



Key words: Big Telescopes, ELT, Science, Engineering, International Collaboration, Society

<p>Why Do We Even Need Big Telescopes? (ESOcast Episode 241)</p>	
<p>00:00 Pre-intro</p> <p>Maria-Rosa Cioni: <i>“Hi! So my name is Maria-Rosa Cioni. I’m a joint professor at the Leibniz Institute for Astrophysics and the University of Potsdam and my favorite objects are the Magellanic Clouds, which you can also see by naked eye if you travel to ESO Chile for example.”</i></p>	<p>Caption: “Maria-Rosa Cioni – Astronomer Leibniz Institute for Astrophysics Potsdam, Germany”</p>
	<p>TYPO: What does ESO mean to you?</p>
<p>00:21:00 Maria-Rosa Cioni: <i>“Uhm... yeah, it’s my... let’s say... For me it’s my eye to the Universe. [laughter]”</i></p>	
<p>00:31:00 Video intro // New ESOcast intro</p>	<p>New ESOcast introduction</p>
<p>00:39:00 TITLE</p>	<p>Why Do We Even Need Big Telescopes?</p>
<p>00:45:00 SCIENCE</p>	<p>PLATE: SCIENCE</p>

<p>00:50:00</p> <p>Narration: ESO telescopes have been helping us study our Universe in ever more detail and look to the furthest reaches of the cosmos. With them, scientists have been able to make breakthrough discoveries such as the acceleration of the Universe and proof of the black hole at the centre of our galaxy.</p>	
<p>01:09:00</p> <p>Didier Queloz: <i>"You will have plenty of what I call crazy astronomers with crazy ideas coming, and they say: We want to look at black holes! We want to listen for the beginning of the Universe! We want to detect life on planets. And we're doing that! I mean, we're observing black holes. We're detecting atmosphere of planets. We are hearing the beginning of the universe."</i></p> <p>Didier Queloz: <i>"ESO has always been a key player as part of my activity for a very good reason: I think this is an amazing structure that gives you access to the very best telescope in the world right now."</i></p> <p>Amina Helmi: <i>"The first time I got involved in an ESO project was to measure how the stars in small galaxies around the Milky Way were moving. And so I joined colleagues from different countries in Europe and we put together a large program. And through that program, actually, I developed a new line of research."</i></p>	<p>Caption: "Didier Queloz – Nobel Prize Laureate Uni. Cambridge, UK / Uni. Geneva, Switzerland"</p> <p>Caption: "Amina Helmi – ESO Council Member Kapteyn Astronomical Institute, the Netherlands"</p>
<p>02:06:00</p> <p>Narration: Achievements like this are enabled because ESO is building ever better equipment, more advanced instruments... and bigger telescopes.</p>	
<p>02:18:00</p> <p>Maria-Rosa Cioni: <i>"When you come to ESO and you get to use <u>the</u></i></p>	

<p><i>ESO telescopes it's a different level. It really gives you this spark of being at the edge of technology."</i></p>	
<p>02:27:00 ENGINEERING</p>	<p>PLATE: "SCIENCE -> ENGINEERING"</p>
<p>02:32:00 Narration: Our laser guide stars and other developments in the field of adaptive optics have made it possible to study astronomical objects in stunning detail. Such advances are only possible when scientists and engineers join forces and aim high.</p>	
<p>02:51:00 Didier Queloz: <i>"You need crazy astronomers telling you what is next because this craziness practically is a fantastic push."</i></p> <p>Didier Queloz: <i>"When Galilei is using a telescope he's using a device done by some engineer, some glass polisher. Of course he will be using it in a very specific way and that will push the designer. The polisher will try to get better. This will reflect on the capability of these people to build better glasses to better read and to better see."</i></p>	
<p>03:32:00 Narration: Since Galileo Galilei's time, telescope lenses and mirrors have become bigger and bigger, revealing more and more of the Universe around us.</p> <p>And by joining forces with astronomers, engineers have leaped forward in other fields, such as optics, sensors and their applications in other areas, like medicine.</p> <p>Today, many of ESO's telescope mirrors are produced by SCHOTT and are made out of Zerodur, a glass-ceramic that retains its shape</p>	

