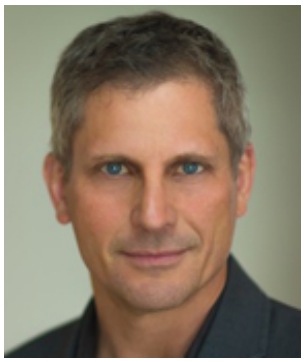
THE YEAR IN SPACE AND BEYOND

Saturday, July 20, 2019, 8-9pm, 25ABC

Prof. Brian Keating

Prof. Shelley Wright

Dr. Andrew Friedman



Stuart Volkow, Moderator

University of California, San Diego, Center for Astrophysics and Space Sciences

UCSD

CASS
CENTER FOR ASTROPHYSICS AND SPACE SCIENCES

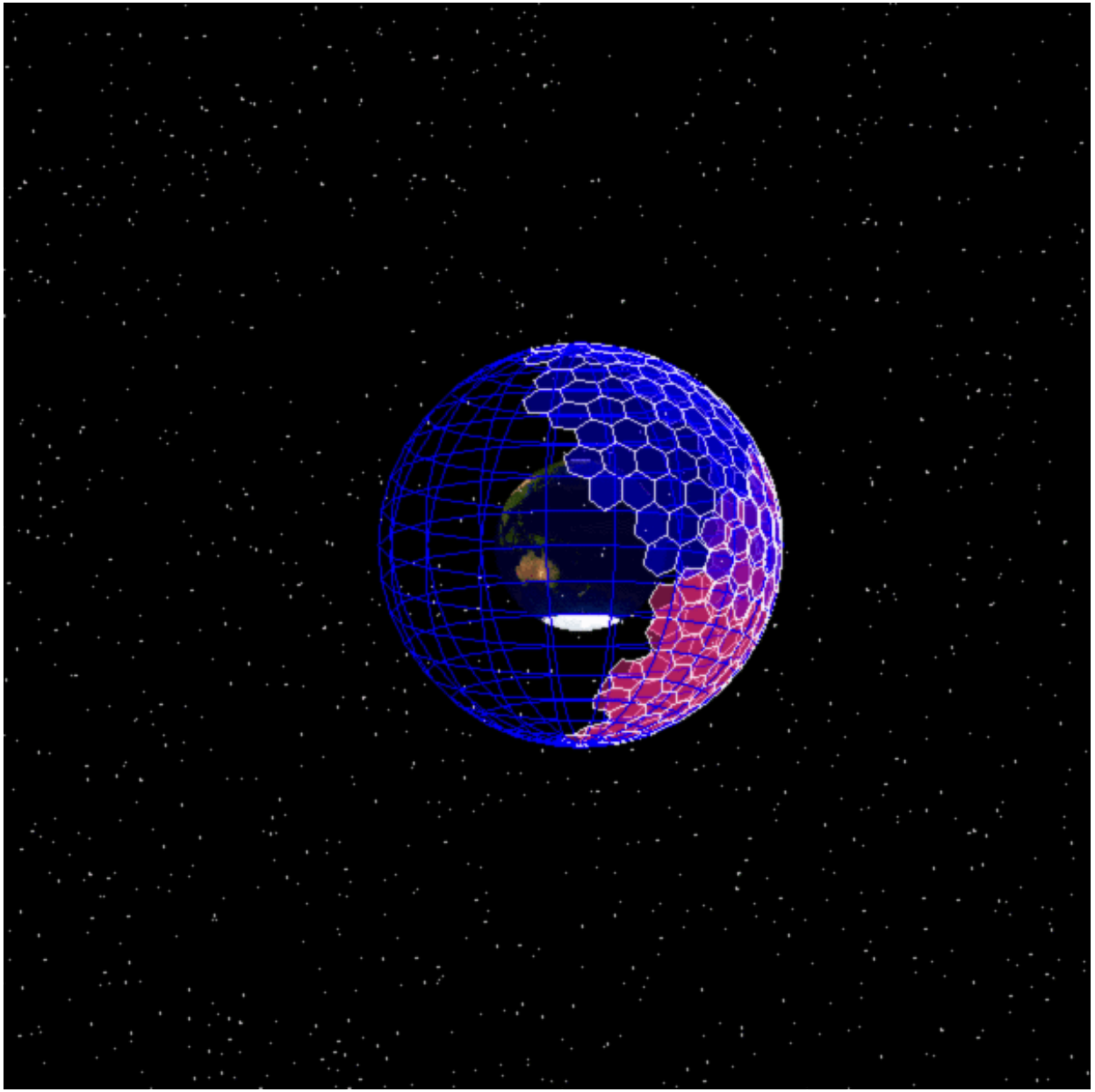
CASS OPTICAL INFRARED LABORATORY

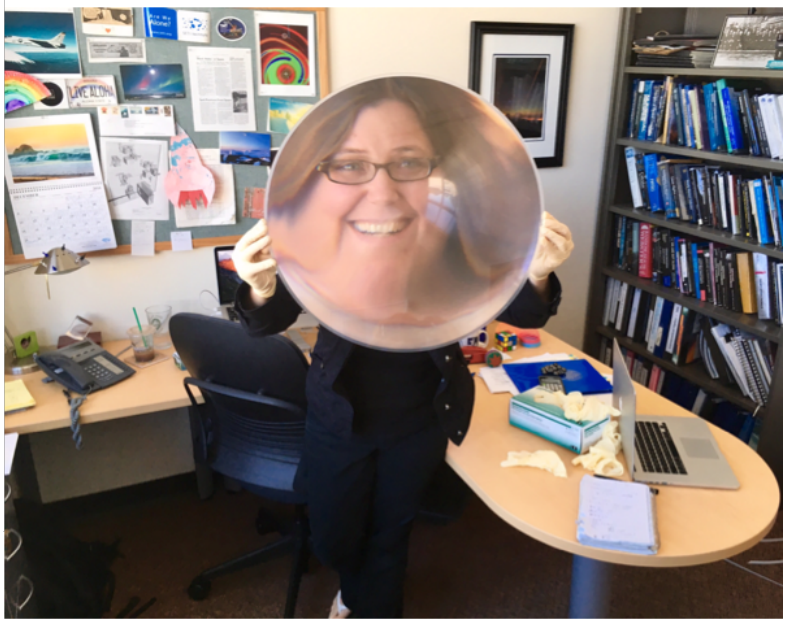
ACEC
AX CENTER *for* EXPERIMENTAL COSMOLOGY

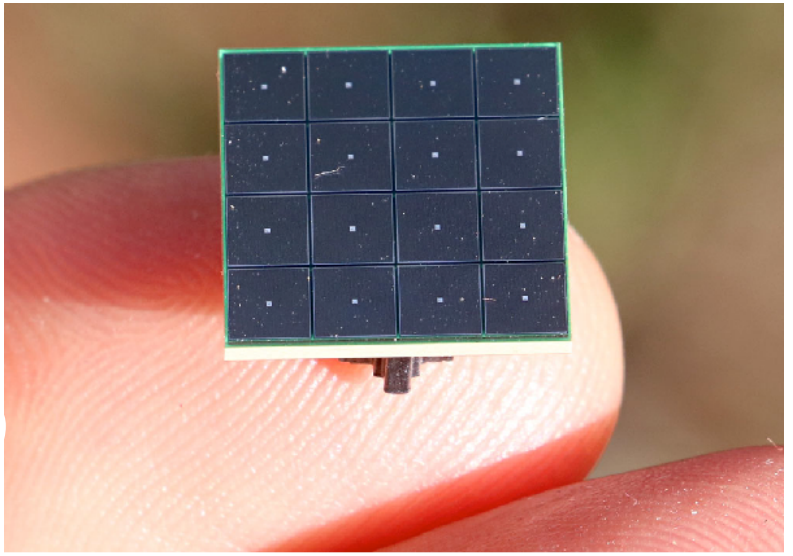
https://comiccon2019.sched.com/event/Rri1/the-year-in-space-and-beyond

