

Industry partnerships, technology transfer to society and future workforce needs

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Big Science
Business
Forum
2024



ESO Vision



To advance humanity's understanding of the **Universe** by working with and for the astronomy community, providing it with **world-leading facilities**



ESO's Extremely Large Telescope
More than 50% complete



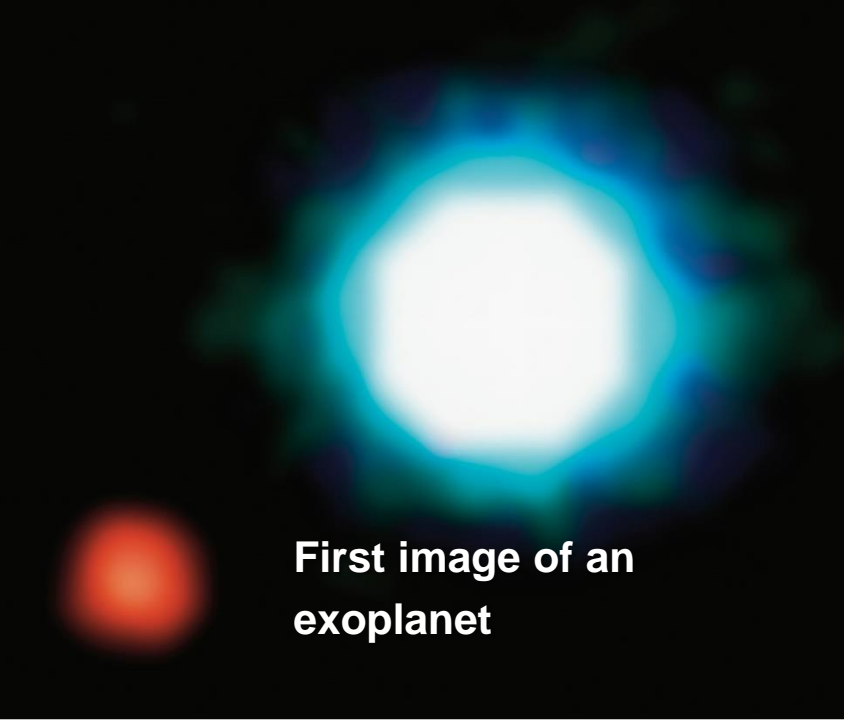
55 years
La Silla



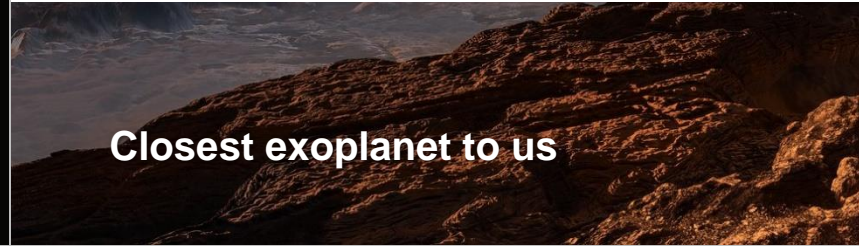
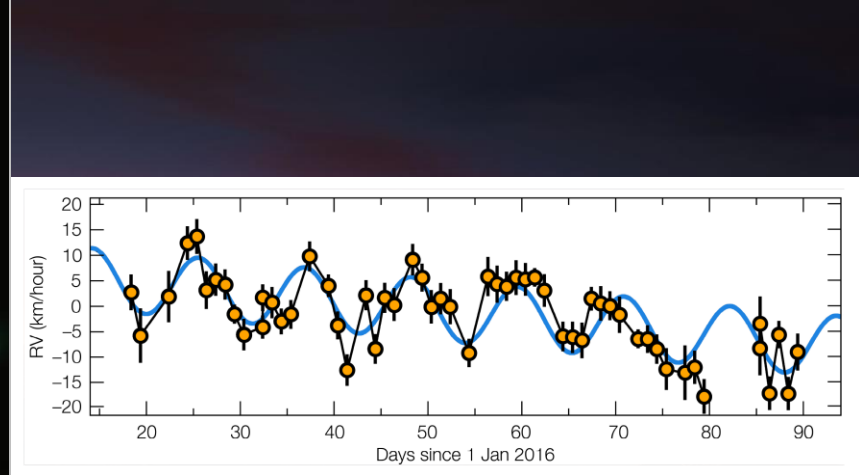
25 years
Very Large Telescope



