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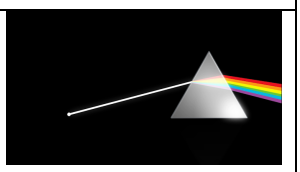
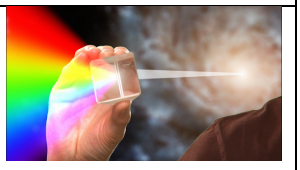
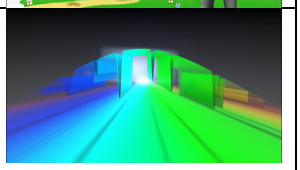
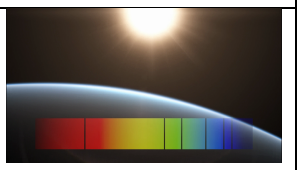
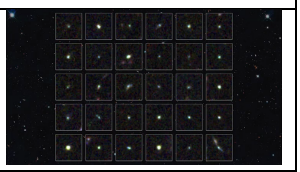
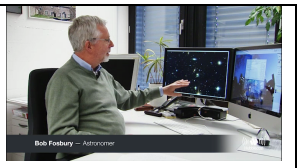
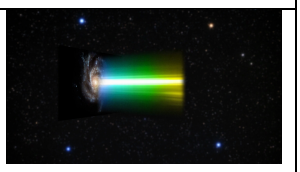
Hubblecast Episode 59: Unweaving the rainbow		
[Narrator] 00:00 We live in a brightly coloured world, even if it doesn't always seem that way. But if you hold a prism up to the whitest of lights, you get a rainbow. For scientists, unweaving this rainbow tells them about the properties of the Universe. Hubble's ability to study its colours is at the heart of many of its most important discoveries.		
		
[Dr J] 00:54 Hello and welcome to another episode of the Hubblecast. Hubble is famous for its sharp and detailed images of the cosmos. But to scientists, the telescope has another, equally important function: decoding the light and probing the colours of the Universe.		
[Narrator] 01:13 Hubble's images see a lot of detail. But if you focus on any spot in the image, the colour information is actually relatively limited. The telescope's cameras capture the brightness of only a handful of colours. That's also how our eyes perceive colour.		
[Dr J] 01:35 But to see the full story, scientists need to use something a lot like this prism to split up the light and study the brightness of the individual colours in the rainbow in more detail. So, let's say goodbye to Hubble's pretty pictures...		

[Dr J] 01:52 … and hello to... [Dr J turns around and gives an “are you kidding me?” face...] to rainbows.		
[Narrator] 01:57 5. Well... almost. Scientists aren’t the most poetic folk, so they call them spectra instead of rainbows. And instead of printing the pretty colours, their scientific reports display their measurements as graphs. But the graphs are simply a way of showing the brightness of the different colours in the light coming from an object. The subtle differences in brightness and darkness can reveal a huge range of information, including the chemical composition, temperature, movement and distance of the object.		
[Dr J] [02:44] Hubble has a couple of instruments onboard that do this kind of science. They function a lot like high-tech versions of a prism – except they work even on the faintest galaxies, and can take extremely precise measurements of brightness. It is these measurements lie behind some of Hubble’s most fascinating discoveries, such as the detection of different gases in the atmospheres of exoplanets.		
[Narrator] 03:11 As a star’s light passes through an exoplanet’s atmosphere, the chemical signature of the atmosphere is imprinted on the light as dark lines in its spectrum. These lines tell scientists precisely what gases are present in the planet’s atmosphere.		
[Dr J] 03:31 Another great example is Hubble’s work on very distant galaxies which only appear as tiny blobs in images.		

[Bob Fosbury] 03:40 So here we have a Hubble image, and it contains a range of objects of different brightnesses and ultimately different distances. But if we just focus on this image here, the galaxy in the centre, you can see how we add the spectroscopic information. Now this direct colour image, but what we do is to disperse the light of all those objects in the field into spectra, which you can see in white here. And so for this object here, we see the spectrum spread out on one side, and from the distribution of light in that spectrum we can learn a lot about this galaxy.		
[Narrator] 04:19 A distant galaxy's spectrum reveals which elements it is made of. Every substance affects or emits light in a particular way, imprinting a series of bright or dark lines in the spectrum that betrays its presence. And by looking at the way these lines are shifted towards red or blue in the spectrum, Hubble sees whether they are moving towards or away from us. In the case of really faraway objects, the redshift also tells us how distant the galaxy is.		
[Dr J] 04:55 Spectra aren't as immediate and attractive as pictures, but they are an absolutely vital tool for astronomers to reveal the hidden properties of the Universe – facts you just cannot discover even in the sharpest of images. This is Dr J signing off for the Hubblecast. Once again, nature has surprised us beyond our wildest imagination.		

Ends 06:13