PANOSETI

A Panoramic All-sky All-time Near InfraRed and Optical Technosignature Finder







MAUNA KEA HAWAII

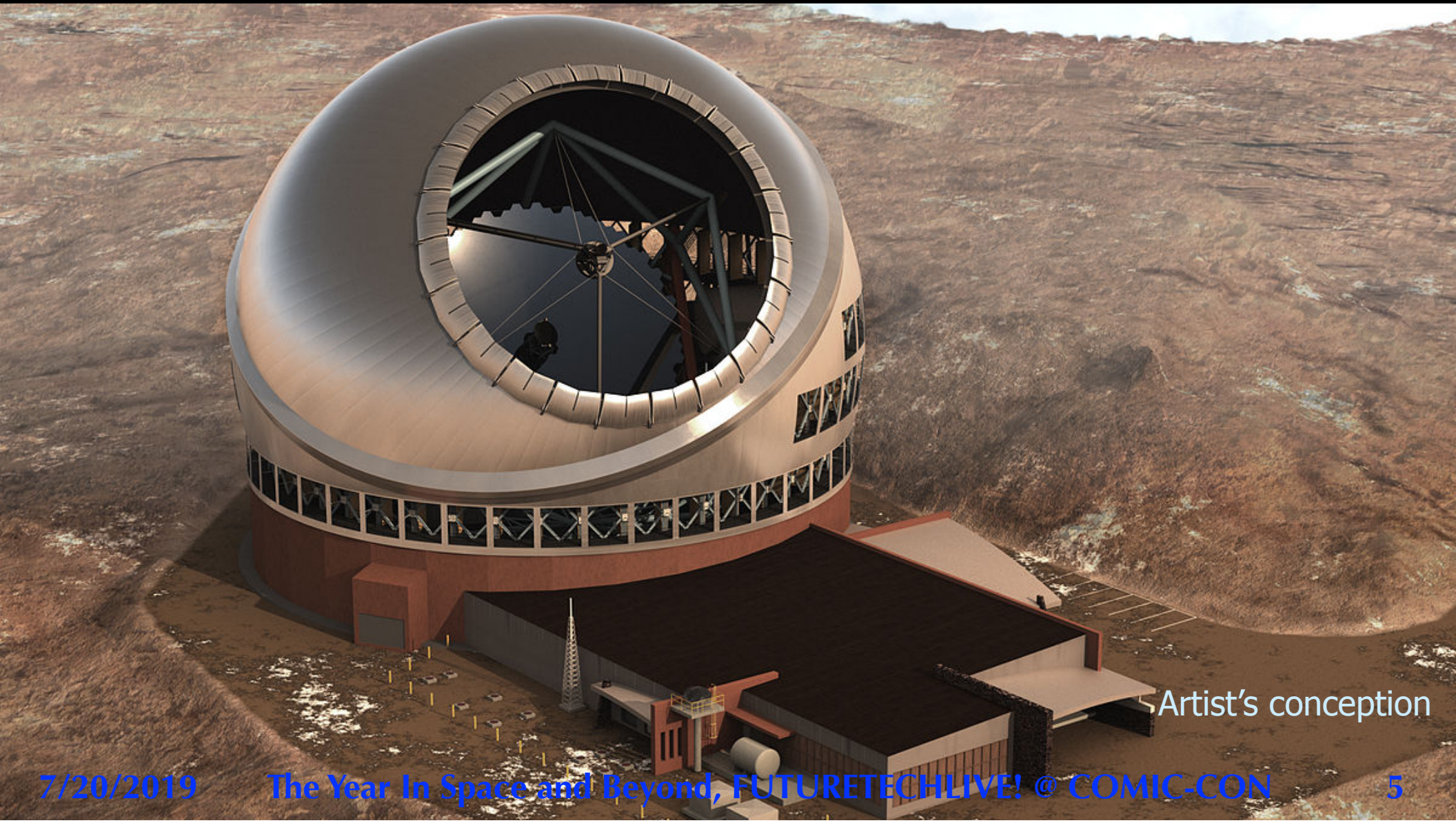
KECK OBSERVATORY

The Keck Observatory: the largest in the world (UC, Caltech, NASA).

Twin 10-meter Telescopes On Mauna Kea

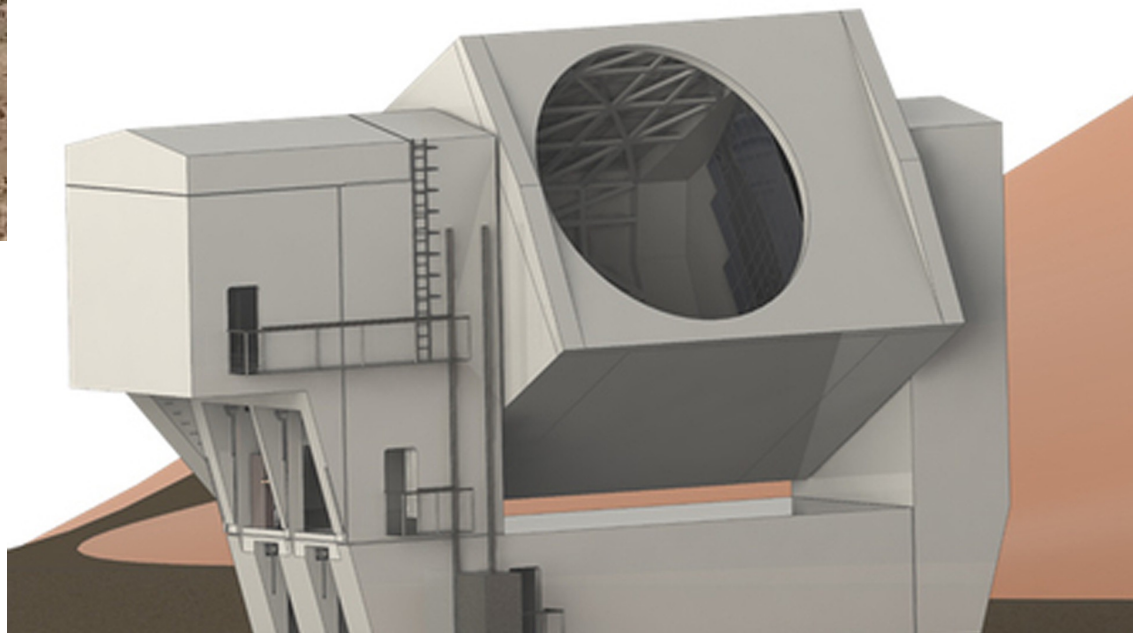
TMT (THIRTY METER TELESCOPE)

492 segmented mirrors (collecting area of a single 30-m mirror). 9 x power of Keck Telescope. First light scheduled for 2027. Near-UV, Optical, and Near-Infrared. Mauna Kea, Hawaii (but not without controversy).



