



<p><b>ESOCast Episode 47: Finding Life</b>  <b>Special 50<sup>th</sup> anniversary episode #7</b></p>	
<p><b>00:00</b>  <b>[Visuals start]</b></p>	<p><b>Images:</b></p>
<p><b>00:45</b>  <b>[Dr J]</b>  1.  Have you ever wondered about life in the Universe? Inhabited planets orbiting distant stars?</p>	<p>Dr J, close up, with La Silla observatory panorama in background</p>
<p><b>00:52</b>  <b>[Dr J]</b>  2.  Astronomers have - for centuries.</p>	<p>Dr J, close up, with La Silla observatory panorama in background</p>
<p><b>00:55</b>  <b>[Dr J]</b>  3.  After all, with so many galaxies, and each with so many stars, how could the Earth be unique?</p>	<p>Dr J, close up, with La Silla observatory panorama in background</p>
<p><b>01:02</b>  <b>[Dr J]</b>  4.  In 1995, Swiss astronomers Michel Mayor and Didier Queloz were the first to discover an exoplanet orbiting a normal star.</p>	<p>Another view of La Silla with Dr J in the foreground</p>
<p><b>01:12</b>  <b>[Dr J]</b>  5.  Since then, planet hunters have found many hundreds of alien worlds. Large and small, hot and cold, and in a wide variety of orbits.</p>	<p>Artist impressions of exoplanetary systems</p>
<p><b>01:22</b>  <b>[Dr J]</b>  6.  Now, we're on the brink of discovering Earth's twin sisters.</p>	<p>Dr J, close up, with La Silla observatory panorama in background</p>
<p><b>01:27</b>  <b>[Dr J]</b>  7.  And in the future: a planet with life – the Holy Grail</p>	<p>Exoplanet animation</p>

of astrobiologists.		
<b>01:39</b> <b>[Narrator]</b> 8. The European Southern Observatory plays an important role in the search for exoplanets.		ESO sign at start of La Silla road
<b>01:46</b> <b>[Narrator]</b> 9. Michel Mayor's team found hundreds of them from Cerro La Silla, ESO's first Chilean foothold.		Views from the road to La Silla, ending with panorama.
<b>01:55</b> <b>[Narrator]</b> 10. Here's the CORALIE spectrograph, mounted on the Swiss Leonhard Euler Telescope.  It measures the tiny wobbles of stars, caused by the gravity of orbiting planets.		Close-up of CORALIE Overview of Leonhard Euler telescope
<b>02:08</b> <b>[Narrator]</b> 11. ESO's venerable 3.6-metre telescope is also hunting for exoplanets.		Outside and inside views of the ESO 3.6-metre telescope
<b>02:16</b> <b>[Dr J]</b> 12. The HARPS spectrograph is the most accurate in the world. So far, it has discovered more than 150 planets.		Dr J at HARPS
<b>02:28</b> <b>[Narrator]</b> 13. Its biggest trophy: a rich system containing at least five and maybe as many as seven alien worlds.		Artist's impression of HD10180
<b>02:48</b> <b>[Dr J]</b> 14. But there are other ways to find exoplanets.		Dr J walking on La Silla towards the Danish 1.54-metre telescope, and into building.
<b>02:58</b> <b>[Dr J]</b> 15. In 2006, the 1.5-metre Danish telescope helped to discover a distant planet that is just five times more massive than the Earth.		Dr J in the dome of the Danish 1.54-metre telescope.
<b>03:12</b> <b>[Narrator]</b>		Animation explaining gravitational microlensing Artist impression of the planet

