

AGA5802

Astrofísica Observacional

1. The decadal survey and **The Big Questions in Astronomy**. Observational system: telescopes and instrumentation

Bibliography: Astronomy Methods, Decadal surveys (USA, Australia, Europe), many references for historical intro.

Prof. Jorge Meléndez

Questions to discuss in class

- Why bigger telescopes?
- Just telescopes? What else do we need?

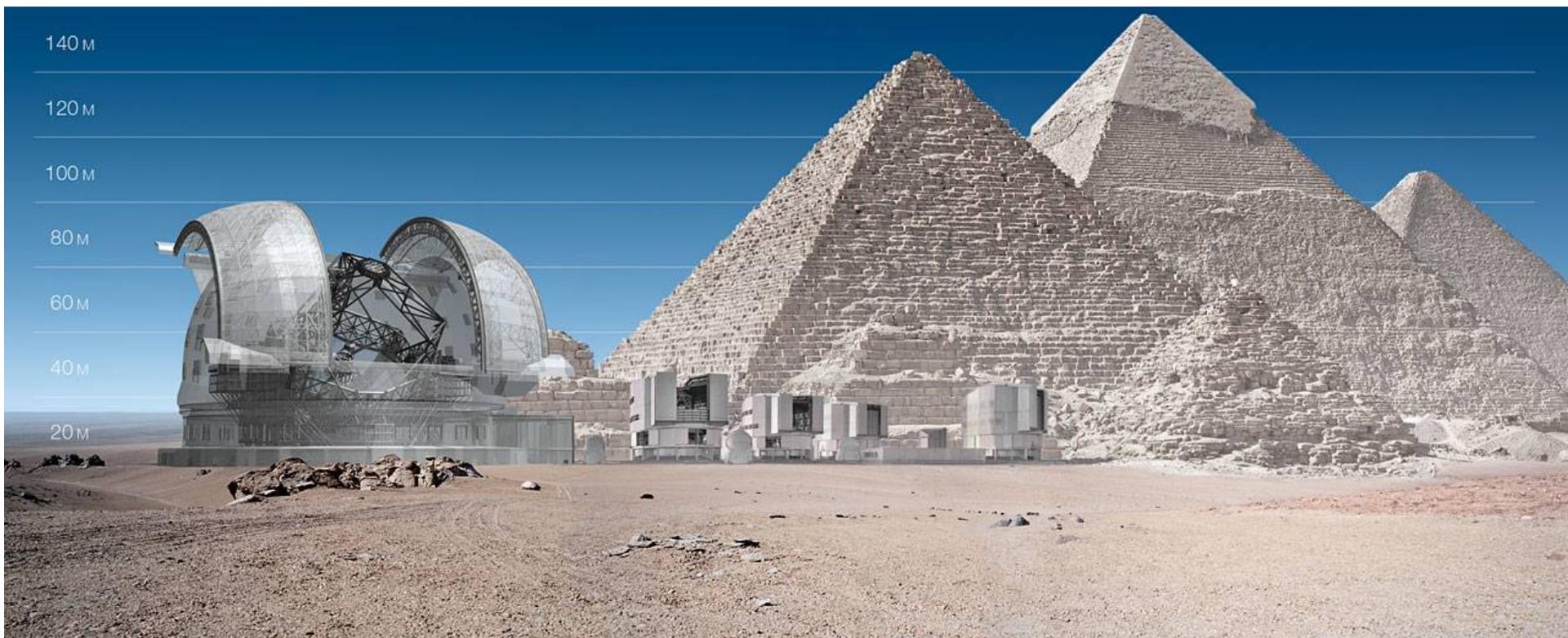


ESO Extremely Large Telescope

- How should we plan science in a country?
- What are the big questions in Astronomy?

The Big Questions in Astronomy

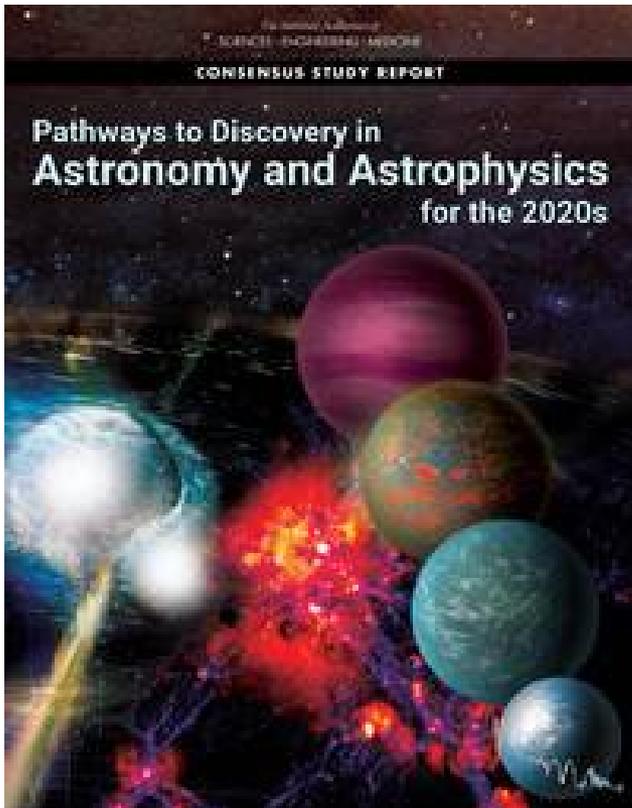
- **Science is the main driver for new major facilities in astronomy**



