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<p>Hubblecast Episode 30: Rebirth of an icon EMBARGOED UNTIL 17:00 (CEST)/11:00 am EST 09 Sept, 2009</p>		
<p>00:00 [Visual starts]</p> <p>00:01 [Narrator] For the first time since astronauts visited it in May, Hubble is opening its upgraded eyes. Brand new and repaired instruments have facilitated a spectacular reveal of the observatory's new capabilities. The moment many have been waiting for has arrived; Hubble is back and better than ever.</p> <p>00:20 Standard Hubblecast Sequence</p> <p>00:38 [Woman] This is the Hubblecast!</p> <p>News and images from the NASA/ESA Hubble Space Telescope with your host, Dr. J, aka Dr. Joe Liske.</p> <p>00:50 [Dr. J] Hello and welcome back to the Hubblecast as I'm sure some of you have noticed, we haven't seen any new images coming from our favourite telescope lately. That's of course b/c in May 2009, 7 daring astronauts spent 30 spacewalking hours repairing Hubble and replacing some of its instruments. Now Hubble is of course unique in that it's the only space telescope that can be serviced by humans and the astronauts really made the most of their last visit. Now, the fruits of their labour are ready for everyone to see. In this episode, we're going to show you Hubble's first observations after the servicing mission. The new images show us a bunch of different astrophysical phenomena, ranging from a bug-like planetary nebula to one of these huge galaxy clusters that act like a cosmic magnifying glass.</p> <p>01:36 [Narrator] When new instruments are brought from Earth to Hubble, they</p>		<p>Standard Hubble Sequence</p>   

need a chance to eliminate any trapped gases that could cause interference with their performance. This is a process called outgassing. Once that procedure is complete, scientists work with engineers to ensure that instruments are properly calibrated, so the quality of the data is top-notch.

01:57

[Dr. J]

After an incredible 16 years of service, the much-celebrated WFPC2, or Wide Field Planetary Camera 2 has now finally been retired. Instead, we now have WFC3, the Wide Field Camera 3. This new camera has imaged a stellar jet about 7,500 light-years away in the Carina Nebula. What is going on here is that we have an infant star about 8 times as massive as the Sun which is causing quite a stir. What the WFC3 image reveals is a pillar of gas and it's at the centre of this gas cloud that the young star is forming. Now the star is surrounded by swirling gas and dust and some of this material is being pulled into the star by its gravity. As a result of this tumultuous process, a jet is formed and the interaction of this jet causes shockwaves and intense heat which ionises the surrounding gas, thus causing it to glow.

02:49

[Narrator]

Truly the most powerful camera ever sent into space, the new WFC3's capabilities in both the visible and the infrared are an unbeatable combination and complements Hubble's other instruments, especially the Advanced Camera for Surveys.

Moving from visible to infrared in the image of the Carina Nebula, we see the nebulosity fade and the baby star and its emission jets are revealed. WFC3's impressive infrared capability reveals hundreds of stars and the jet itself hidden behind the dust and gas.

03:24

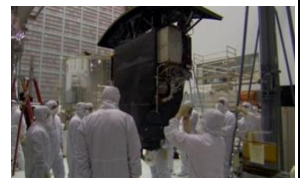
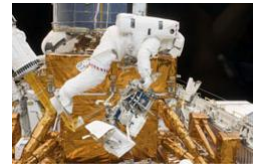
[Dr. J]

Stephan's Quintet is a stunning collection of five galaxies. Four of these galaxies' destinies are literally bound together. As they crash into each other at break-neck speed, gas is ripped from the galaxies and produces the distinctive tidal tails. Now astronomers believe that galaxy mergers like we see here are one of the key processes by which galaxies can grow and evolve and so studying mergers can help us understand what shapes many of the galaxies that we see around us today.

03:54

[Narrator]

The new WFC3 camera's detector is highly sensitive and,



paired with the camera's wide field of view, it improves Hubble's discovery power by 20 to 35 times!

The wide field of view and clear resolution of WFC3 will enable forensic searches that lead to clues about the collisions and mergers between galaxies, as seen in the beautiful swirling chaos of Stephan's Quintet.

04:26

[Dr. J]

WFC3 has also zoomed in on one very hot cosmic bug. NGC 6302 is a planetary nebula that is better known as the Bug Nebula or the Butterfly Nebula. The source of the nebula is an extremely hot dying star which was once about 5 times the mass of the Sun. It has now evolved into a red giant and its life will soon come to an end but it's not going quietly.