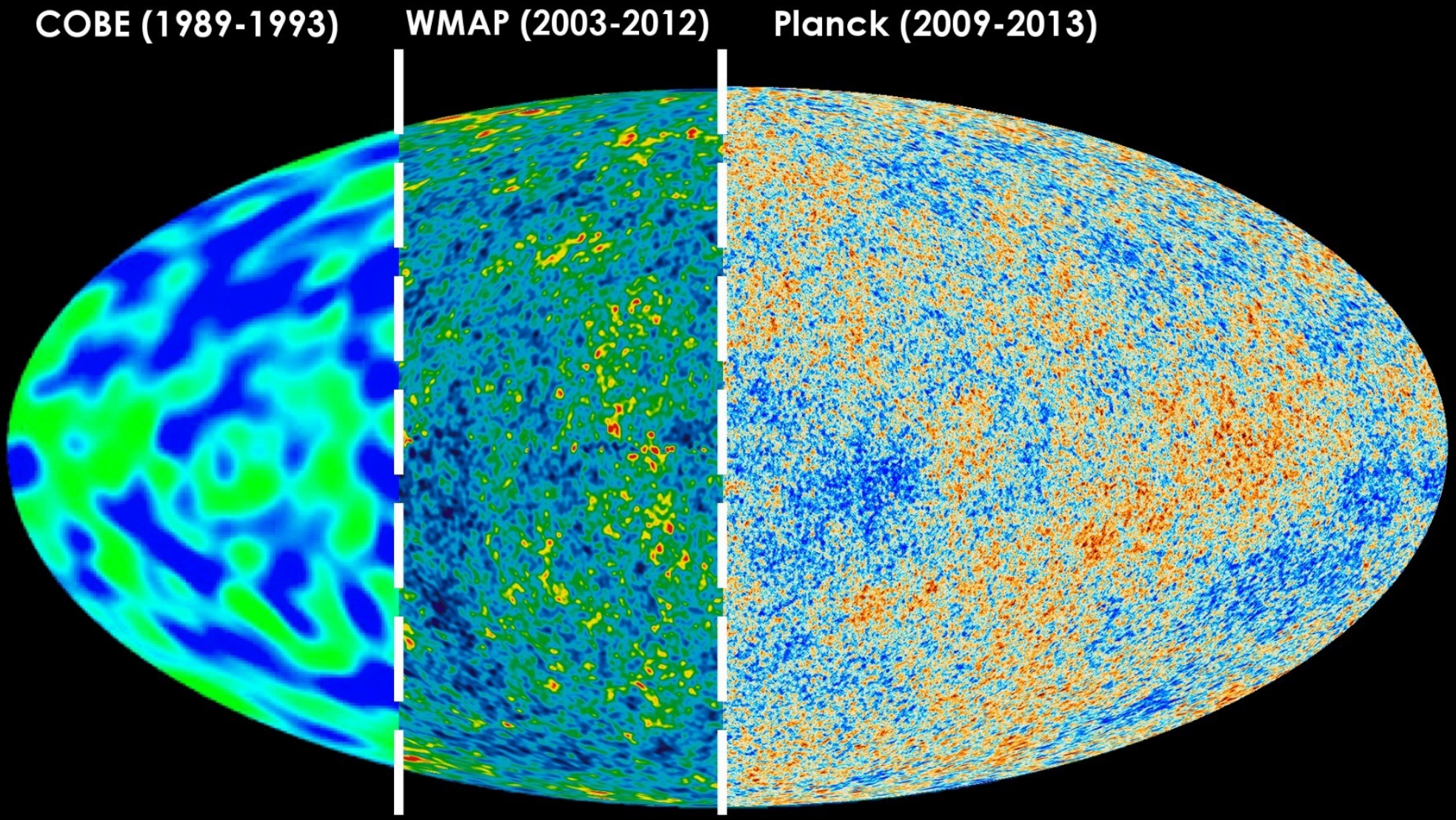
Artist's conception

SIMONS OBSERVATORY

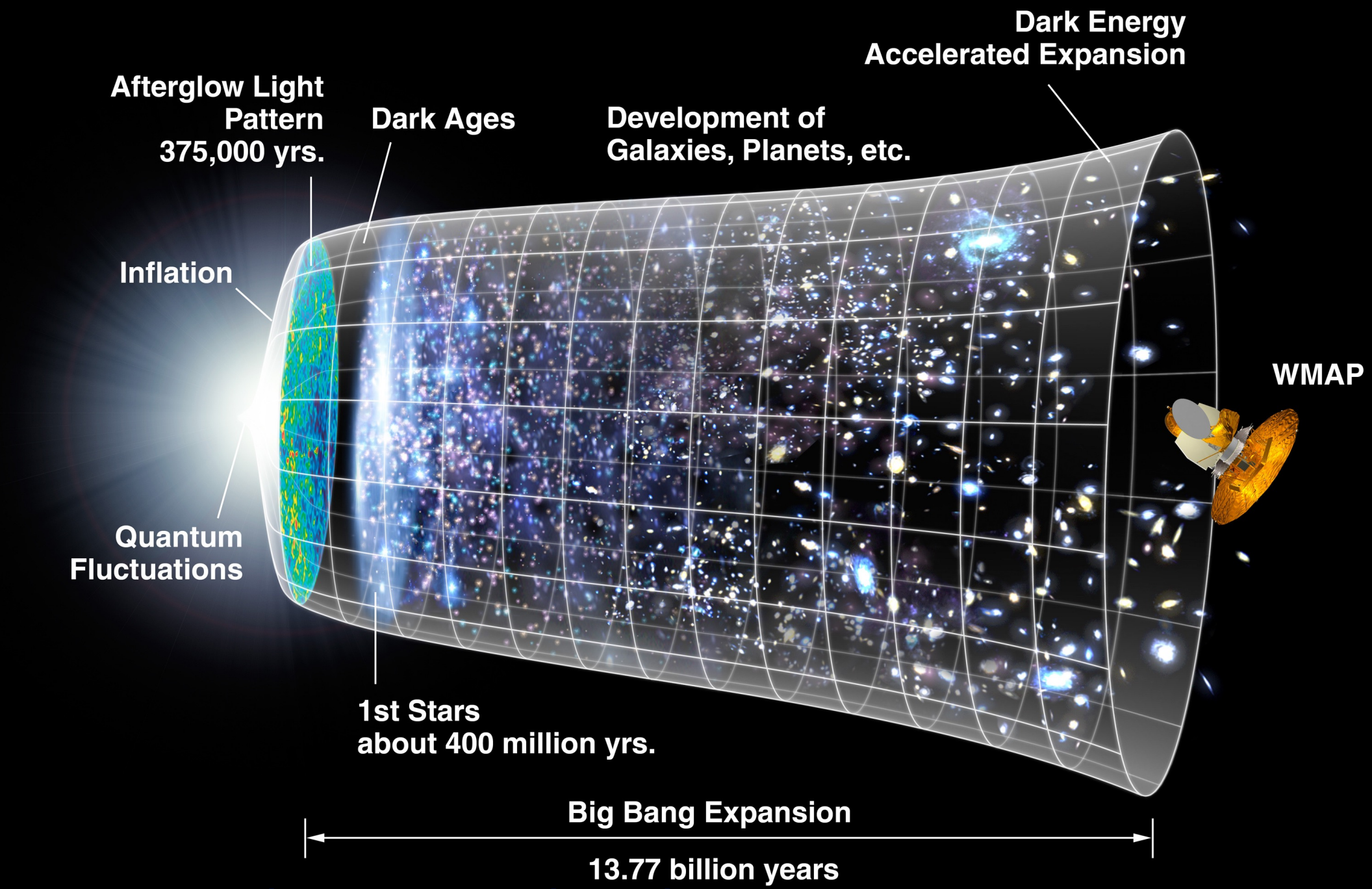


Cosmic Microwave Background Polarization Experiment in the Atacama Desert, Chile

COSMIC MICROWAVE BACKGROUND: RELIC RADIATION FROM BIG BANG