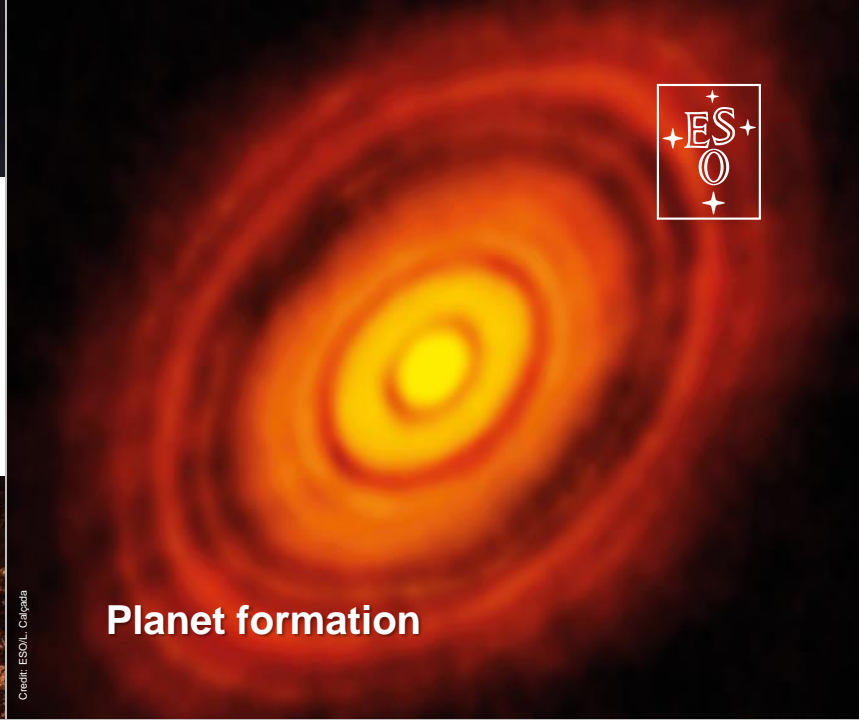
10 years
ALMA



First image of an exoplanet

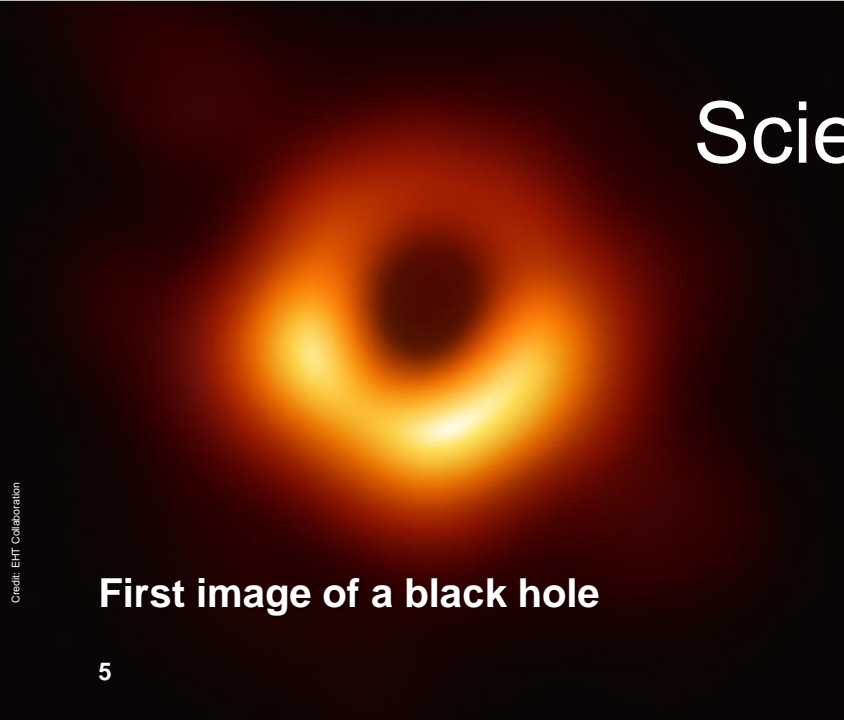


Closest exoplanet to us



Planet formation

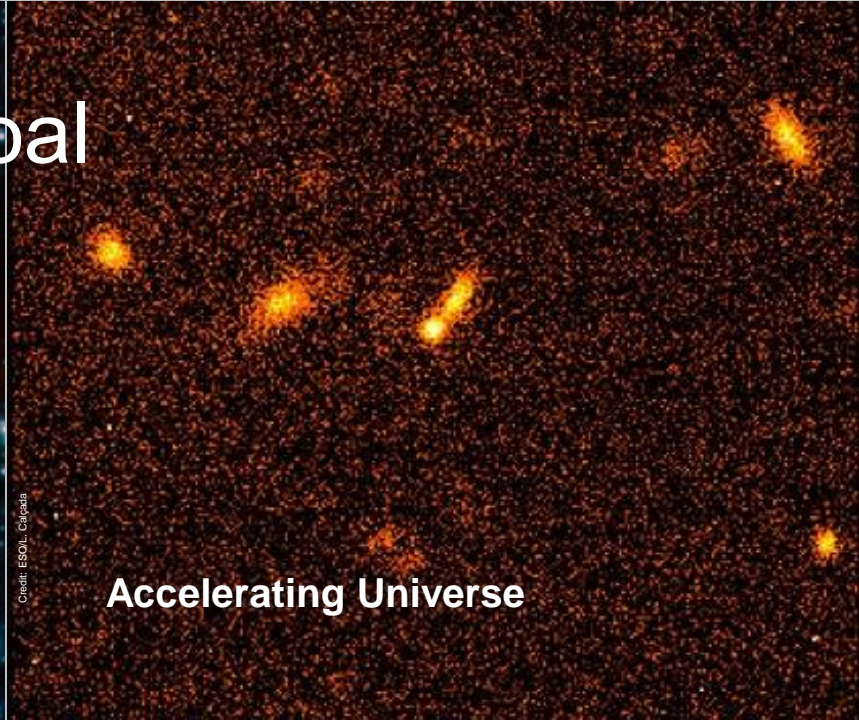
