SLATE 1:

Slug: Astrophysics HD Resource Tape

TRT: 0:17:04 GSFC Library # G07-007HD
Super(s): NASA Release Date: 06/08/07
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Synopsis:
The Astrophysics Science Division at the NASA Goddard Space Flight Center conducts a broad program of research in the realm of Astronomy, Astrophysics and Fundamental Physics. ASD's missions and scientists attempt to answer questions about how galaxies, stars, and planetary systems form and evolve; what worlds and life may exist beyond our solar system; what powered the big bang; what dark energy is; and what happens to space, time, and matter at the edge of a black hole.

SLATE 2:

Astrophysics Missions (centered)

SLATE 3:

Slug: Astrophysics HD Resource Tape

The Hubble Space Telescope (HST)
Launched in 1990, the Hubble Space Telescope (HST) has revolutionized astronomy by providing unprecedented views of the Universe. Hubble's spectral range extends from the ultraviolet, through the visible, and into the near-infrared. NASA will fly a servicing mission (SM4) in 2008 to bring two new science instruments to Hubble - the Cosmic Origins Spectrograph and the Wide Field Camera 3. New gyros and batteries will extend Hubble's life through 2013.

Item 1: Hubble flies 360 miles above the earth (0:19)
Item 2: Journey through the cosmic web of the early universe, Hubble collects data points (0:44)
Item 3: Hubble views the Moon as it rises over the Earth (0:10)
Item 4: Comparison of Hubble's instruments and their relative fields of view (0:36)

TRT: 1:56
Super(s): NASA/STScI
For more info: www.nasa.gov/hubble

SLATE 4:

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WMAP Mission
Scientists using NASA's Wilkinson Microwave Anisotropy Probe (WMAP) have created the most detailed portrait of the infant Universe. By capturing the afterglow of the Big Bang, called the cosmic microwave background (CMB), we now believe the Universe to be 13.7 billion years old. Encoded in these patterns is much-anticipated information about the fundamental properties of the early Universe. WMAP launched on June 30, 2001.

Item 1: WMAP spins like a top to capture light from every part of the sky (0:10)
Item 2: The spacecraft and its map of the early universe (0:05)

Item 3: A zoom in to WMAP's portrait of the universe reveals the beginnings that the image represents – the first stars ignite, then galaxies form. Finally, the expanse of sky WMAP has looked across to record this image. (0:24)

TRT: 0:42
Super(s): NASA
For more info: http://map.gsfc.nasa.gov

SLATE 5:

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JWST Mission
The James Webb Space Telescope (JWST) will locate the first galaxies that formed in the early Universe, connecting the Big Bang to our own Milky Way Galaxy. JWST will have a large mirror over 21 feet in diameter and a sunshield the size of a tennis court. The mission will observe primarily in the infrared range of the electromagnetic spectrum and will reside in an orbit about one million miles from the Earth. JWST is scheduled for launch in 2013.

Item 1: JWST will orbit at the second Lagrange point, L2 (0:06)

TRT: 0:07
Super(s): NASA
For more info: http://www.jwst.nasa.gov

SLATE 6:

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LISA Mission
The Laser Interferometer Space Antenna (LISA) consists of three spacecraft orbiting the Sun in a triangular configuration. The LISA mission will study the mergers of supermassive black holes, test Einstein's theory of general relativity, probe the early Universe, and search for gravitational waves. As these passing waves ripple space and time, they will alter the laser beams shining between the spacecraft, offering a different perspective on the universe. LISA is scheduled for launch in 2015.

Item 1: LISA's three spacecraft, separated from each other by five million kilometers (0:06)
Item 2: A unique perspective of LISA's laser beams (0:06)
Item 3: Gravitational waves passing through the spacecraft (0:06)

TRT: 0:24
Super(s): NASA
For more info: http://lisa.nasa.gov

SLATE 7:

The Universe: Early Beginnings (centered)

SLATE 8:

Slug: Astrophysics HD Resource Tape

The Big Bang
This dominant cosmological theory suggests the universe began nearly 13.7 billion years ago, expanding rapidly from a very dense and incredibly hot state. Eventually, stars ignited and galaxies slowly formed. The Big Bang theory has been improved and advanced especially through NASA's Cosmic Background Explorer (COBE) and WMAP missions. This animation conceptualizes these explosive beginnings of the universe. (0:14)

TRT: 0:14
Super(s): NASA

SLATE 9:

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The Cosmic Dawn
About 300,000 years after the Big Bang, the universe spread out enough that free electrons and protons could form atomic hydrogen. These atoms readily absorb light, thus creating an opaque, murky era known as the cosmic Dark Ages. Roughly 900 million years later, the universe underwent a Reionization Period - the earliest stars and quasars generated enough ultraviolet light to turn hydrogen atoms back into protons and electrons. These areas began as bubbles, continually spreading until light was permitted to travel freely through the universe. This moment has been dubbed the Cosmic Dawn.

