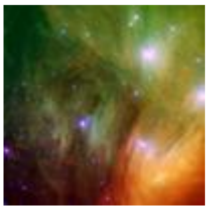
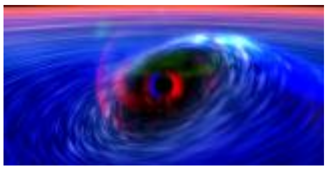
HUBBLE
European Space Agency Information Centre

c/o ST-ECF
ESO, Karl-Schwarzschild-Str.2
D-85748 Garching bei München,
Germany
Telephone: +49 (0)89 3200 6306
Cellular : +49 (0)173 38 72 621
Telefax: +49 (0)89 3200 6480
hubble@eso.org
www.spacetelescope.org

Video Podcast **Hubblecast 24 Special Edition -** **Eyes on the Skies Chapter 6: Beyond Earth** **FOR IMMEDIATE RELEASE 16:30 (CET)/10:30 AM EST 11 December, 2008**		
00:30 **[Dr. J]** Welcome to the sixth special episode of the Hubblecast celebrating the International Year of Astronomy in 2009. In the fifth episode, we saw how some telescopes study some parts of the universe that we can’t see with our eyes. This time, we will see how telescopes in space have revolutionised almost every field in astronomy.		Dr. J. in Virtual Studio
00:51 The Hubble Space Telescope. Is by far the most famous telescope in history. And for good reason. Hubble has revolutionised so many fields in astronomy.		Dr. J. Standing next to image of the Hubble Space Telescope
01:00 By modern standards, Hubble’s mirror is actually quite small. It only measures about 2.4 metres across. But its location is literally out of this world. High above the blurring effects of the atmosphere, it has an exceptionally sharp view of the Universe. And what’s more, Hubble can see ultraviolet and near-infrared light. This light just cannot be seen by ground-based telescopes because it is blocked by the atmosphere.		(Dr. J. not in view) Zoom in on and fly around Hubble Space Telescope. 
01:30 Cameras and spectrographs, some as big as a telephone booth, dissect and register the light from distant cosmic shores.		Dr. J. in Virtual Studio

		
01:38 Just like any ground-based telescope, Hubble is upgraded from time to time. Spacewalking astronauts carry out servicing missions. Broken parts get refurbished and older instruments get replaced with newer and state-of-the-art technology.		Footage of servicing missions.
01:55 Hubble has become the powerhouse of observational astronomy. And it has transformed our understanding of the cosmos.		
02:02 **[Narrator]** With its keen eyesight, Hubble observed seasonal changes on Mars... a cometary impact on Jupiter... an edge-on view of Saturn’s rings... and even the surface of tiny Pluto.		Full screen Hubble images: Changing seasons on Mars.  Saturn and Puto
02:23 It revealed the life cycle of stars, from their very birth and baby days in a nursery of dust-laden clouds of gas, all the way to their final farewell: as delicate nebulae, slowly blown into space by dying stars, or as titanic supernova explosions that almost outshine their home galaxy.		
02:50 Deep in the Orion Nebula, Hubble even saw the breeding ground of new solar systems: dusty discs around newborn stars that may soon condense into planets.		

03:00 The space telescope studied thousands of individual stars in giant globular clusters, the oldest stellar families in the Universe.		
03:10 And galaxies, of course. Never before had astronomers seen so much detail. Majestic spirals, absorbing dust lanes, violent collisions.		
03:25 Extremely long exposures of blank regions of sky even revealed thousands of faint galaxies billions of light-years away. Photons that were emitted when the Universe was still young. A window into the distant past, shedding new light on the ever-evolving cosmos.		Hubble Deep Field fly-through
03:45 **[Dr. J]** Hubble is not the only telescope in space. This is NASA’s Spitzer Space Telescope, launched in August 2003. In a way, it is Hubble’s equivalent for the infrared.		Dr. J. in the studio image wall. On studio TV screen: Hubble flies out of view... ...and Spitzer flies into view. [full screen]
04:00 Spitzer has mirror that is only 85 centimetres across. But the telescope is hiding behind a heat shield that protects it from the Sun. And its detectors are tucked away in a dewar filled with liquid helium. Here the detectors are cooled down to just a few degrees above absolute zero making them very, very sensitive.		Dr. J. in the studio image wall. Footage of Spitzer. Exploded view of telescope.
04:20 Spitzer has revealed a dusty Universe. Dark, opaque clouds of dust glow in the infrared when heated from within. Shock waves from galaxy collisions sweep up dust in telltale rings and tidal features, new sites for ubiquitous star formation.		Full screen: Glowing dust clouds 
04:40 Dust is also produced in the aftermath of a star’s death.		