Science: ESO's ultimate goal



First image of a black hole



Black hole at the centre of the Milky Way



Accelerating Universe



Member States and Partners

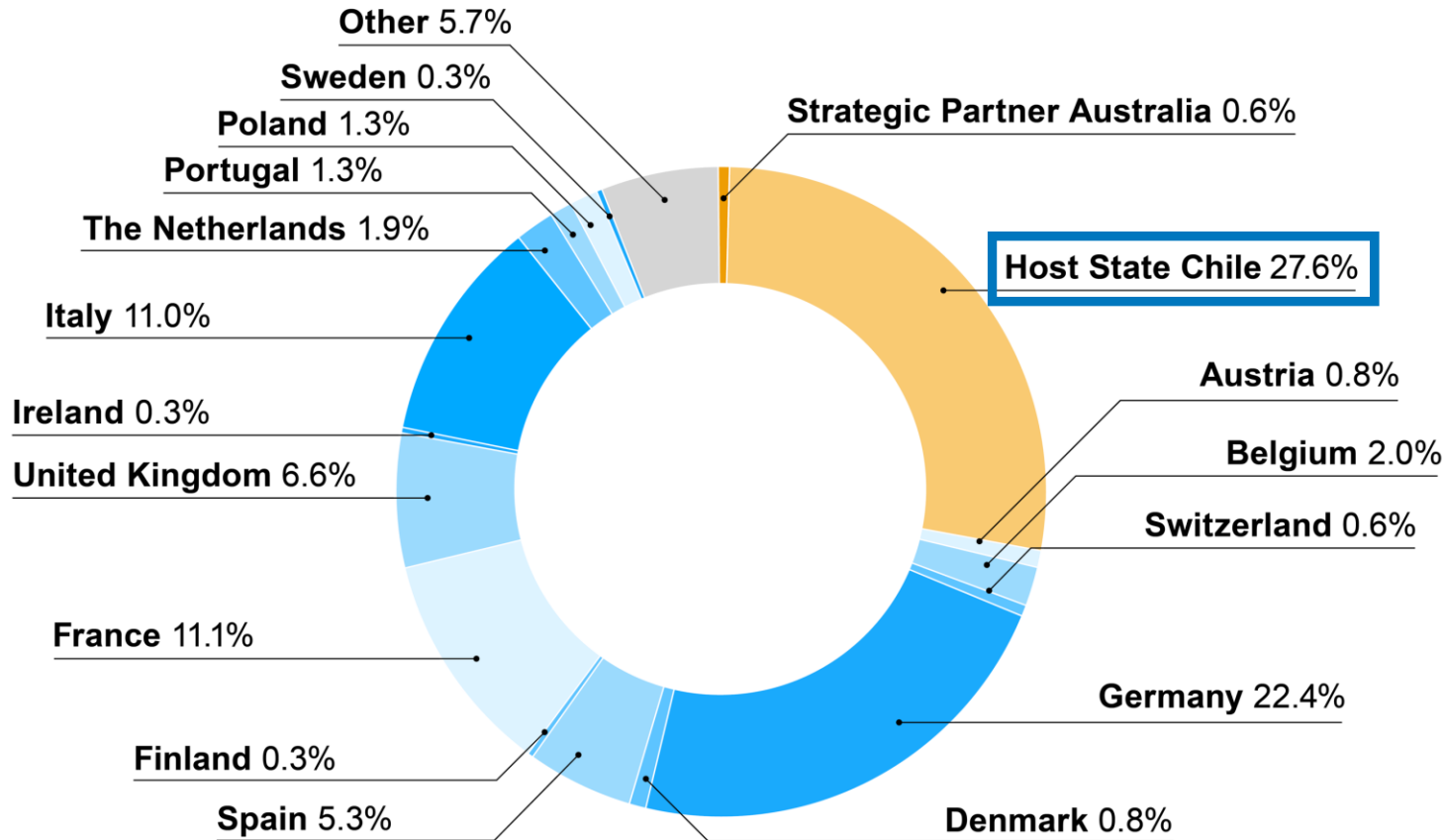
Intergovernmental
Organisation
(1962) with
16 Member States

Chile is the host state to ESO's
telescopes (since 1962)

Germany is the host state to ESO HQ

Australia is a strategic partner (2017-
2027)