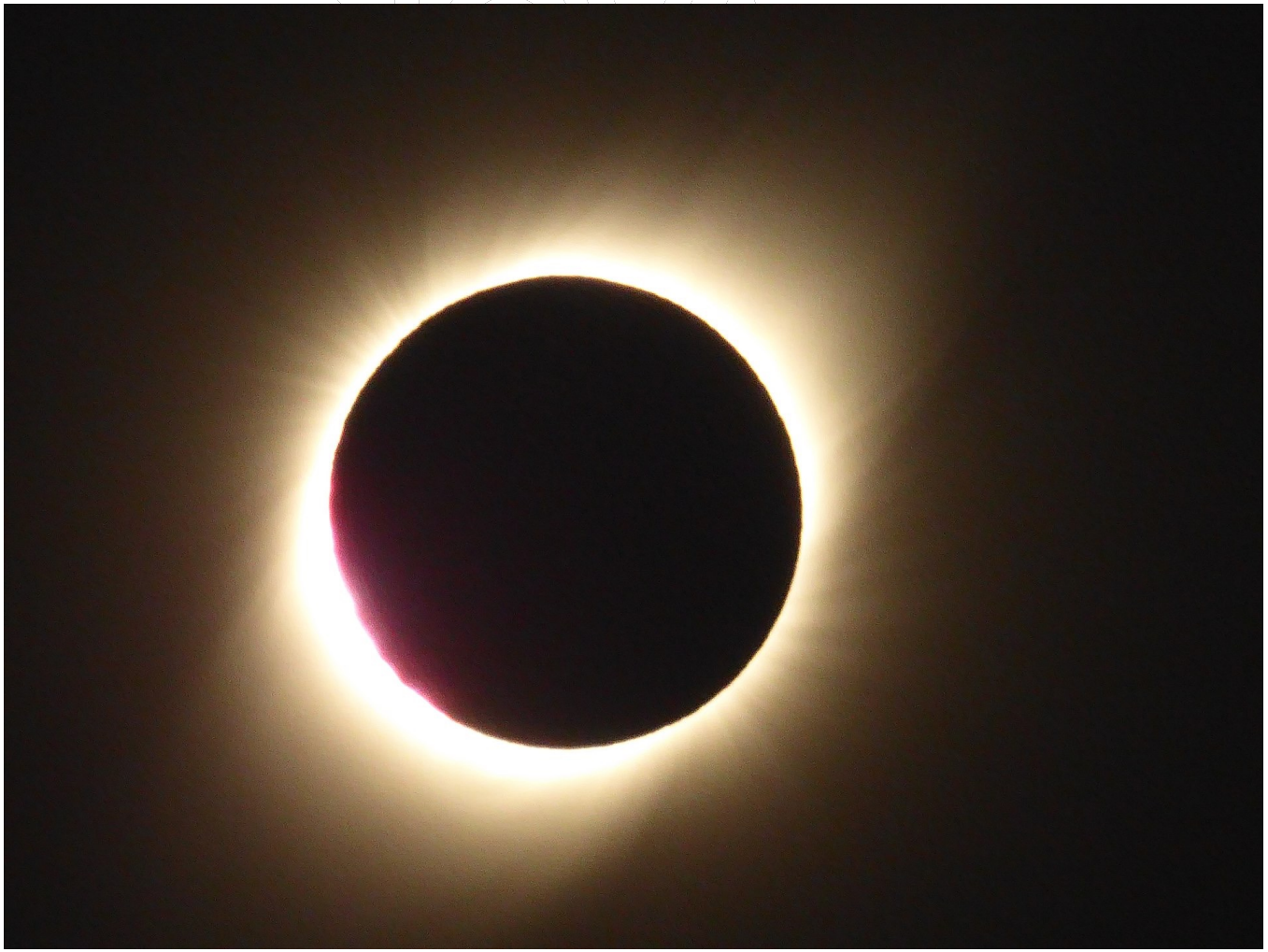


BIG BANG TO TODAY

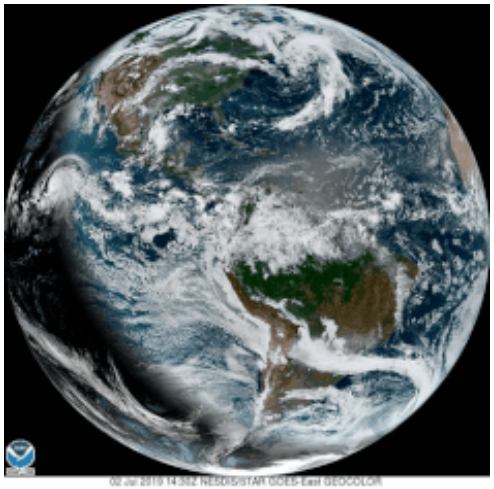


TOTAL SOLAR ECLIPSE

July 2, 2019



Totality viewed from La Serena, Chile

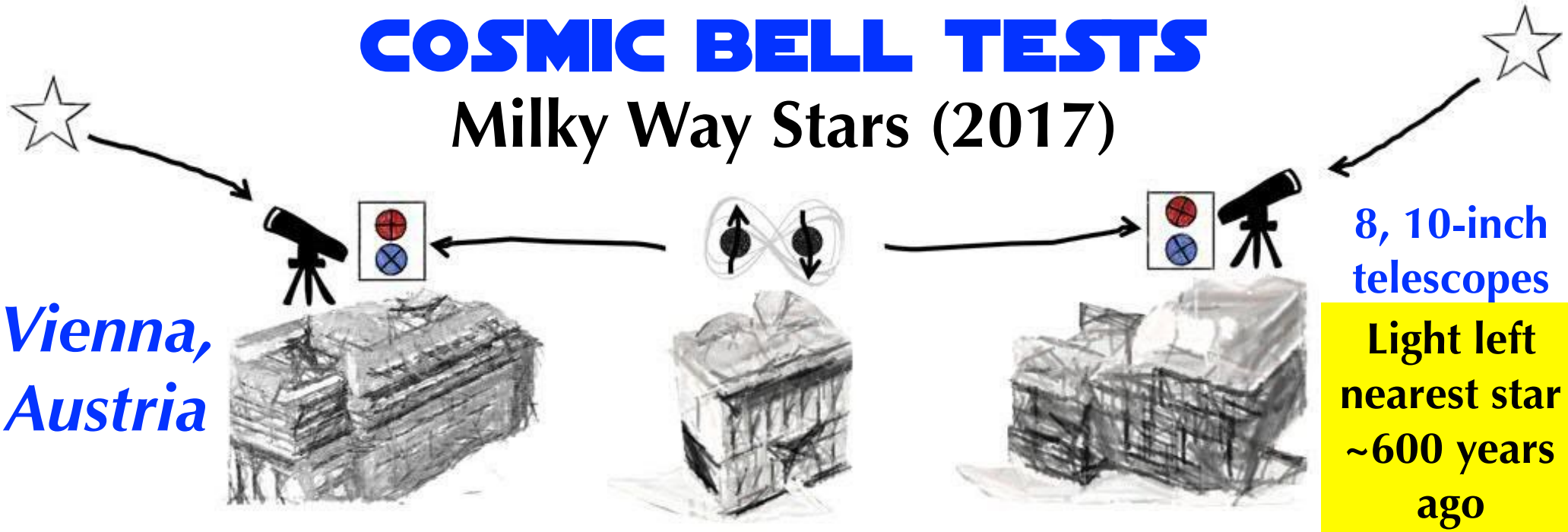


Geostationary satellite view of the eclipse by NOAA's GOES East. Hurricane Barbara can also be seen in the northern hemisphere.

https://en.wikipedia.org/wiki/Solar_eclipse_of_July_2,_2019

COSMIC BELL TESTS

Milky Way Stars (2017)