Spitzer found that planetary nebulae and supernova remnants are laden with dust particles, the prerequisite building blocks of future planets.		
04:50 At other infrared wavelengths, Spitzer can also see right through a dust cloud, revealing the stars inside, hidden in their dark cores.		
05:02 Finally, the space telescope's spectrographs have studied the atmospheres of extrasolar planets – gas giants like Jupiter, that race around their parent stars in just a few days.		Animation of transiting planet 
05:15 So what about X-rays and gamma rays? Well, they are completely blocked by the Earth's atmosphere. And so without space telescopes, astronomers would be totally blind to these energetic forms of radiation.		Dr. J. in virtual studio. Electromagnetic spectrum (from Hidden Universe) and atmospheric transmission graphic, now focussing on high-energy radiation
05:26 X-ray and gamma ray space telescopes reveal the hot, energetic and violent Universe of galaxy clusters, black holes, supernova explosions, and galaxy collisions.		
05:42 They are very hard to build, though. Energetic radiation passes right through a conventional mirror. X-rays can only be focused with nested mirror shells made of pure gold. And		Dr. J. in virtual studio

gamma rays are studied with sophisticated pinhole cameras, or stacked scintillators that give off brief flashes of normal light when struck by a gamma ray photon.		
06:05 In the 1990s, NASA operated the Compton Gamma Ray Observatory. At the time, it was the largest and most massive scientific satellite ever launched. A fully fledged physics lab in space.		Dr. J. in virtual studio With images of space telescopes in the background
06:15 In 2008, Compton was succeeded by GLAST: the Gamma Ray Large Area Space Telescope. It will study everything in the high-energy Universe from dark matter to pulsars.		Footage of launch
06:32 Meanwhile, astronomers have two X-ray telescopes in space. NASA's Chandra X-ray Observatory and ESA's XMM-Newton Observatory are both studying the hottest places in the Universe.		Footage of Chandra and XMM-Newton.
06:47 **[Narrator]** This is what the sky looks like with X-ray vision. Extended features are clouds of gas, heated to millions of degrees by shock waves in supernova remnants. The bright point sources are X-ray binaries: neutron stars or black holes that suck in matter from a companion star. This hot, in falling gas emits X-rays.		
07:13 Likewise, X-ray telescopes reveal supermassive black holes in the cores of distant galaxies. Matter that spirals inward gets hot enough to glow in X-rays just before it plunges into the black hole and out of sight.		
07:25 Hot but tenuous gas also fills the space between individual galaxies in a cluster. Sometimes, this intracluster gas is shocked and heated even more by colliding and merging galaxy clusters.		

07:40
Even more exciting are gamma ray bursts, the most energetic events in the Universe. These are catastrophic terminal explosions of very massive, rapidly spinning stars.

In less than a second, they release more energy than the Sun does in 10 billion years.

08:00
[Dr. J]
Hubble, Spitzer, Chandra, XMM-Newton and GLAST are all versatile giants.

Dr. J. in virtual studio

But some space telescopes are much smaller and have much more focused missions.

08:14
Take COROT, for example. This French satellite is devoted to stellar seismology and the study of extrasolar planets.

Or NASA’s Swift satellite, a combined X-ray and gamma ray observatory designed to unravel the mystery of gamma ray bursts.

08:28
And then there’s WMAP, the Wilkinson Microwave Anisotropy Probe. In just over two years in space, it had already mapped the cosmic background radiation to unprecedented detail. WMAP gave cosmologists the best view yet of one of the earliest phases of the Universe, more than 13 billion years ago.

08:50
Opening up the space frontier has been one of the most exciting developments in the history of the telescope.

So what’s next?

09:00
Thank you for joining me in this sixth episode of the special series. Next time we will see the new and amazing telescopes of the future that are currently being planned.

Dr. J. in virtual studio

This is Dr. J. signing off for the Hubblecast, once again nature has surprised us beyond our wildest imagination.

09:41 END