ESO staff



ESO employs **more than 750 people of more than 30 nationalities**

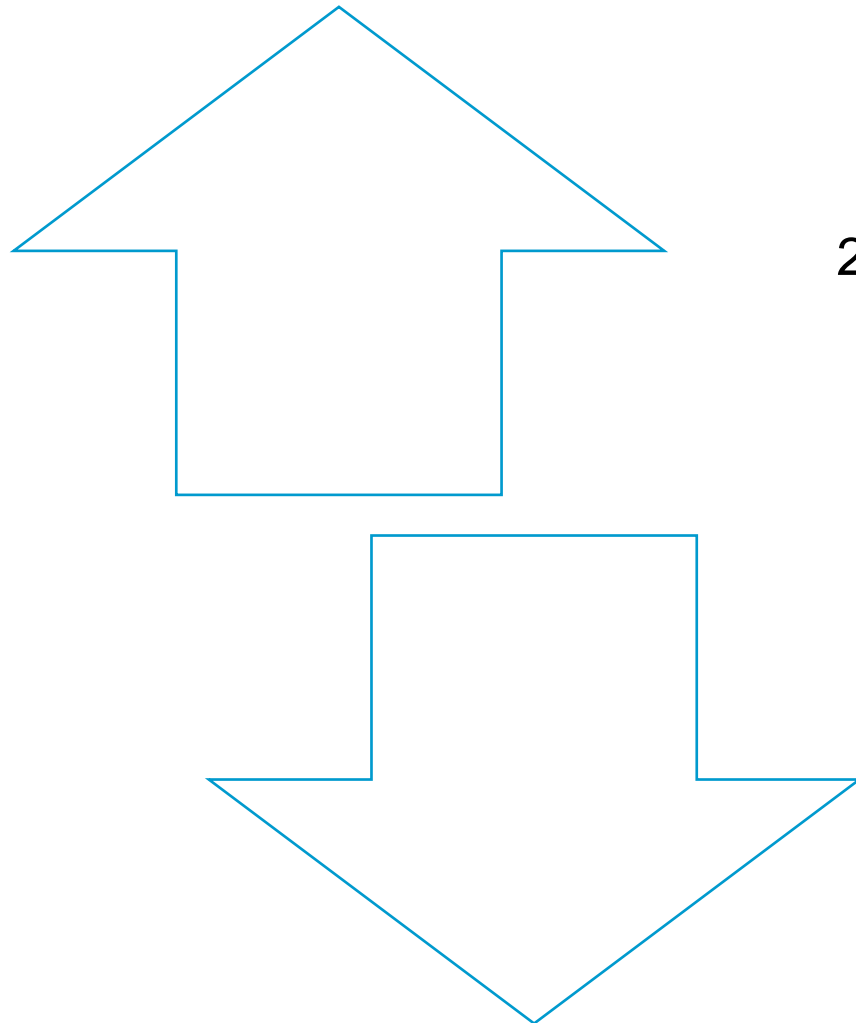
450 staff in Garching

- 27 Chileans
- 18 in Germany
- 9 in Chile

300 in Chile

- ~180 Chileans

ESO budget 2024



€228M

2024 income from Member States and Australia (in proportion to GDP)

€400M

2024 expenditure, including ELT construction costs

60% for development of new telescopes, instruments and technology

Developing new facility telescopes: large multi-national enterprises



ESO achieves what individual Member States cannot achieve alone

- Every 15-20 years, ESO develops a new facility telescope/observatory
 - La Silla 3.6m, VLT/VLTI (Paranal), ALMA (Chajnantor), ELT (Armazones), ...
 - ESO will initiate later in 2024 a process to identify its new post-ELT Programme; the process will take several years.
- **ESO** retains overall management, scientific requirements, engineering design, development oversight, assembly, integration & verification, commissioning, and handover to operations.
- Most of the actual development work is contracted to external **partner industries**.
 - These items are for the most part one-offs, for which high-tech companies need to upskill themselves
 - **ESO** produces some critical items on which we specialize (control systems, detectors, etc)



Technology Transfer

Technology Transfer for astronomy & space

Building world-class telescopes needs access to innovations, enabling technologies and potential collaborations with industry.

Space infrastructure faces additionally much tougher technical challenges

For ESO technology transfer is a two-way street:

- Know-how developed by ESO made available for use (Publications, Patents)
- Access to existing technologies developed by others, e.g. through EPO databases

Astronomy and Space activities share an important number of challenges and make use of the same (or similar) technologies in some areas.