<p>even under the most extreme conditions.</p>	
<p>04:16:00 Janina Krieg <i>“ESO always challenged us with very ambitious projects. Can you have a four meter blank? Can you have an eight meter blank? Can you have a better expansion class? Can you do different shapes? We took that challenge and we said ‘yes, we’re going to try it!’”</i></p>	<p>Caption: “Janina Krieg – Product Manager SCHOTT AG, Germany”</p>
<p>04:36:00 Narration: Since its introduction, Zerodur has found its way into our everyday lives with a whole host of applications: from the production of displays and microchips, to measurement tools and stove tops. Currently, SCHOTT is producing mirror segments for ESO’s most ambitious project yet – the Extremely Large Telescope. The ELT will collect 15 times more light than the largest optical telescope today. With it, astronomers will be able to unlock the mysteries of the Universe and probe parts of the cosmos that we haven’t been able to explore yet.</p>	
<p>05:21:00 Maria-Rosa Cioni: <i>“The moment you have a larger telescope it means you can go further and further. I work with galaxies where you can observe individual stars – so my Universe stops where the largest telescope today allows me to see individual stars in a given galaxy</i></p> <p>Didier Queloz: <i>“It’s pretty obvious that with a big telescope you do big stuff. And you will be able to see things that was impossible before. We’re going to see things and we’re going to be surprised.”</i></p> <p>Didier Queloz: <i>“Building a telescope of the size of the ELT is really the front edge of any engineering you can</i></p>	

<p><i>think about.”</i></p> <p>Janina Krieg: <i>“We are proud to contribute to really challenging engineering projects that drive borders of what’s physically possible.”</i></p> <p>Amina Helmi: <i>“Building this massive telescope requires the industries in the member states to rise up to what’s needed.”</i></p>	
<p>06:16:00 INTERNATIONAL COLLABORATION</p>	<p>PLATE: “INTERNATIONAL COLLABORATION”</p>
<p>06:21:00</p> <p>Maria-Rosa Cioni: <i>“The fact that several countries contribute to ESO has allowed to take projects of a scale that a single country could not do.”</i></p> <p>Didier Queloz: <i>“Extreme knowledge can only be reached when you have the very best people working together – and ESO is providing this.”</i></p> <p>Amina Helmi: <i>“What you get out at the end is way more than the sum of the parts. What you see is how we complement each other in Europe.”</i></p> <p>Janina Krieg: <i>“We have the mirror substrate that we grind and then they get polished in France and a lot of players in Europe and ESO member states are involved.</i></p>	

<p>07:00:00 Narration: ESO's investments are helping to generate new markets, create jobs and spark collaborations all across Europe, Chile and further afield. For example, over 30 companies and more than 50 institutes are playing a role in building the ELT, a project with an overall budget of 1.3 billion Euros.</p>	
<p>07:25:00 Amina Helmi: <i>"There is definitely this idea that we're in this together and that all of us will benefit at the end of the day."</i></p>	
<p>07:33:00 OUTLOOK</p>	<p>PLATE: "US!"</p>
<p>07:40:00 Didier Queloz: <i>"People are already discussing what's next after the ELT and that's very healthy. Because I think as a species we're built to be curious. Just look at a kid! Do you think a kid has enough? Astronomers retain the kid attitude at a very high level. And we really have a duty to share this because I think this attitude is very healthy to reconsider things that we have accepted as a fact and will help us to push forward the society"</i></p> <p>Amina Helmi: <i>I'm hoping that with the ELT we will be able to understand what our place in the universe is in concrete terms – maybe finding the answer to whether we're alone in the universe."</i></p>	
<p>08:28:00 [Outro]</p>	<p><i>Produced by ESO, the European Southern Observatory. Reaching new heights in Astronomy.</i></p>
	<p>Also interesting: https://www.eso.org/public/videos/eso-cast165a/ https://www.eso.org/public/videos/eso-cast186a/</p>