Vienna, Austria

8, 10-inch telescopes

Light left nearest star ~600 years ago

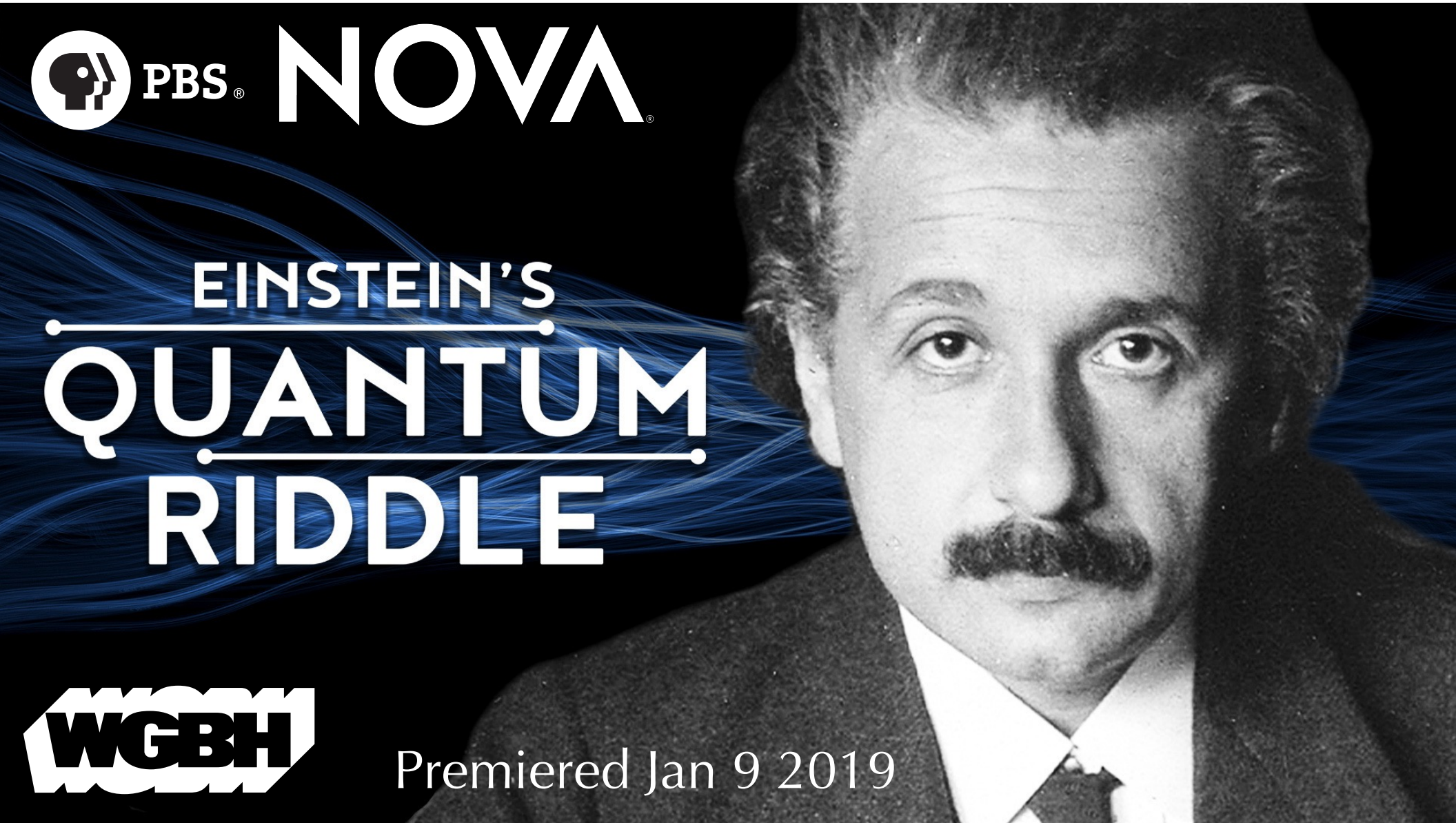
High Redshift Quasars (2018)