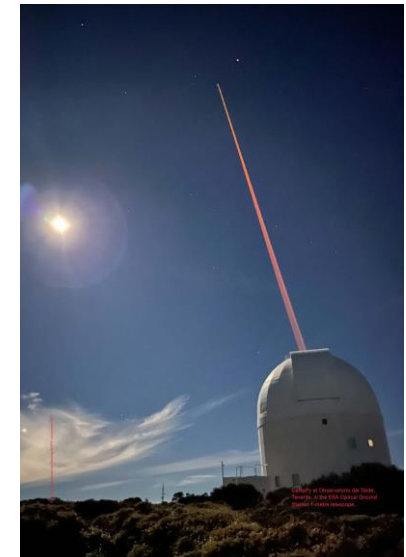
Laser Guide Stars (LGS)

LGS are artificial stars created 90 km up in the atmosphere, used to correct observations for atmospheric blur.

- The LGS development led to patent, prestigious prices, and a turn-key system for astronomy
- New markets opened for European industry and new applications tested in collaboration with ESA



Four Laser Guide Star Facility on the VLT

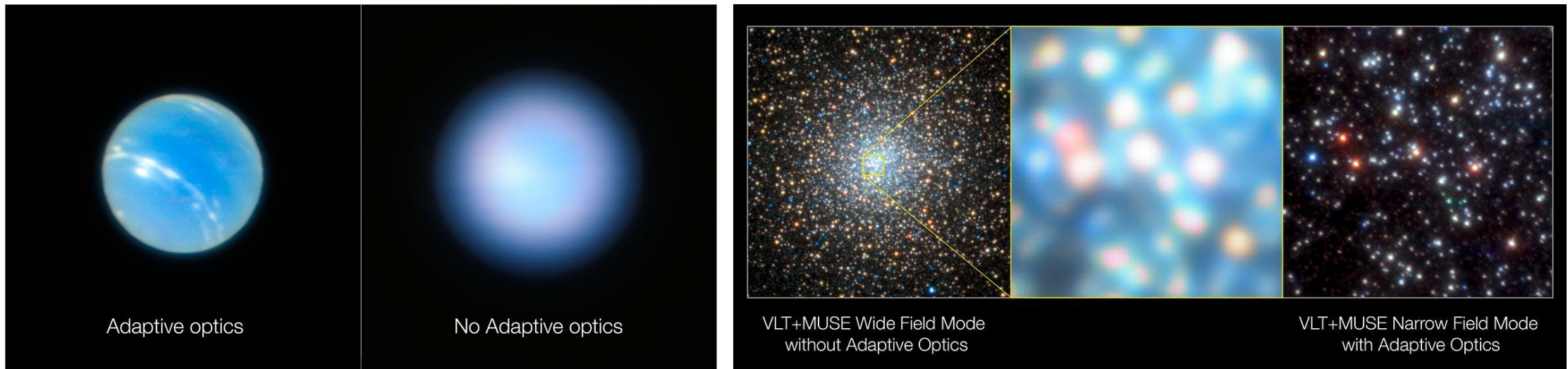


*World record led by ESO,
63W LGS on sky
CaNaPy ESO-ESA LGS demonstrator
at Teide Observatory, Tenerife*

Deformable Mirrors for Adaptive Optics

Deformable mirrors are cornerstone components of ESO AO instrumentation, allowing to reach the theoretical limit of image sharpness and be no longer limited by atmospheric blur.

