



Welcome to the La Silla Observing School!

Florian Rodler

ESO Chile





A few words about myself:

Florian Rodler

- ESO Staff Astronomer since 2016
with duties at Paranal Observatory
- before: postdocs in Spain, US and Germany
- PhD 2008 University of Vienna and MPIA Heidelberg
Thesis topic: Reflectance of Exoplanet Atmospheres

Why ESO?

- Interest in technical aspects of telescopes & instruments
- Community support
- Training of students and postdocs





LS24 Overview

Mon 12th – Thu 15th:

Workshop at ESO Chile
from 9:30 to ~18:00

Coffee breaks and lunch will
be provided by ESO

Transport from hotel to ESO

Dinner on Thu at 18:30 in
the ESO Garden

Fri 16th – Wed 21st:

Trip to La Silla
Departure Friday 9:30

Observations on
Sunday: 2p2, NTT, 3p6
Monday: 2p2, NTT, 3p6
Tuesday: 2p2, NTT

Return to Santiago on
Wednesday afternoon

Thu 22nd – Fri 23rd:

Data analysis at ESO Chile

Group presentations on
Friday afternoon





The LS24 Team



Florian Rodler



Paulina Jiron



Evelyn Johnston



Robert de Rosa



Elyar Sedaghati



Leslie Kiefer



Francesca Lucertini



Luca Sbordone





The European Southern Observatory



Some Facts about ESO

Intergovernmental research institution of **16 member states*** along with the host state of Chile and with Australia as a strategic partner.

(*Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, UK)

ESO's Vision ("Why?")

ESO's Vision is to advance humanity's understanding of the Universe by working with and for the astronomy community, providing it with world-leading facilities.

ESO's Mission ("What?")

ESO's Mission is to design, build and operate advanced ground-based observatories, and to foster international collaboration for astronomy.



Some Facts about ESO



Headquarters in Garching bei München, Munich
~550 staff (incl. 20 students + 18 fellows)



ESO Chile campus in Vitacura, Santiago de Chile
+ **observatories**: ~210 staff
(incl. 10 students + 19 fellows)



ESO Observatories



La Silla

ESO operated:
NTT 3.58 m
3.6-metre telescope

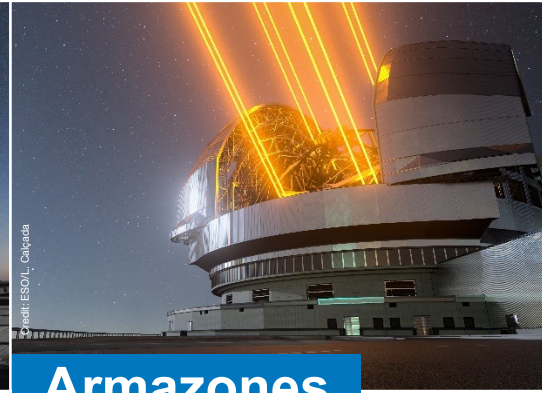
Hosted telescopes
 currently in
 operation: **14**



Paranal

ESO operated:
VLT and VLTi
 4 x 8.2 m, 4 x 1.8 m
VISTA 4.1 m

Hosted telescopes
 currently in operation:
VST, NGTS, SPECULOOS



Armazones

Under construction:
ELT 39.3 m



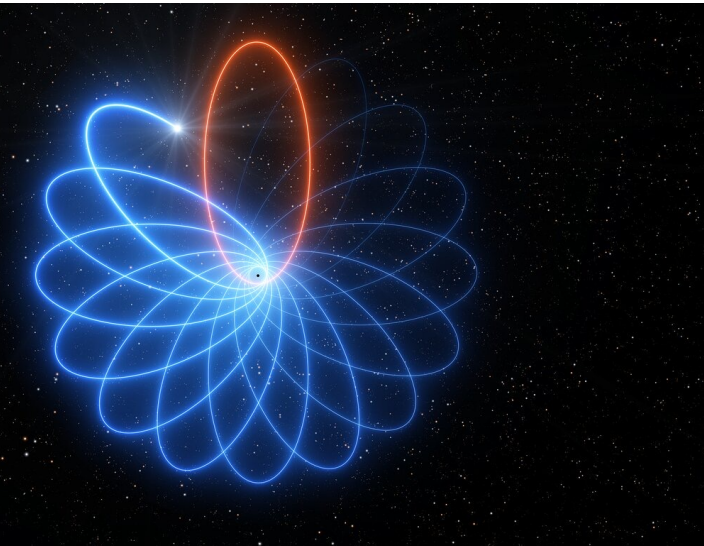
Chajnantor

ALMA
 54 x 12 m and
 12 x 7 m antennas





Top 10 Discoveries with ESO Telescopes

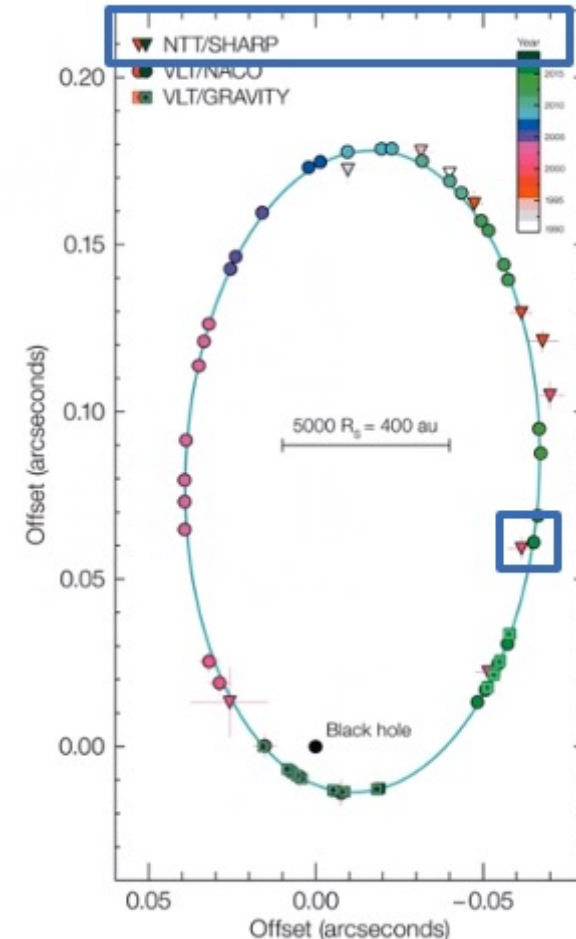


1. Stars orbiting the Milky Way supermassive black hole

The observations made with NTT and VLT have for the first time revealed the effects predicted by Einstein's general relativity on the motion of a star passing through an extreme gravitational field.