The Canary Island of La Palma

3.6, 4.2-meter telescopes

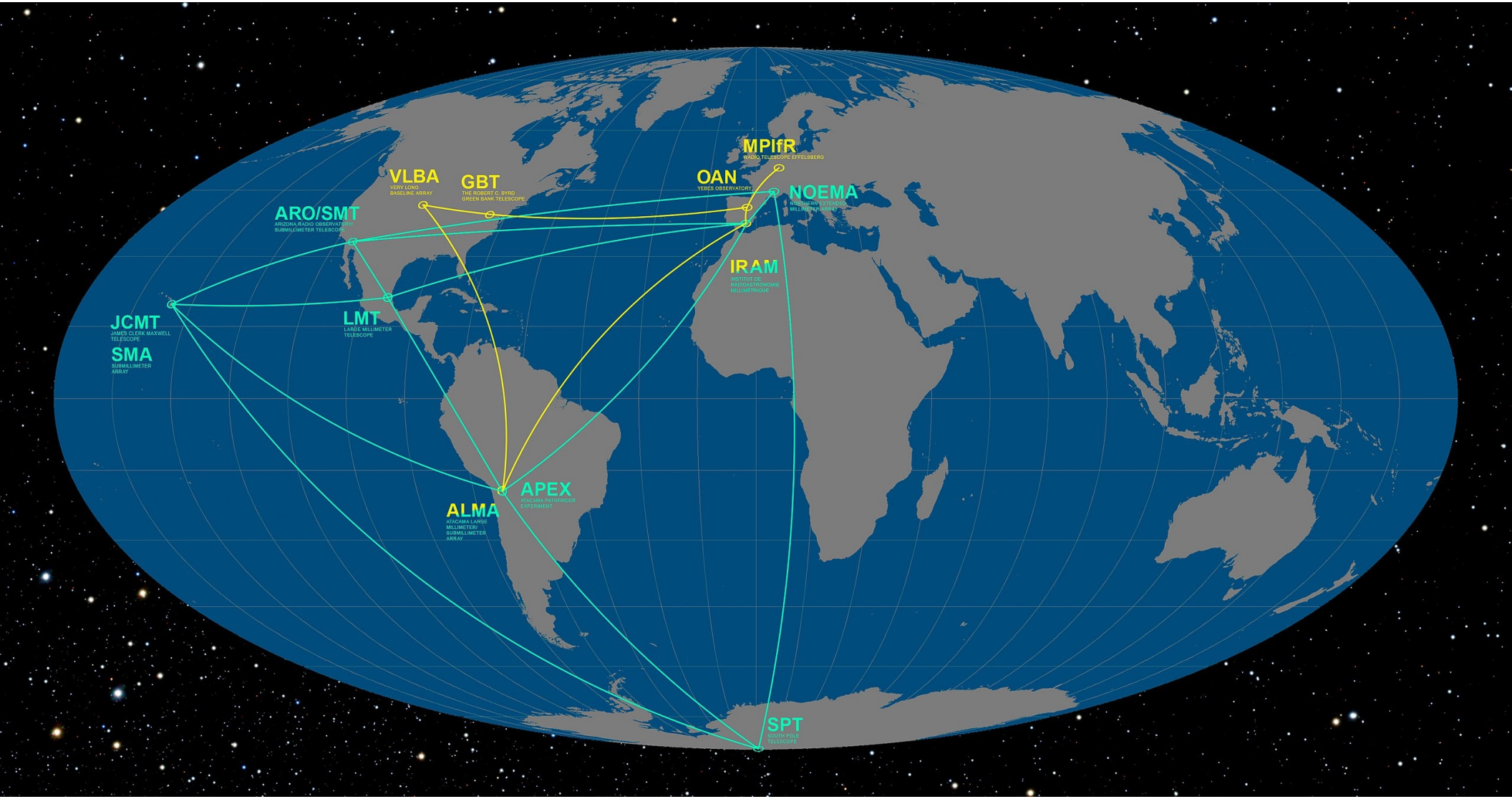
Light left nearest quasar ~7.8 billion years ago!