- Applications in ophthalmology, microscopy, defence and space, laser physics, and microelectronics



New Detector Technologies

ESO has played a central role in the developments of two low-noise, high-speed detectors that have resulted in technology transfer to industry, subsequently resulting in commercial products

- CCD220 Detector for Adaptive Optics: World's fastest and most sensitive astronomical camera!
- SAPHIRA Infrared Detector: enabled the 2020 Nobel Prize in Physics
- Curved Detectors in Collaboration with ESA
- Applications in defence, life science, medical imaging, space optical communication



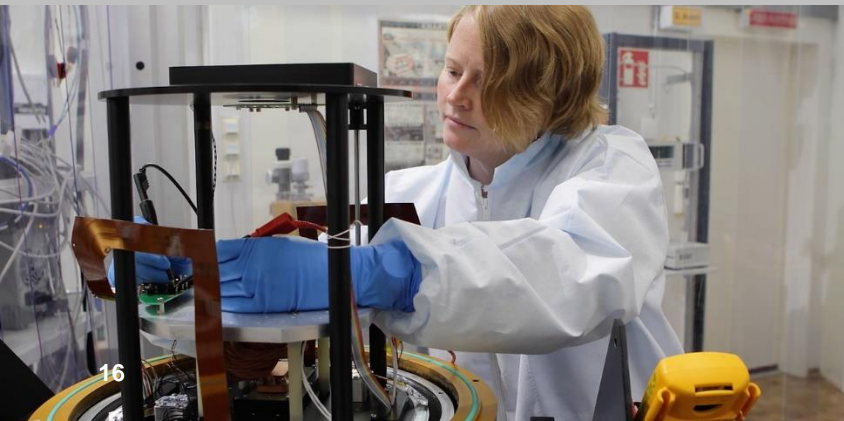
The CCD220 detector



Talent Development

Programmes for the next generations

- Competitive studentships and fellowships in astronomy and engineering
- Internships in astronomy, engineering, science communication, science policy and diplomacy, human resources
- Summer research programmes and observing summer schools





Talent development impact

260 students

from more than 40 countries in science and engineering

90 interns

in science writing, astronomy, graphic design, engineering, science policy, and administration

150 postdoctoral fellows

from more than 30 countries

800+ ESO alumni

in areas such as astronomy, space exploration, engineering, operations, information technology, education, business development, programme and project management, media & communications

Promoting STEM careers



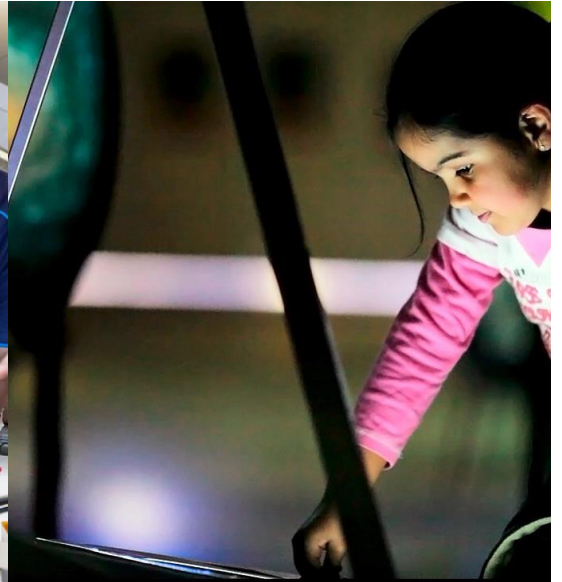
ESO AstroCamps



ESO ambassadors



ESO internships



Girls day events

Increasing Scientific Literacy



ESO enabled science in the media



ESO Supernova, teacher training & materials



Guided tours of observatories



Local outreach and project funding in Chile



Finding new Staff Members

With all what was presented, it must be easy for ESO to find new staff members!

Not always ...



Knowledge about ESO

All astronomers know ESO, but what about the public?



- First picture of black hole -> known by 'everyone'
- Telescopes in Chile -> known by many people
- ESO as organization -> known by some people (often mixed up with ESA)
- ESO headquarter in Garching near Munich/Germany
-> known by little people (even little in Munich or in the TUM across the street)

And the ones knowing ESO and its headquarter don't know that we hire not only astronomers ...



Thank you!

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