A&A, 2020, vol. 636, p. L5

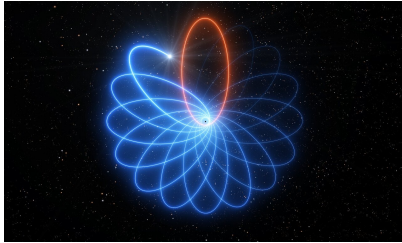
Nobel prize in Physics in 2020



<https://www.eso.org/public/science/top10/>



Top 10 Discoveries with ESO Telescopes



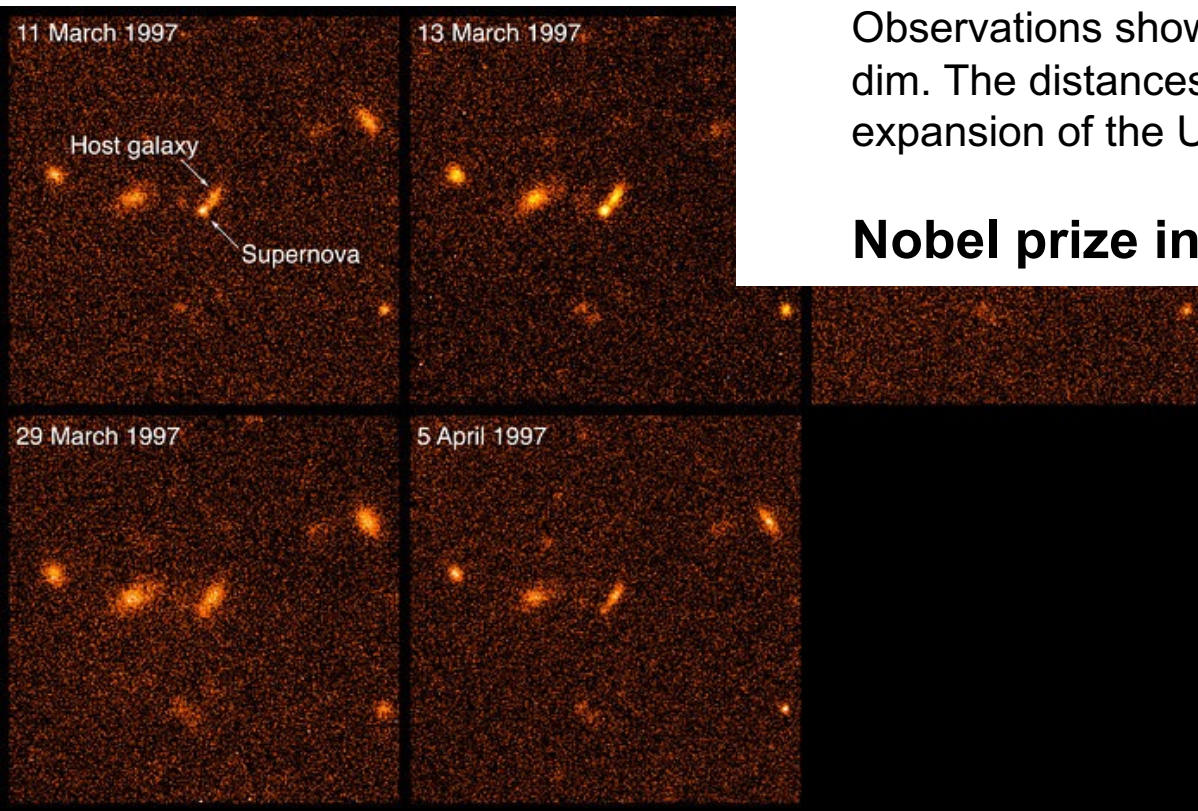
1. Stars orbiting the Milky Way supermassive black hole

The observations made with NTT and VLT have for the first time revealed the effects predicted by Einstein's general relativity on the motion of a star passing through an extreme gravitational field.

2. Accelerating Universe

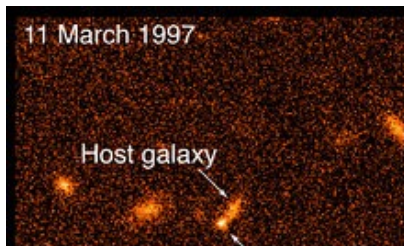
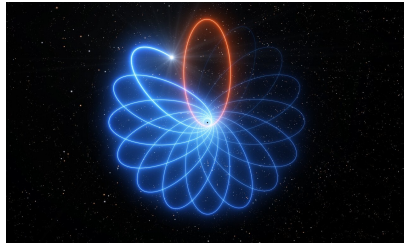
Observations show that, compared to their nearby twins, distant supernovae appear too dim. The distances to the supernovae must have increased, suggesting that the rate of expansion of the Universe must increase with time. Observations with NTT.

Nobel prize in Physics in 2011



<https://www.eso.org/public/science/top10/>

Top 10 Discoveries with ESO Telescopes



1. Stars orbiting the Milky Way supermassive black hole

The observations made with NTT and VLT have for the first time revealed the effects predicted by Einstein's general relativity on the motion of a star passing through an extreme gravitational field.

2. Accelerating Universe

Observations show that, compared to their nearby twins, distant supernovae appear too dim. The distances to the supernovae must have increased, suggesting that the rate of expansion of the Universe must increase with time. Observations with NTT.

3. Planet Found in Habitable Zone Around Nearest Star, Proxima

Proxima b, orbits its cool red parent star every 11 days and has a temperature suitable for liquid water to exist on its surface. This rocky world is a little more massive than the Earth and is the closest exoplanet to us. Observations with 3.6m.

<https://www.eso.org/public/science/top10/>



Top 10 Discoveries with ESO Telescopes

1. Stars orbiting the Milky Way supermassive black hole (LS+VLT)
2. Accelerating Universe (LS)
3. Planet Found in Habitable Zone Around Nearest Star, Proxima (LS)
4. Astronomers Capture First Image of a Black Hole (ALMA)
5. Revolutionary ALMA image reveals planetary genesis (ALMA)
6. First image of an exoplanet (VLT)
7. First light from gravitational wave source
8. First Super-Earth Atmosphere Analysed
9. Cosmic temperature independently measured
10. Record-breaking planetary system (Trappist-1)

<https://www.eso.org/public/science/top10/>





Milestones

Les soussignés, astronomes appartenant aux pays ci-après désignés: Allemagne, Belgique, France, Grande Bretagne, Pays Bas, Suède, réunis à Leyde le 25 et 26 janvier 1954.

