ESOcast Episode 40: When Speed Matters — Discovery of the Accelerating Universe Wins 2011 Nobel Prize for Physics		
00:00 [Visuals start] 00:06 [Narrator] 1. In the past two decades, astronomers have made a truly revolutionary discovery: that the cosmos is not only expanding, but is doing so at an ever-faster rate. The discovery of the accelerated expansion of the Universe was awarded the 2011 Nobel Prize in Physics.		Images: Animation of accelerating Universe
00:29 ESOcast intro 2.This is the ESOcast! Cutting-edge science and life behind the scenes of ESO, the European Southern Observatory, exploring the ultimate frontier with our host Dr J, a.k.a. Dr Joe Liske.		ESOcast introduction
00:45 [Dr J] 3. Hello and welcome to the ESOcast. In this episode, we're going to find out how astronomers learned that the expansion of the Universe is speeding up and why this finding is so important not only for our understanding of the Cosmos, but in fact, for all of Physics. Now this discovery was awarded the 2011 Nobel Prize in Physics, and observations from ESO's telescopes in Chile played a significant role in this breakthrough.		Dr J in virtual studio Background images: Expanding Universe, deep Cosmos La Silla/Paranal footage
01:18 [Narrator] 4. The Universe we live in was created in the Big Bang some 13.7 billion years ago. Ever since then, the Universe has been expanding. And for decades, astronomers have wanted to learn more about the nature of this expansion. For a long time, there were two main ideas:		Deep Universe Existing galaxy fly-through Animations or telescope footage

Either the expansion would gradually slow down and would ultimately come to a halt — after which the Universe would start to contract towards a "Big Crunch". Or that the Cosmos would continue to expand forever.		
01:52 [Dr.J] 5. But how could astronomers find out which of these models of the Universe is the correct one? Well, one of the simplest ways of doing this is to accurately measure distances to very faraway galaxies, and then to compare these measurements with the predictions from these models for these particular galaxies. The comparison between the measurements and the predictions tells us which of the models is the right one. But how does this work? How can astronomers precisely determine these huge distances across the Cosmos? Well, stellar explosions, or supernovae, play a key role here.		Dr J in virtual studio Background images: Telescopes, galaxies
02:33 [Narrator] 6. Supernovae are rare cosmic events: They are exploding stars. There is a certain type of explosion, known as a Type la Supernova, which is ideal for measuring distances in the cosmos. These supernovae are very bright, which means they can be seen even in distant galaxies. And what's more their intrinsic brightness's are always the same, meaning that their distances can be inferred from how bright they appear to us from Earth. By the 1990s two separate research teams had begun to carefully observe these exploding stars. For their studies, astronomers partly used telescopes at ESO's La Silla observatory in Chile.		Animation of supernovae type la Animation of distant galaxy with supernova La Silla Footage
03:20 [Statement Spyromilio] 7. "Observing extremely distant supernovae in the mid 1990s was extremely challenging and exciting. We at ESO used the 3.6-metre, the NTT and the 1.5-metre telescopes to observe these high-redshift supernovae discovered at the nearby Tololo Observatory. In those days, 15 years ago, we were actually counting literally every single photon, which is a beautiful experiment to be part of, because it was extremely challenging. The critical component of all of this is of course to realise that we did not set out to find the accelerating Universe, so watching a		Jason Spyromilio

new paradigm in physics establish itself has of course been very interesting and it's been great fun."		
04:00 [Statement Leibundgut] 9. "Once we had established that the distant supernovae were too far away for a Universe that was dominated by gravity we had to go back and measure this again. So the accelerated expansion that we measured with the first set of supernovae which then was translated very quickly into a new component for cosmology - dark energy - we had to confirm that result. What we did is we asked for VLT time like other groups as well (several other groups did the same thing) to confirm what we had measured to get better data with a bigger telescope and to get a better sampling of the supernovae themselves."		Bruno Leibundgut
04:38 [DrJ] 10. The discovery of the accelerating expansion of the Universe was one of the most unexpected and important of the last decades. It was so unexpected because up until that point, everyone believed that the expansion of the Universe should be slowed down by the attractive force of gravity exerted by all of the matter in the Universe. But, as it turns out, the Universe is in fact much more interesting than that. But why is this acceleration so important? Well, as far as we know, there are two possible explanations for the acceleration: The number one explanation is that nearly ¾ of the Universe consist of some form of this mysterious dark energy. Dark energy is so mysterious because it exerts negative pressure. That's pretty exotic stuff. The number two explanation is that there is something wrong with our understanding of gravity. In other words, that Einstein's theory of general relativity is not quite correct. In either of these cases, we are confronted with completely new physics, and that's why this is so important and why this discovery was awarded the 2011 Nobel Prize in Physics. This is Dr J signing off for the ESOcast. Join me again next time for another cosmic adventure		Dr J in virtual studio Background images: Expanding Universe Telescopes
06:00 [Outro]		ESOcast is produced by ESO, the European Southern Observatory. *ESO, the European Southern Observatory, is the pre-eminent intergovernmental science and*

		technology organisation in astronomy designing, constructing and operating the world's most advanced ground-based telescopes.

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