Item 1: The Dark Ages and early stars give way to the Reionization Period (1:01)
Item 2: Still image timeline showing the early murky haze (right) and the later bright universe (left) - the bubbles of reionization appear in the transition area (0:10)
Item 3: Reionization still without titles (0:10)

TRT: 1:14
Super(s): NASA

SLATE 10:

The Universe: Close-Up (centered)

SLATE 11:

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Quantum Particles
Particles of matter in classical physics can be considered as objects that have a definite location in space at any given time. However, in quantum theory, particles are given a *probability* of being located in a particular space at a particular time. In this animation, particles pop into and out of existence in varying spaces and at varying times. (0:20)

TRT: 0:20
Super(s): NASA

SLATE 12:

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The Helium Atom
Helium nuclei were created in the Big Bang and contain two protons and two neutrons each. Helium is the second most abundant element, comprising roughly one quarter of the mass of the universe. This animation zooms into a standard helium atom, showing its protons (green), neutrons (white) and electrons (blue). (0:11)

TRT: 0:11
Super(s): NASA

SLATE 13:

The Universe: Wide Shots

SLATE 14:

Slug: Astrophysics HD Resource Tape

Journeys Through the Universe
Item 1: This animated tour takes us first past a red giant locked in orbit with a black hole and its accretion disk; through a spiral galaxy much like our own Milky Way; and then flies over a massive black hole with an accretion disk and jets. (0:20)

Item 2: This visualization flies through a series of galaxy clusters, the largest gravitationally-bound objects in the universe. (0:16)

Item 3: This visualization presents a 3-D view of the largest structures in the universe via data from the Sloan Sky Survey. It ends on data from the WMAP mission. (1:24)

TRT: 2:22
Super(s): NASA

SLATE 15:

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Theories of the Universe
Item 1: This animation conveys the Brane Theory of Multiple Dimensions, in which there are multiple universes, the touching of two causing an event such as the Big Bang. (0:10)

TRT: 0:10
Super(s): NASA

SLATE 16:

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IMAX: "Hubble: Galaxies Across Space and Time"
This short film features a computer-generated flight through more than 10,000 real galaxies originally imaged by Hubble as part of the Great Observatory Origins Deep Survey (GOODS) project. Hubble scientists and imaging specialists worked for months to extract individual

galaxy images, placing them in a 3D model according to their approximate true distances as determined by ground-based photometric redshift data.

TRT: 0:51
Super(s): NASA/STScI
For more info: http://hubblesource.stsci.edu/exhibits/largefilm

SLATE 17:

High-Energy Objects (centered)

SLATE 18:

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Black Holes
A black hole is a massive object whose gravitational field is so intense that no light (electromagnetic radiation) can escape it.

Item 1: A cutaway reveals the inner workings of an accretion disk. (0:07)
Item 2: A closer look at the center of a spiral galaxy reveals a pair of black holes locked in a death spiral. When they merge, a massive amount of energy is released in the form of jets. (0:20)
Item 3: Researchers have seen evidence of hot iron gas riding upon waves in spacetime around black holes. This animation paints an intriguing image of how a spinning black hole can drag the very fabric of space around with it. (0:15)

TRT: 0:46
Super(s): NASA

SLATE 19:

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Gravitational Waves
A Gravitational Wave is a theoretical fluctuation in the curvature of spacetime caused by the movement of incredibly massive objects.

Item 1: Two massive black holes create gravitational waves as they orbit each other. (0:08)

TRT: 0:08
Super(s): NASA

SLATE 20:

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Pulsars
A pulsar is generally believed to be a rapidly rotating neutron star that emits pulses of radiation (such as x-rays and radio waves) at known regular intervals. A millisecond pulsar is one with a rotational period in the range of 1-10 milliseconds.

Item 1: Wide animation of a millisecond pulsar. (0:15)

Item 2: Close-up animation of a millisecond pulsar. (0:24)

TRT: 0:41
Super(s): NASA

SLATE 21:

Slug: Astrophysics HD Resource Tape

Cepheids
A Cepheid is a star which varies in light intensity over regular, measurable periods.

Item 1: An animation of a Cepheid variable star varying in brightness in the arm of a spiral galaxy. (0:30)

TRT: 0:30
Super(s): NASA