Considérant

Que l'astronomie occupe dans la science contemporaine une position essentielle et que diverses branches de la science qui ont récemment bénéficié de ses progrès sont appelées à en bénéficier encore dans l'avenir,

Que l'étude de l'hémisphère céleste austral est beaucoup moins avancée que celle de l'hémisphère boréal, la plupart des grands instruments étant situés dans l'hémisphère terrestre nord, en particulier ceux du Mont Palomar,

Que, par suite, les données sur lesquelles repose la connaissance de la Galaxie sont loin d'avoir la même valeur dans les diverses parties du ciel et qu'il est indispensable de les améliorer et de les compléter là où elles sont insuffisantes,

Que, notamment, il est hautement regrettable que, le noyau galactique du Sagittaire, la plupart des amas globulaires, les Nuages de Magellan, les systèmes extragalactiques de Fornax et de Sculpteur, c'est-à-dire des systèmes qui n'ont pas d'équivalent dans l'hémisphère nord, soient presque inaccessibles aux plus grands instruments actuellement en service.

Qu'en conséquence, il n'y a pas de tâche plus urgente pour les astronomes que d'installer dans l'hémisphère austral de puissants instruments, comparables à ceux de l'hémisphère nord, notamment un télescope réflecteur d'au moins 3 m d'ouverture et une chambre de Schmidt de 1,20 m,

Mais que, d'autre part, faute de ressources suffisantes, aucun pays ne semble en mesure d'assurer l'élaboration et la réalisation d'un tel projet, que seule une coopération internationale permettrait de mener à bonne fin,

Que la participation à cette entreprise, de tous les pays adhérents à l'Union Astronomique Internationale, par exemple, entraînerait de grandes complications et qu'il paraît sage de limiter actuellement le nombre des participants à quelques pays voisins formant un groupe restreint,

Que ces pays de l'Europe occidentale, en s'associant pour la construction et le fonctionnement d'un observatoire commun situé en Afrique du Sud, ouvriraient aux astronomes européens un champ de recherches peu exploré et d'une grande richesse,

Que la participation à cette entreprise des six pays susmentionnés paraît indispensable pour en assurer le succès,

Emettent le voeu

Que les organisations scientifiques représentatives de ces six pays recommandent aux autorités qualifiées la construction en Afrique du Sud d'un observatoire commun, doté, notamment, d'un télescope de 3 m d'ouverture et d'une chambre de Schmidt de 1,20 m.

Ont signé:

Prof. O. Heckmann
Directeur de l'Observatoire de Hambourg

O. Heckmann

Prof. A. Unsöld
Directeur de l'Observatoire de Kiel

Albrecht Unsöld

Dr. P. Bourgeois
Directeur de l'Observatoire royal de Belgique

P. Bourgeois

Dr A. Couder
Astronome de l'Observatoire de Paris

A. Couder

Prof. A. Danjon
Directeur de l'Observatoire de Paris

A. Danjon

Prof. R. O. Redman
Directeur de l'Observatoire de Cambridge

R.O. Redman

Prof. J. H. Oort
Directeur de l'Observatoire de Leyde

J.H. Oort

Prof. P. Th. Oosterhoff
Astronome de l'Observatoire de Leyde

P.Th. Oosterhoff

Prof. P. J. van Rhijn
Directeur du Laboratoire Astronomique "Kapteyn"
Groningue

P.J. van Rhijn

Prof. B. Lindblad
Directeur de l'Observatoire de Stockholm

Bertil Lindblad

Prof. K. Lundmark
Directeur de l'Observatoire de Lund

Knut Lundmark

Prof. K. G. Malmquist
Directeur de l'Observatoire d'Uppsala

K.G. Malmquist

26 January 1954

Astronomers from six European countries signed a statement with the aim of establishing a joint observatory.

The observatory should house two modern telescopes with an initial staffing of 14 people.

André Danjon, one of ESO's founding persons, signs the statement.