Comparison of the ELT (ESO) to the VLT telescopes (ESO) and the Giza pyramids

Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020)

<https://www.nationalacademies.org/our-work/decadal-survey-on-astronomy-and-astrophysics-2020-astro2020>



Astronomy in the USA, 2020 - 2030

Homework 1: USA Decadal Survey. Read chapter 2 and present the homework below by March 21st, 2023

(1) Mention which is the most important topic from your point of view. Why? Four (3) points

(2) How your MSc dissertation or PhD thesis relates to the DS? Mention which section(s), page(s) and paragraph(s) of Chapter 2. Four (4) points

Maximum size for questions (1) and (2): half a page.

(3) Oral presentations on March 21st, to explain how your MSc dissertation or PhD thesis relates to the DS. Talks either in PT or EN. Two (3) points.

Presentations must be two (2) to four (4) minutes long. Outside that range (2 to 4 minutes), 2 points will be subtracted.

Bibliography

- 2020 vision. An Overview of New Worlds, New Horizons in Astronomy and Astrophysics, U.S.A.
- Planning Astronomy in the USA 2010 - 2020

<https://nap.nationalacademies.org/catalog/12951/new-worlds-new-horizons-in-astronomy-and-astrophysics>



Bibliography

- New Horizons. A Decadal Plan for Australian Astronomy 2006-2015

New Horizons

A Decadal Plan for
Australian Astronomy
2006 – 2015

Prepared by the National Committee for Astronomy of the Australian Academy of Science November 2005



Bibliography

Australia in the era of global astronomy

**The decadal plan for
Australian astronomy
2016–2025**



Brian Schmidt receiving his Nobel Prize diploma and medal from His Majesty the King of Sweden in 2011 © THE NOBEL FOUNDATION 2011 CREDIT: FRIDA WESTHOLM

Bibliography

- A Science Vision for European Astronomy

A Science Vision for European Astronomy

What is the origin and evolution of stars and planets?

How do galaxies form and evolve?

Do we understand the extremes of the Universe?

How do we fit in?

Bibliography

- National Plan for Astronomy in Brazil

Plano Nacional de Astronomia



Proposta

Comissão Especial de Astronomia

Outubro de 2010

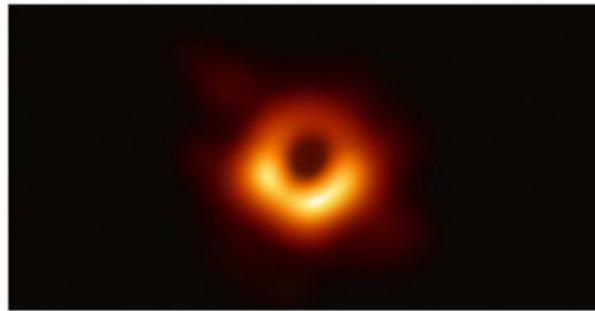
Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020)



Worlds and Suns in Context

Priority Area: Pathways to Habitable Worlds

Understanding the connections between stars and the worlds that orbit them, from nascent disks of dust and gas through formation and evolution, is an important scientific goal for the next decade. The effort to identify habitable Earth-like worlds in other planetary systems and search for the biochemical signatures of life will play a critical role in determining whether life exists elsewhere in the universe.



New Messengers and New Physics

Priority Area: New Windows on the Dynamic Universe

Over the next decade, a range of complementary observations—from radio to gamma rays, gravitational waves, neutrinos, and high-energy particles—will enable investigations into the most energetic processes in the universe and address larger questions about the nature of dark matter, dark energy, and cosmological inflation. These growing capabilities will enable closer study of neutron stars, white dwarfs, black hole collisions, stellar explosions, and the birth of our universe.



Cosmic Ecosystems

Priority Area: Unveiling the Drivers of Galaxy Growth

Research in the coming decade will revolutionize our understanding of the origins and evolution of galaxies, from the cosmic webs of gas that feed them to the formation of stars. New observational capabilities across the electromagnetic spectrum along with computation and theory will help resolve the rich workings of galaxies on all scales.

Observational system

Light collector (e.g., lens, mirror)

Optical system / instrumentation

Detector
(e.g., eye, CCD)