04:55

[Narrator]

The improvement in resolution provided by WFC3 is clear but this new image reveals so much more. WFC3 is equipped with a wide variety of filters that isolate light emitted by various chemical elements, allowing astronomers to infer properties of the nebular gas, such as its temperature, density, and composition.

The reddish outer edges of the nebula are due to light emitted by nitrogen, which marks the coolest gas visible in the picture. The white areas emanating from the hidden central star are sulfur-emitting regions where fast- and slow-moving gases collide and cause shockwaves. The image also shows numerous finger-like projections pointing back to the star, which may mark denser blobs in the outflow that have resisted the pressure from the star.

05:42

[Dr. J]

Hubble's newly-repaired Advanced Camera for Surveys has eyed a fascinating galaxy cluster called Abell 370. This is one of the places in the Universe where Einstein's Theory of General Relativity really comes to life. The image captures the phenomenon of gravitational lensing. If you have a galaxy that sits behind a really massive object like a galaxy cluster, then the light from that background galaxy gets bent by the gravitational pull of the foreground cluster as the light passes the cluster. Now this process can seriously distort the image of the background galaxy, often making it look like an arc. It also magnifies the image of the galaxy and so the cluster acts sort of like a cosmic magnifying glass.

06:27

[Narrator]

Although Abell 370 has been imaged by other telescopes, this Hubble ACS image is the most detailed yet. In the large, striking orangeish arc, the curvature of the arc abruptly changes to turn around the smaller galaxies as the light is



warped by their gravity. This prominent arc seems to appear several times in the image as if copied and pasted onto other parts of the sky.

Another incredible example of the level of detail is in the arm of a spiral galaxy at the bottom right in the image. The arm is strongly bent, or distorted by a foreground galaxy.

07:06

[Dr. J]

The new Cosmic Origin Spectrograph, COS, and the repaired Space Telescope Imaging Spectrograph, STIS, are providing us with taking capability of taking spectra in ultraviolet light. Now astronomers have pointed these instruments towards Eta Carina which is a rather large and unstable binary system. Now this pair of stars has a tendency towards violent outbursts and astronomers have used COS and STIS to identify some of the elements in the material that is forcefully being ejected by this duo.

07:38

[Narrator]

Hubble also captured the aftermath of the death of a massive star in the Large Magellanic Cloud, an irregular galaxy close to our own Milky Way. The object, known as N132D, lies roughly 170,000 light-years away and provides an exceptional opportunity for forensic analysis of the life and demise of a massive star. In addition to the stunning visual image that highlights a cloud of pink emission gas and soft purple wisps, the COS instrument gives astronomers clues to the chemical processes deep inside the star.

08:14

[Dr. J]

Another object spied by Hubble's new and repaired instruments is the barred spiral galaxy, Markarian 817. Now this galaxy has a very bright nucleus and that's because it harbours a supermassive black hole right at its center which is being fuelled with the gas from the galaxy. This is called an active galactic nucleus, or AGN. In many other galaxies, the AGN can be so bright that it outshines the whole rest of the galaxy.

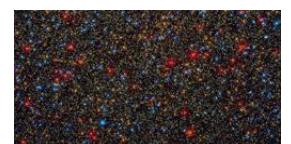
08:42

[Narrator]

Looking like a brightly-decorated Christmas tree, this image is actually a small part of the huge globular cluster called Omega Centauri. Although held together by gravity, the stars in this cluster are at different stages of life and thanks to WFC3's sensitivity, we are treated to a twinkling array from yellow-white "mid-life" stars like our own Sun to retiring red giants. Although the stars are close together, WFC3's sharpness can resolve each of them as individual stars.

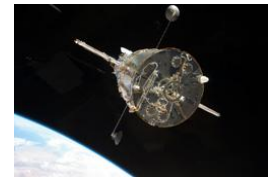
09:17

[Dr. J]



Hubble is well into its 19th year of observations but it continues to keep a watchful eye on the Universe. Although Hubble may be middle-aged by spacecraft standards, it is definitely not slowing down. Equipped with a powerful set of new and repaired instruments, this scientific icon is continuing its quest to unravel the secrets of the cosmos, to link us to our distant past and to give us a reason for another episode! This is Dr. J signing off for the Hubblecast. Once again, nature has surprised us beyond our wildest imagination.

10:32
END



Hubblecast is produced by ESA/Hubble at the European Southern Observatory in Germany.

The Hubble mission is a project of international cooperation between NASA and the European Space Agency.

Credits