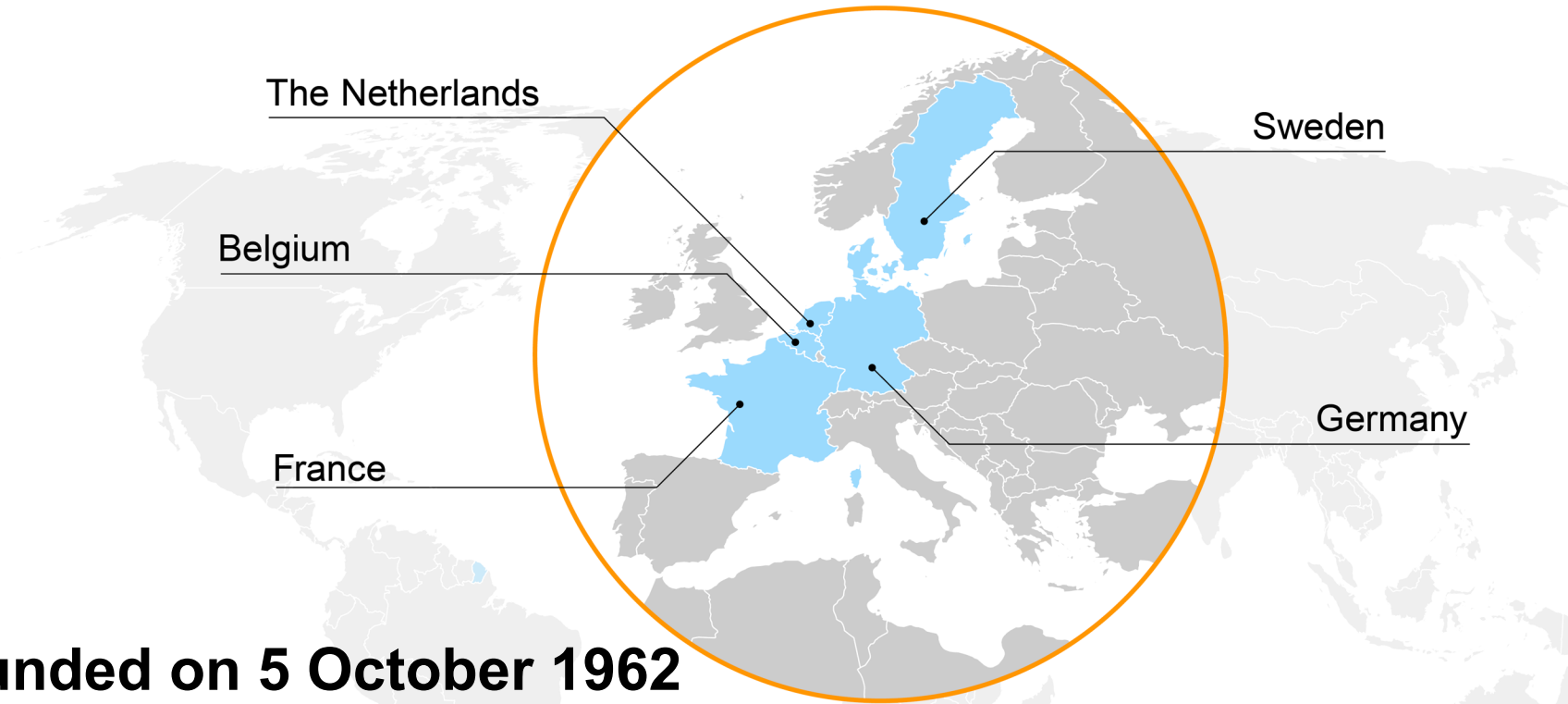


1956

*Site testing in South Africa,
later in Chile*



Founding Member States



ESO, founded on 5 October 1962
by **five** Member States

1962

In October 1959 the Ford Foundation of New York promised a donation of 1 000 000 U.S. dollars under the condition that four European countries join the ESO project. Without any doubt this promise has played an essential rôle in stimulating the countries concerned to reach an agreement. On 21 September 1964 the Ford Foundation transferred the above mentioned sum to the ESO account.



EUROPEAN SOUTHERN OBSERVATORY



ANNUAL REPORT
1964

Hamburg-Bergedorf
1965

1963

3. Convention between the Chilean Government and ESO

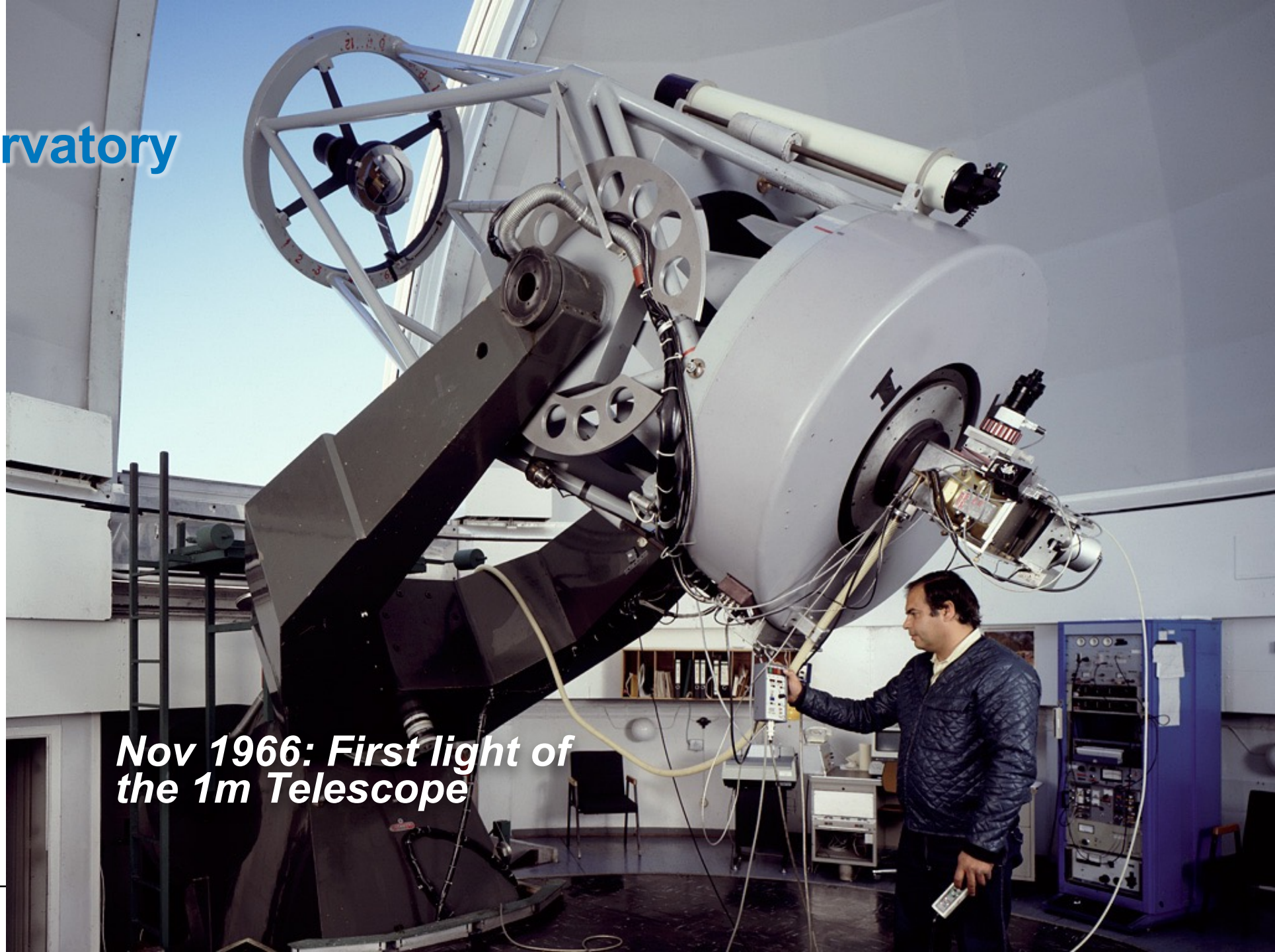
In order to facilitate international scientific activities the Swiss Government has granted to the European Organization for Nuclear Research / Organisation Européenne pour la Recherche Nucléaire (CERN) / certain immunities, preferences, and priorities in a special convention. ESO decided to aim at a similar Convention with the Chilean Government. Discussions were arranged in which the representatives of the Chilean Government fully agreed to ESO's request. The resulting Convention was signed in November 1963. It gives to ESO very much the same rights as had been granted to the Comisión Económica para América Latina (CEPAL) of the United Nations. The Convention was ratified by the Chilean Parliament and approved by the ESO Council early in 1964*).

