ESOcast Episode 46: Catching Light Special 50th anniversary episode #6		
00:00 **[Visuals start]**		**Images:**
00:50 **[Narrator]** 1. For half a century, the European Southern Observatory has showcased the splendour of the Universe.		Slow pan/zoom on some of the most beautiful cosmic images
01:03 **[Narrator]** 2. Starlight rains down on the Earth. Giant telescopes catch the cosmic photons, and feed them to state-of-the-art cameras and spectrographs.		Slowly rotating skies above ESO telescopes. Animation (?) of starlight passing through telescopes and instruments.
01:18 **[Narrator]** 3. Today's astronomical images are very different from those of the 1960s.		Scientists studying photos on monitor.
01:24 **[Narrator]** 4. When ESO began, back in 1962, astronomers used large photographic glass plates.		Historic footage of astronomers working with photographic plates.
01:31 **[Narrator]** 5. Not very sensitive, imprecise, and hard to handle.		Dark room activities; examples of old astronomical images.
01:41 **[Narrator]** 6. What a difference today's electronic detectors have made!		Crossfade from old B&W photo to colourful, detailed CCD image of the Tarantula Nebula.
01:45 **[Narrator]** 7. They catch almost every photon.		Extreme closeup, showing pixels. Scientists working on images on computer consoles.

The images are available instantaneously. And, most importantly, they can be processed and analyzed by computer software.		
01:58 **[Narrator]** 8. Astronomy has truly become a digital science.		Astronomical images.
02:09 **[Dr J]** 9. ESO telescopes use some of the largest and most sensitive detectors in the world.		Dr J walks in front of the VISTA telescope.
02:14 **[Dr J]** 10. The VISTA camera has no less than 16 of them, for a total of 67 million pixels.		Dr J at back of VISTA telescope
02:24 **[Narrator]** 11. This huge instrument catches infrared light from cosmic dust clouds, newborn stars and distant galaxies.		Examples of VISTA images.
02:40 **[Narrator]** 12. Liquid helium keeps the detectors at minus 269 degrees.		VISTA operator at back of telescope
02:46 **[Narrator]** 13. VISTA takes an inventory of the southern sky, like an explorer surveying an unknown continent.		VISTA operator walks away from telescope
02:56 **[Dr J]** 14. The VLT Survey Telescope is another discovery machine, but this one works at visible wavelengths.		Outside view of VST, Dr J entering
03:08 **[Narrator]** 15. Its camera, called OmegaCAM, is even larger. 32 CCDs team up to produce spectacular images with a mind-boggling 268 million pixels.		Dr J at OmegaCAM camera.
03:25 **[Narrator]** 16.		Astronomical images.

The field of view is one square degree — four times as large as the full Moon.		
03:34 **[Narrator]** 17. OmegaCAM generates fifty gigabytes of data every night.		OmegaCAM view.
03:40 **[Narrator]** 18. And these are just gorgeous gigabytes.		More OmegaCAM images.
03:46 **[Dr J]** 19. Survey telescopes like VISTA and the VST also mine the sky for rare and interesting objects. Astronomers then use the sheer power of the VLT to study these objects in exquisite detail.		Close up of Dr J talking (at VLT platform). Zoom out: VLT becomes visible.
04:04 **[Dr J]** 20. Each of the VLT's four telescopes has its own set of unique instruments, each with its own particular strengths.		Interior views of VLT Unit Telescope, eventually focussing on instrument(s). (SINFONI)
04:12 **[Dr J]** 21. Without these instruments, ESO's giant eye on the sky would be - well - blind.		Dr J at UT4 instrument (HAWK-I)
04:21 **[Narrator]** 22. They have fanciful names like ISAAC, FLAMES, HAWK-I and SINFONI. Giant high-tech machines, each the size of a small car.		More images of some of the instruments, including interior views (optical benches, filters, etc etc).
04:34 **[Narrator]** 23. Their purpose: to record the cosmic photons and recover every possible bit of information.		
04:43 **[Dr J]** 24. All of the instruments are unique, but some are a little more special than others. For example, NACO and SINFONI make use of the VLT's adaptive optics system.		Dr J at NACO, in UT4