<p>16. The trick? Gravitational microlensing. The planet and its parent star passed in front of a brighter star in the background, magnifying its image.</p>	
<p><b>03:26</b> <b>[Narrator]</b> 17. And in some cases, you can even capture exoplanets on camera.</p>	<p>Exoplanet animation.</p>
<p><b>03:34</b> <b>[Narrator]</b> 18. In 2004 NACO, the adaptive optics camera on the Very Large Telescope took the first image ever of an exoplanet.</p>	<p>More OmegaCAM images.</p>
<p><b>03:45</b> <b>[Narrator]</b> 19. The red dot in this image is a giant planet orbiting a brown dwarf star.</p>	<p>Picture of 2M1207</p>
<p><b>03:54</b> <b>[Narrator]</b> 20. In 2010, NACO went one step further.</p>	<p>NACO instrument</p>
<p><b>04:01</b> <b>[Narrator]</b> 21. This star is 130 light-years away from Earth. It is younger and brighter than the Sun, and four planets circle around it in wide orbits.</p>	<p>Keck image of HR8799 system</p>
<p><b>04:13</b> <b>[Narrator]</b> 22. NACO's eagle-eyed vision made it possible to measure the light of planet c — a gas giant ten times more massive than Jupiter.</p>	<p>Zoom-in on VLT/NACO image of HR8799 with planet c, artist's impression</p>
<p><b>04:25</b> <b>[Narrator]</b> 23. Despite the glare of the parent star, the feeble light of the planet could be stretched out into a spectrum, revealing details about the atmosphere.</p>	<p>Animation(s) of obtained spectrum</p>
<p><b>04:36</b> <b>[Narrator]</b> 24. Today, many exoplanets are discovered when they transit across their parent stars.</p>	<p>Animation of planetary transit</p>
<p><b>04:43</b> <b>[Narrator]</b></p>	<p>Closeup of transit, with accompanying graph of star's brightness</p>

<p>25. If we happen to see the planet's orbit edge-on, it will pass in front of its star every cycle. Thus, tiny, regular brightness dips in the light of a star betray the existence of an orbiting planet.</p>	
<p><b>04:59</b> <b>[Dr J]</b> 26. The TRAPPIST telescope at La Silla will help search for these elusive transits.</p>	<p>Dr J and the TRAPPIST telescope.</p>
<p><b>05:05</b> <b>[Narrator]</b> 27. Meanwhile, the Very Large Telescope has studied a transiting planet in exquisite detail.</p>	<p>Artist impression of GJ1214b</p>
<p><b>05:14</b> <b>[Narrator]</b> 28. Meet GJ1214b, a super-Earth 2.6 times larger than our home planet.</p>	<p>Artist impression of GJ1214b</p>
<p><b>05:23</b> <b>[Narrator]</b> 29. During transits, the planet's atmosphere partly absorbs the light of the parent star.</p>	<p>Animation of starlight being filtered by planet's atmosphere during transit</p>
<p><b>05:34</b> <b>[Narrator]</b> 30. ESO's sensitive FORS spectrograph revealed that GJ1214b might well be a hot and steamy sauna world.</p>	<p>Animation/artis impression of sauna world</p>
<p><b>05:46</b> <b>[Narrator]</b> 31. Gas giants and sauna worlds are inhospitable to life.  But the hunt is not over yet.</p>	<p>Animation/artis impression of sauna world</p>
<p><b>05:54</b> <b>[Narrator]</b> 32. Soon, the new SPHERE instrument will be installed at the VLT.  SPHERE will be able to spot faint planets in the glare of their host stars.</p>	<p>Views of SPHERE</p>
<p><b>06:06</b> <b>[Narrator]</b> 33. In 2016, the ESPRESSO spectrograph will arrive at the VLT and greatly surpass the current HARPS</p>	<p>Computer drawings of ESPRESSO</p>

instrument.		
<b>06:17</b> <b>[Narrator]</b> 34. And ESO's Extremely Large Telescope, once completed, may well find evidence for alien biospheres.		Animation of E-ELT
<b>06:30</b> <b>[Narrator]</b> 35. [Start with few seconds silence] On Earth, life is abundant.		Landscape, animals, closeup of flying condor
<b>06:37</b> <b>[Narrator]</b> 36. Northern Chile offers its share of condors, vicuñas, vizcachas and giant cacti.		Views of other Altiplano lifeforms
<b>06:49</b> <b>[Dr J]</b> 37. Even the arid soil of the Atacama desert teems with hardy microbes.		Dr J kneeling in Atacama desert, pouring sand
<b>06:57</b> <b>[Narrator]</b> 38. We've found the building blocks of life in interstellar space.		Molecular clouds / nebulae
<b>07:03</b> <b>[Narrator]</b> 39. We've learnt that planets are abundant.		Exoplanet artist impressions
<b>07:10</b> <b>[Narrator]</b> 40. Billions of years ago, comets brought water and organic molecules to Earth.		Comet animations
<b>07:17</b> <b>[Narrator]</b> 41. Wouldn't we expect the same thing to happen elsewhere?  Or are we alone?		Cosmic scenes with Earth-like planet
<b>07:30</b> <b>[Dr J]</b> 42. It's the biggest question ever.  And the answer is almost within reach.		Dr J in desert; Zoom out to reveal VLT in distance. Dr J stands up and walks away, in the direction of Paranal.

07:45

[Outro]

08:51 END