La Silla Observatory

~500 km North of Santiago de Chile,
at 2400m elevation



La Silla Observatory

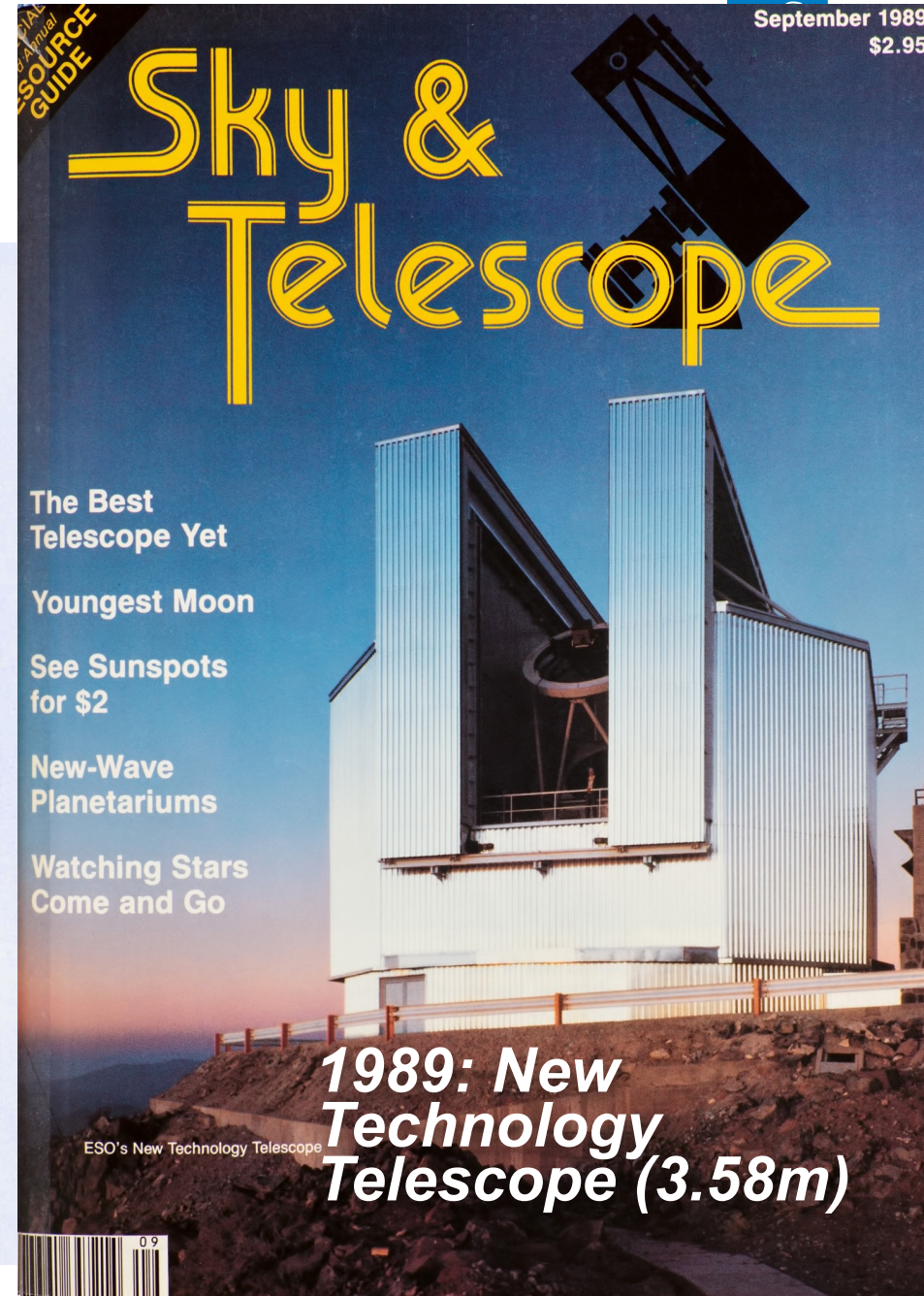


*Nov 1966: First light of
the 1m Telescope*

La Silla Observatory



1976: 3.6m Telescope



1989: New Technology Telescope (3.58m)