04:58 **[Narrator]** 25. Lasers produce artificial stars that help astronomers to correct for atmospheric blurring.		Night view of Paranal with lasers.
05:11 **[Narrator]** 26. NACO's images are as sharp as if they were taken from outer space.		Examples of AO images.
05:18 **[Narrator]** 27. And then there's MIDI, and AMBER. Two interferometric instruments.		Interior view(s) of interferometry lab (?)
05:26 **[Narrator]** 28. Here, lightwaves from two or more telescopes are brought together, as if they were captured by one giant, single mirror.		Tunnels, moving delay lines, high-tech atmosphere.
05:36 **[Narrator]** 29. The result: the sharpest views you can imagine.		If possible: examples of compelling interferometric results (?)
05:44 **[Dr J]** 30. But astronomy is not only about taking images.		Dr J at VLT platform
05:47 **[Dr J]** 31. If you're after the details, you have to dissect the starlight and study its composition.		Dr J at VLT platform, with prism
05:56 **[Narrator]** 32. Spectroscopy is one of astronomy's most powerful tools.		Animation that zooms in on a rainbow, revealing subtle spectral lines, that then change into a graph-like spectrum
06:05 **[Narrator]** 33. No wonder ESO boasts some of the world's most advanced spectrographs, like the powerful X-Shooter.		X-Shooter (if it's visually attractive J)
06:13 **[Narrator]** **34.** Images carry more beauty, but spectra reveal more information.		Scientists at monitors studying spectra; discussing with each other, pointing at details.

06:22 **[Narrator]** **35.** Composition. Motions. Ages.		Animation of astrophysical concepts, with spectra overlaid
06:34 **[Narrator]** **36.** The atmospheres of exoplanets, orbiting distant stars. Or newborn galaxies at the edge of the observable Universe.		Again: artist's concepts and/or photographs of these topics, with spectra overlaid
06:50 **[Dr J]** **37.** Without spectroscopy, we would just be explorers staring at a beautiful landscape.		Dr J in the desert
06:55 **[Dr J]** **38.** With spectroscopy, we learn about the landscape's topography, geology, evolution and composition.		Animation that turns the landscape into a scientifically rich tapestry (with graphs, contour lines, numbers, etc etc).
07:12 **[Narrator]** **39.** And there's one more thing.		Dr J looking out over landscape which is normal again, sunset scene from Paranal
07:17 **[Narrator]** **40.** Despite its serene beauty, the Universe is a violent place.		Timelapse of dusk setting in on Paranal; stars appear
07:24 **[Narrator]** **41.** Things go bump in the night, and astronomers want to catch each and every event.		Transient events.
07:33 **[Narrator]** **42.** Massive stars end their lives in titanic supernova explosions.		Animation of supernova.
07:45 **[Narrator]** **43.** Some cosmic detonations are so powerful that they briefly outshine their parent galaxy, flooding intergalactic space with invisible, high-energy gamma rays.		Animation of gamma-ray burst.
07:59 **[Narrator]**		Satellite catches gamma-rays; sends alert to the ground. (animation)

44. Small robotic telescopes respond to automatic alerts from satellites. Within seconds, they swing into position to study the aftermaths of these explosions.		REM or TAROT (La Silla) swing into position (real view, with sounds of motor drives)
08:12 **[Narrator]** **45.** Other roboscopes focus on less dramatic events, such as distant planets that pass in front of their mother stars.		View of TRAPPIST at La Silla; animation of transiting planet in background
08:23 **[Narrator]** **46.** The cosmos is in a constant state of flux. ESO tries not to miss a single heartbeat.		Views of astronomical research activities: people
08:33 **[Narrator]** **47.** Cosmology is the study of the Universe as a whole. Its structure, evolution and origin.		Galaxy fly-through
08:44 **[Narrator]** **48.** Here, catching as much light as possible is of the essence. These galaxies are so far away that only a handful of photons reach the Earth.		Crossfade to similarly rotating/zoomout view of deep field image, revealing hundreds of galaxies.
08:58 **[Narrator]** **49.** But these photons hold clues to the cosmic past. They have travelled for billions of years. They paint a picture of the early days of the Universe.		A few close-ups, like mergers/colliding galaxies, groups and clusters, etc.
09:10 **[Narrator]** **50.** That's why big telescopes and sensitive detectors are so important.		VLT rotating.
09:16 **[Narrator]** **51.** Over the past fifty years, ESO telescopes have revealed some of the most distant galaxies and quasars ever observed. They even helped to uncover the distribution of dark matter, the nature of which is still a mystery.		A few more images, including (at the end) composite image showing pink intracluster gas and blue dark matter distribution (combination of Hubble, Chandra, VLT)

09:41 **[Narrator]** **52.** Who knows what the next fifty years will bring?		Laser Guide Star and the Milky Way over Cerro Paranal
09:50		**[Outro]**

10:56 END