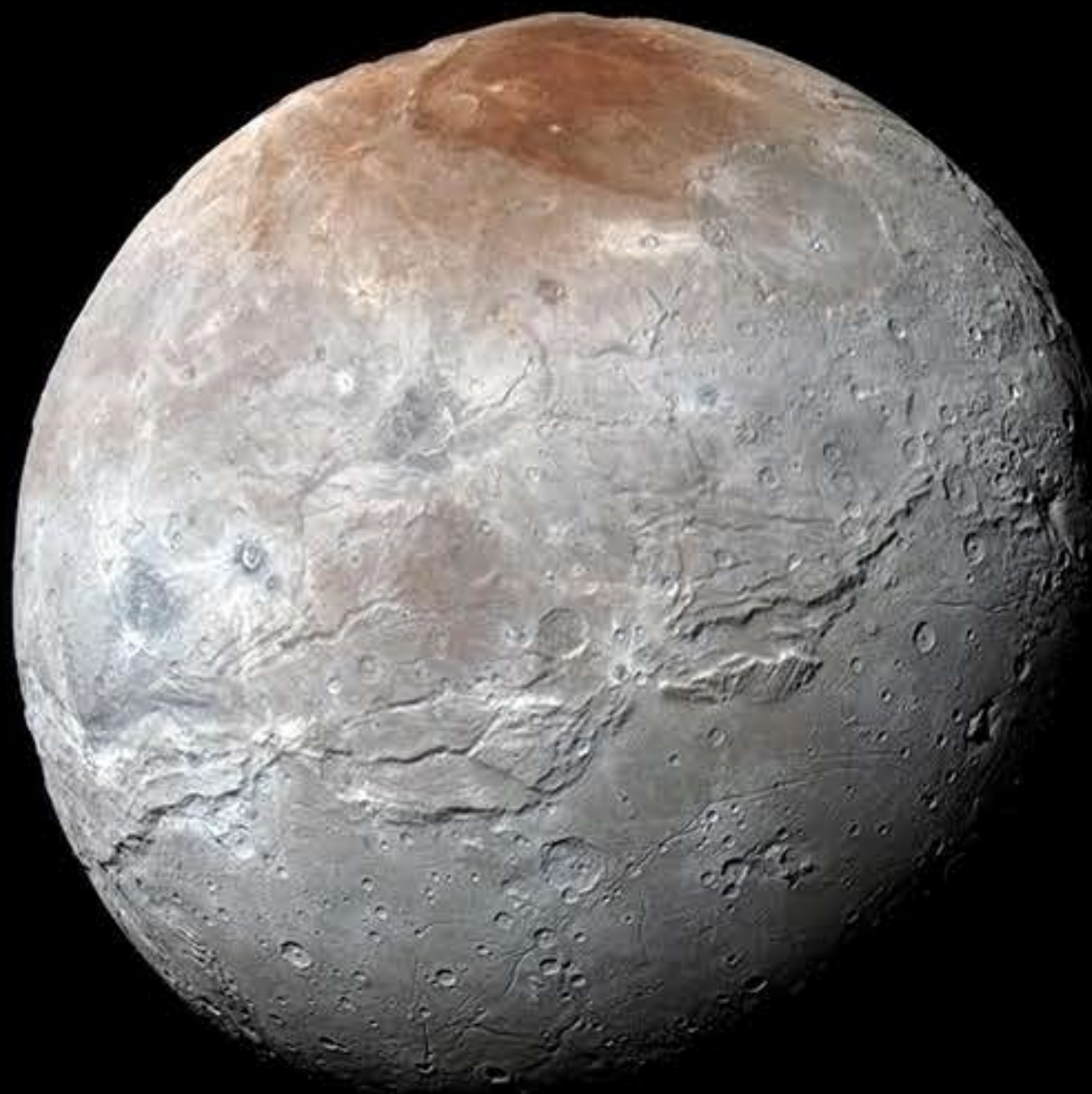
MATTHEW DIEVENDORF - guitars,
synthesizers & ableton live

AMY K BORMET - piano & voice

JACOB DORMUTH - bass

ANA BARREIRO - drums

JESSICA HEMINGWAY - dance



LEFT: "Charon in Enhanced Color" - NASA/
JHUAPL/SwRI (image cropped)

BACK COVER: "The Rich Color Variations of Pluto"
- NASA/JHUAPL/SwRI (image cropped)