Active optics

Inventing a game changer

*Active optics actuators for
the NTT's primary mirror*



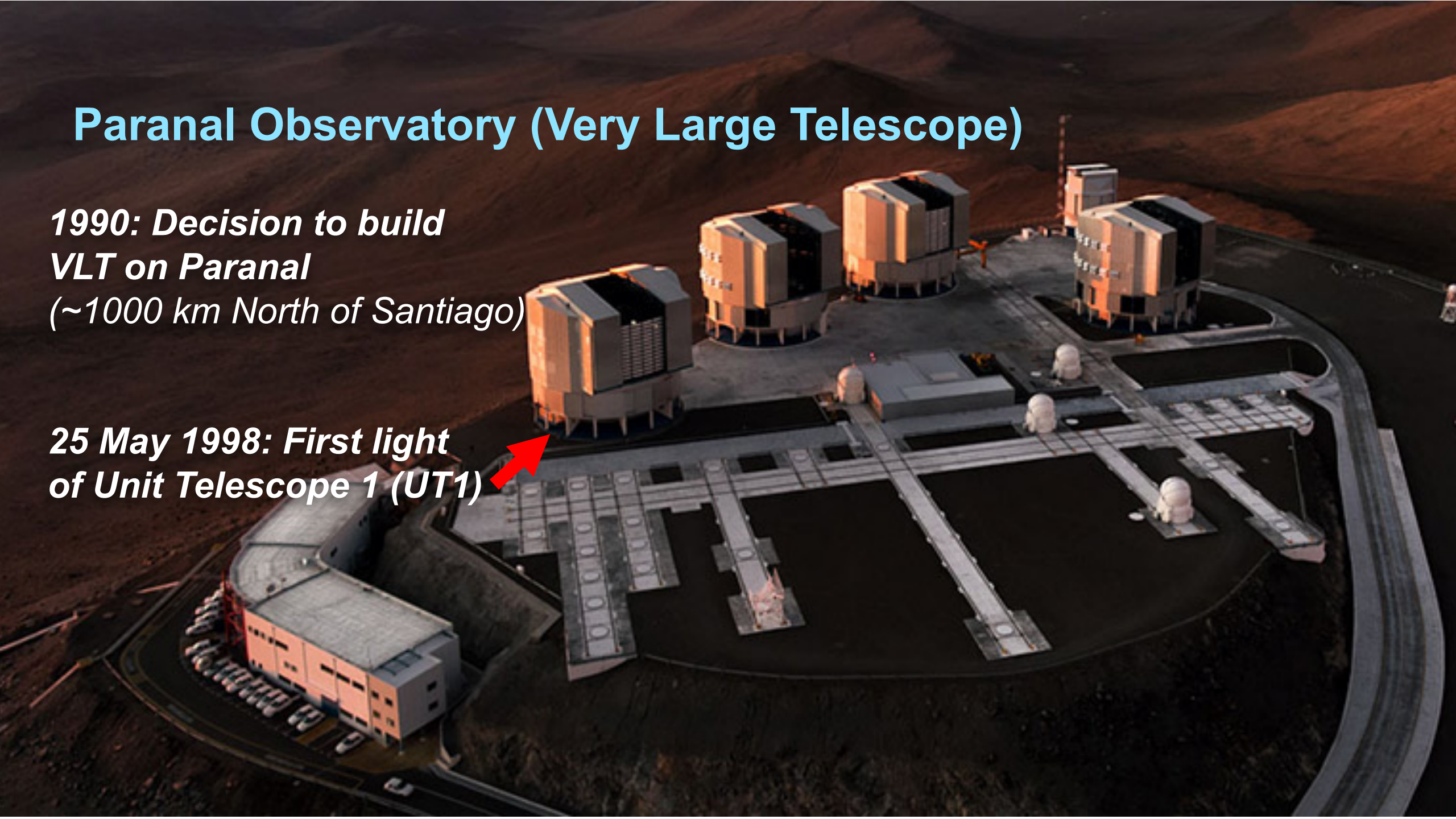
In the late 1980s ESO engineer **Raymond Wilson** invented a **revolutionary technology** and pioneered it at ESO's NTT.

Today, **Active optics** is the backbone of large telescopes all over the world.

Paranal Observatory (Very Large Telescope)

*1990: Decision to build
VLT on Paranal
(~1000 km North of Santiago)*

*25 May 1998: First light
of Unit Telescope 1 (UT1)*



2011: Atacama Large Millimeter Array (ALMA)

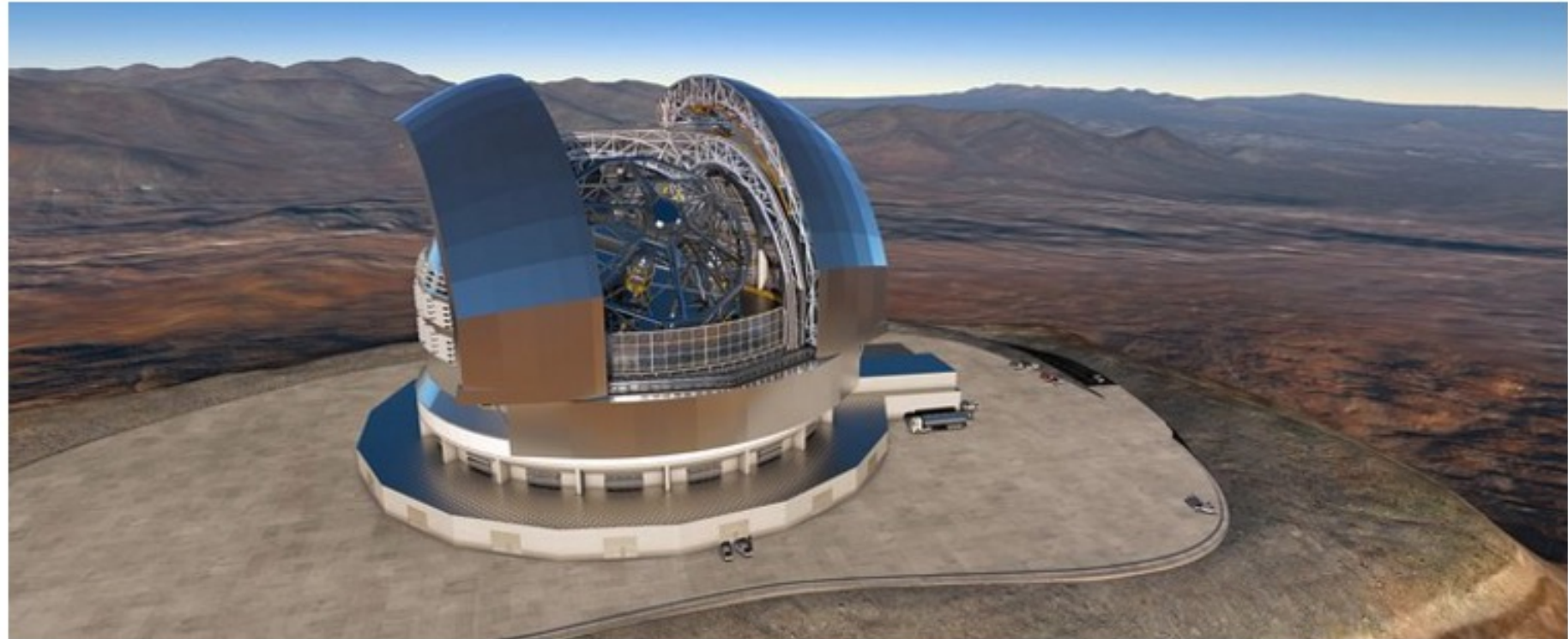
*ALMA: Partnership between ESO, NSF (USA),
Canada, Japan, Taiwan and Chile*

*66 radio telescopes on
Chajnantor plateau (4800m)
(San Pedro de Atacama, Chile)*

2016: ELT

ESO Signs Largest Ever Ground-based Astronomy Contract for ELT Dome and Telescope Structure

25 May 2016



At a ceremony in Garching bei München, Germany on 25 May 2016, ESO signed the contract with the ACe Consortium, consisting of Astaldi, Cimolai and the nominated sub-contractor EIE Group, for the construction of the dome and telescope structure of the Extremely Large Telescope (ELT). This is the largest contract ever awarded by ESO and also the largest contract ever in ground-based astronomy. This occasion saw the unveiling of the construction design of the ELT. Construction of the dome and telescope structure will now commence.



