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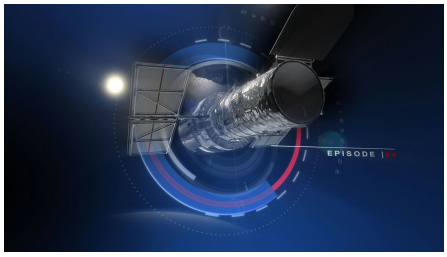
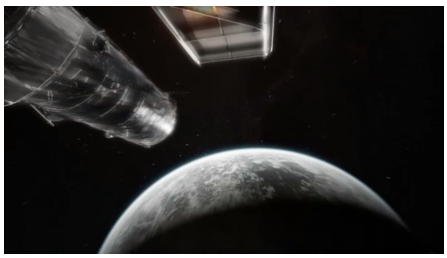
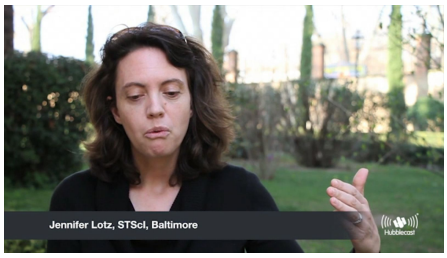
Hubblecast Episode 91: **What does the future hold for Hubble? Part I**	**Visual notes**
00:00 **[Narrator]** Hubble has given us 26 years of remarkable observations. But what comes next? Over the last two years we have asked some of its most loyal users, advocates, and staff what they think we can we expect from the telescope's future. Now it's the time to share their answers and their hopes for the future of Hubble. **[Matt Mountain, Former Director of the Space Telescope Science Institute]** 1. Thirty years from now, Hubble will be remembered as the telescope that transformed our view of the Universe. So I think that legacy is secure. What is much more interesting is what will it do next, and how will it lay the groundwork for the James Webb Telescope?	 
00:37 **2. Intro**	

00:52 **[Narrator]** 3. Hubble's legacy is undeniable, and the research it has spawned has already made a huge impact on our knowledge of the Universe. **[Matt Mountain, Former Director of the Space Telescope Science Institute]** I mean, it's told us how old the Universe is, it's told us what the early galaxies look like. And it has produced a whole range of wonderful images and it engaged the whole population in astronomy in a way that we have not seen with any other telescope in human history. And it's been the most productive telescope in human history.	 
01:22 **[Narrator]** 4. But instead of looking at the achievements in Hubble's past, it's time to look forward. What might be in store for the telescope in the future?	
01:34 **[Narrator]** 5. A major field Hubble has left to explore is the study of exoplanets — planets orbiting other stars. Planets which, when Hubble was launched, we had never seen. Now, there are many telescopes dedicated to finding these alien worlds and nearly 2000 have been discovered. Once they are identified, Hubble plays a critical role in finding out what these planets are like: How hot are they? What are they made of? How much water do they possess? And much more.	
02:13 **[David Singh, Astrophysicist, University of Exeter, UK]** 6. Because the discovery rate for exoplanets is so fast and this is such a fast-moving field, the planets we have to study now are much better than even a couple of years ago, and this is going to continue throughout the	

end of Hubble's lifetime. So every successive year there are new and better planets to look at that we didn't have even just last year, even just last month! You know, the actual discovery rate is that exciting. The spectral capabilities of Hubble now, are so much better than they were a few years ago that the science questions we are asking are spectacular: How much water is on a planet? You can potentially map out a planet and actually look at one side of the planet compared to the other. So there are science questions we are going to be addressing which I think will blow people away.	
03:06 **[Narrator]** 7. The exoplanets Hubble has studied, though hardly close neighbours, are within our own galaxy. Other discoveries are likely to lie much, much, further afield. The Hubble Deep Fields are among the most influential images the telescope has ever taken. But Hubble can look even deeper into the cosmos by using the Universe's natural gravitational lenses to magnify distant objects — something that's being done through the Frontier Fields programme.	
03:43 **[Jennifer Lotz, STScI, Baltimore]** 8. We will be studying places in the sky where the most massive objects in the Universe are, even the strong lensing clusters. Einstein's Theory of General Relativity tells us that these massive objects actually bend space and time around them. And so galaxies that are behind these clusters will appear brighter and larger than they would otherwise. So basically these things act as nature's telescopes. So we will be using Hubble with these natural telescopes to peer deeper into the Universe than we have ever been able to before.	

04:19 **[Ofer Lahav, University College London]** 9. Well, first I think the deeper the better. If we can have programmes to follow up all these Hubble Deep Fields programmes further and even over a patch of sky and just look deeper and deeper and deeper, almost all the way back to the beginning, I think it's wonderful, because the amazing thing with those Hubble deep fields is that when we first looked at them the reaction was, after so many years of just talking about how these galaxies formed, we see how these galaxies form. We actually see it, we see a time sequence, in time. We see how it evolved with time — because we live in a time machine — I think if we can extend it a bit more that's wonderful and then also to look at different environments. The way galaxies look in dense environments what we call clusters of galaxies, compared with the field. I think in those two areas Hubble can still do a fine job.	 
05:17 **[Narrator]** 10. So Hubble's work is far from over. There is much left to learn, and many new questions yet to be posed. And the astronomers know this. There are still thousands of astronomers waiting for the chance to use Hubble for their research with ten times as many applications to use the telescope than can be accommodated!	
05:42 **[Matt Mountain, Former Director of the Space Telescope Science Institute]** 11. Hubble is just at the peak of its power now. We are learning new ways to use the Hubble, we haven't even scratched the surface of what we can do with exoplanets. We've got this new approach of using gravitational lenses to actually magnify the Universe in ways that we won't be able to get to until we get to JWST. We are learning new things about stellar populations. In some sense, the discoveries are just beginning, yet again we are on another regeneration of discoveries.	

Ends 07:05