The Future



La Silla Observatory





La Silla Observatory - Hosted Telescopes

Optical counterparts of gravitational waves

- BlackGem
- Schmidt / LS4
- TAROT
- REM

ExoPlanets

- ESO 1.52m > PLATOSPEC
- ExTRA
- Swiss
- MASCARA
- TRAPPIST

General science

- Danish 1.54m
- 2.2m MPG
- ESO 1m > UCN

Near Earth Objects

- ESA / TBT
- ESA / FlyE Eye (future)



La Silla Observatory - Hosted Telescopes

Swiss 1.2-metre
Leonhard Euler
telescope

ESO 1-metre
Schmidt
telescope

Danish
1.54-metre
telescope

ESO 1-metre
telescope

Rapid Eye
Mount
telescope

MPG/ESO
2.2-metre
telescope

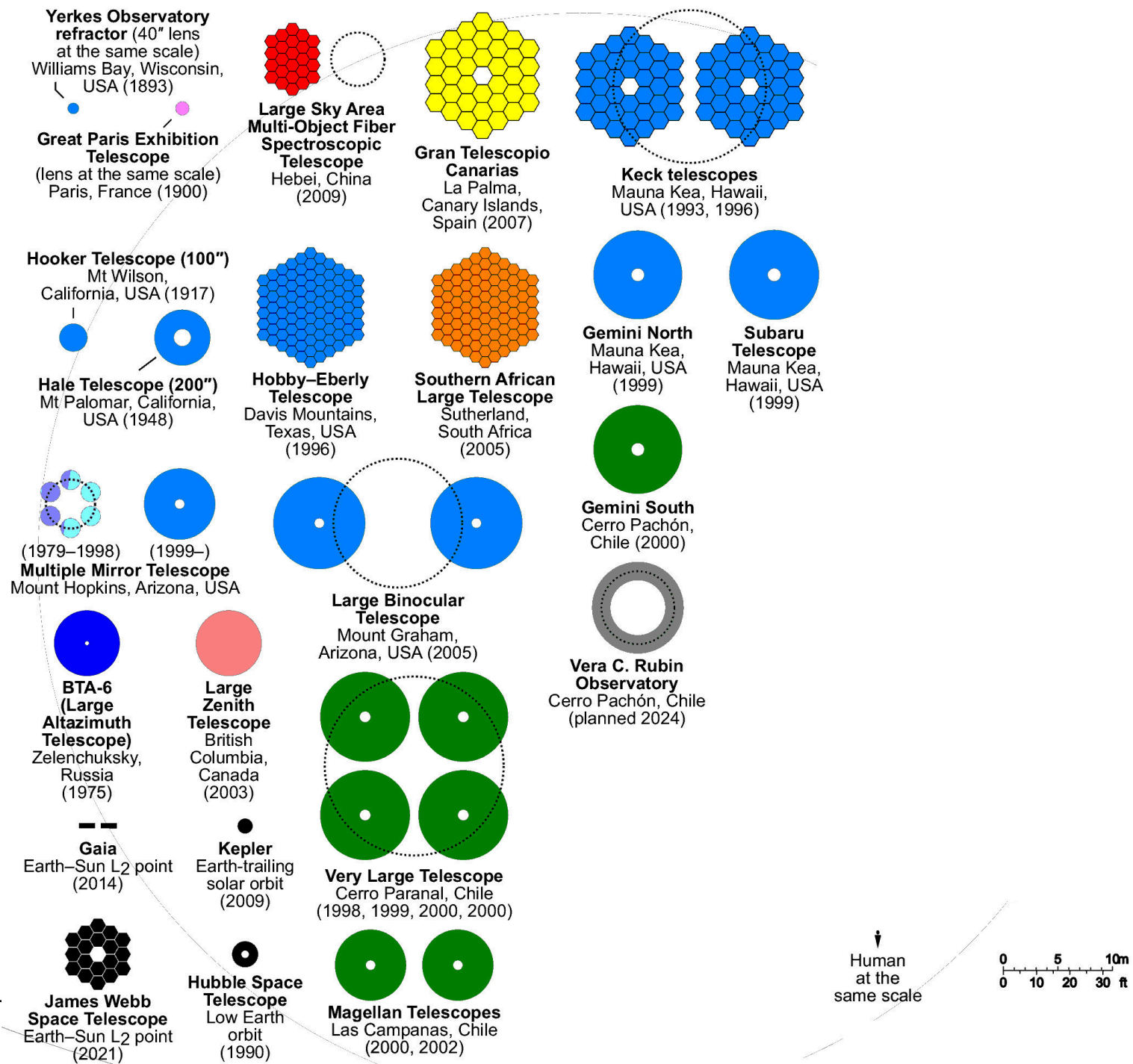
BlackGEM

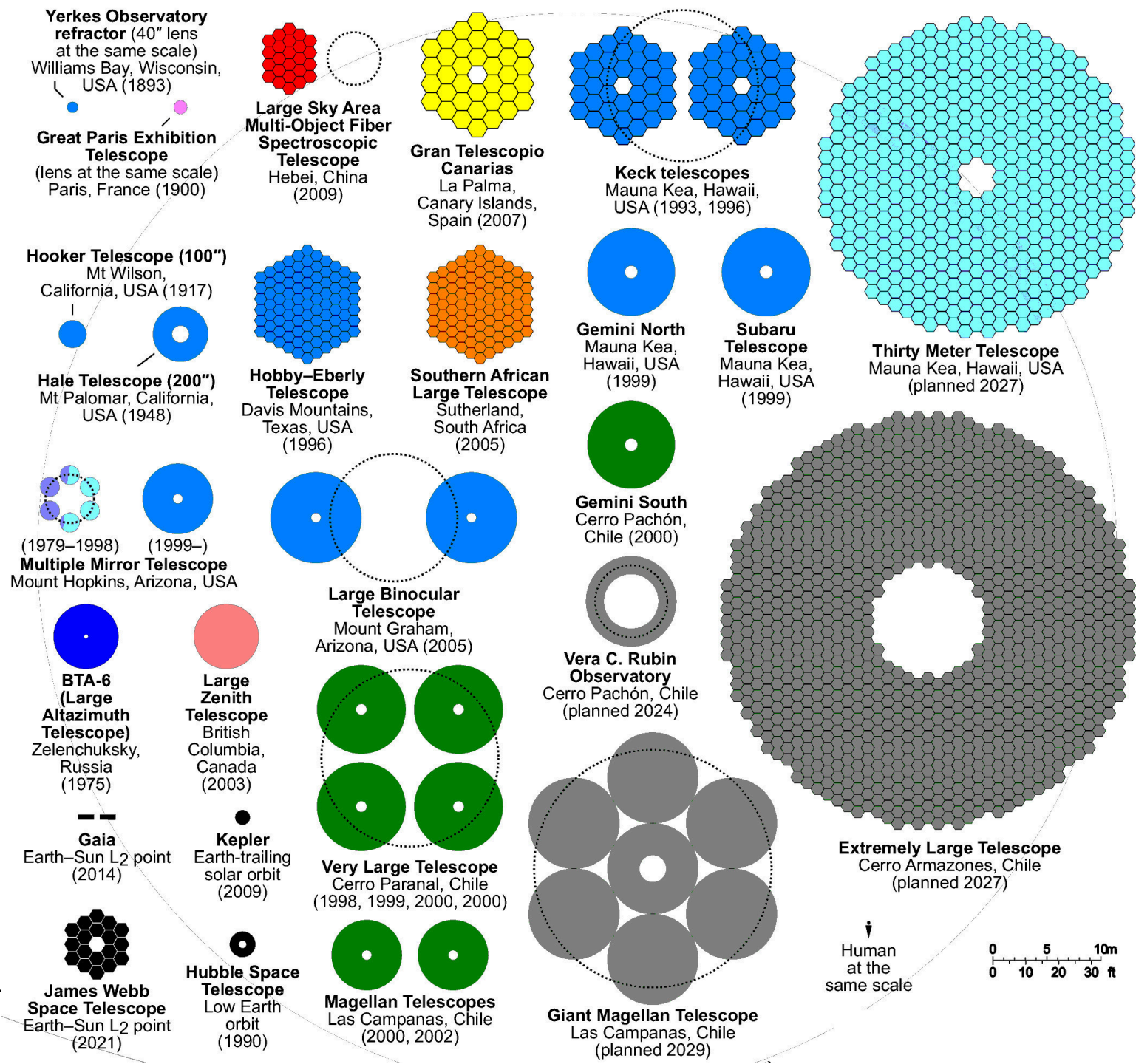
TRAnsiting Planets
and Planetesimals
Small Telescope –
South

ExTrA

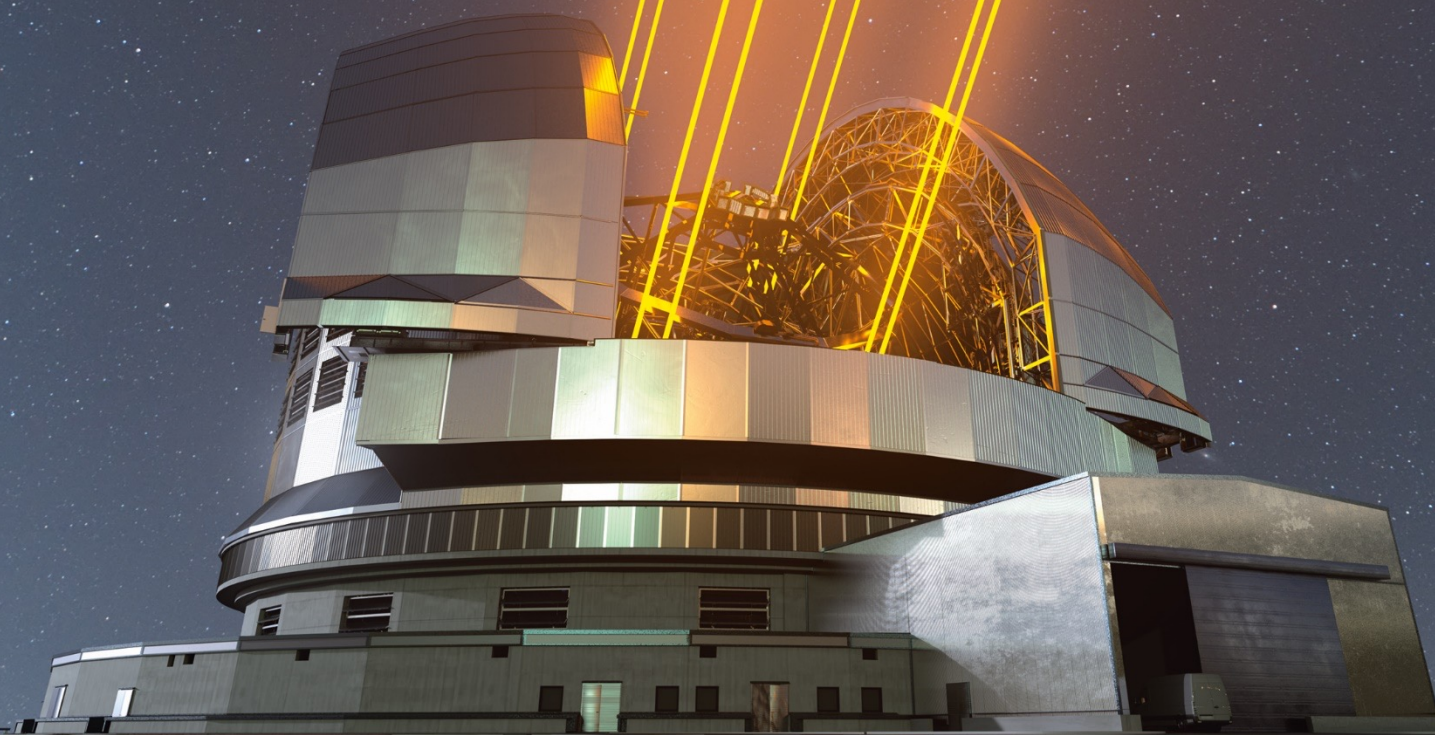
Télescope à Action
Rapide pour les
Objets Transitoires

Multi-site All-Sky
CAmeRA





ESO's Extremely Large Telescope (ELT) - 2028



August 2023:



Credit: Boris Häußler, ESO