COSMIC BELL TEST ON TV!

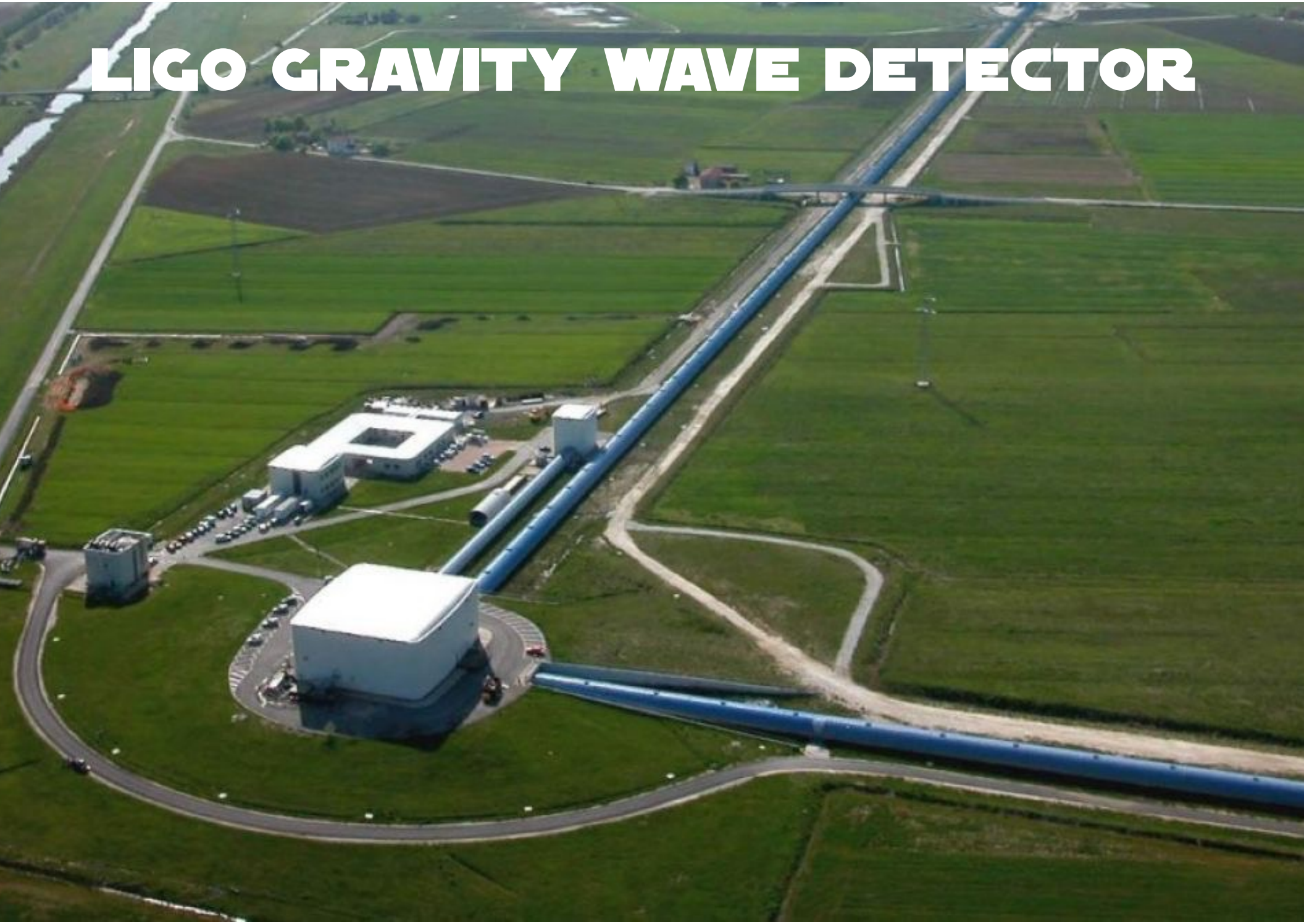


FIRST IMAGE OF A BLACK HOLE EVENT HORIZON!

EVENT HORIZON TELESCOPE



LIGO GRAVITY WAVE DETECTOR



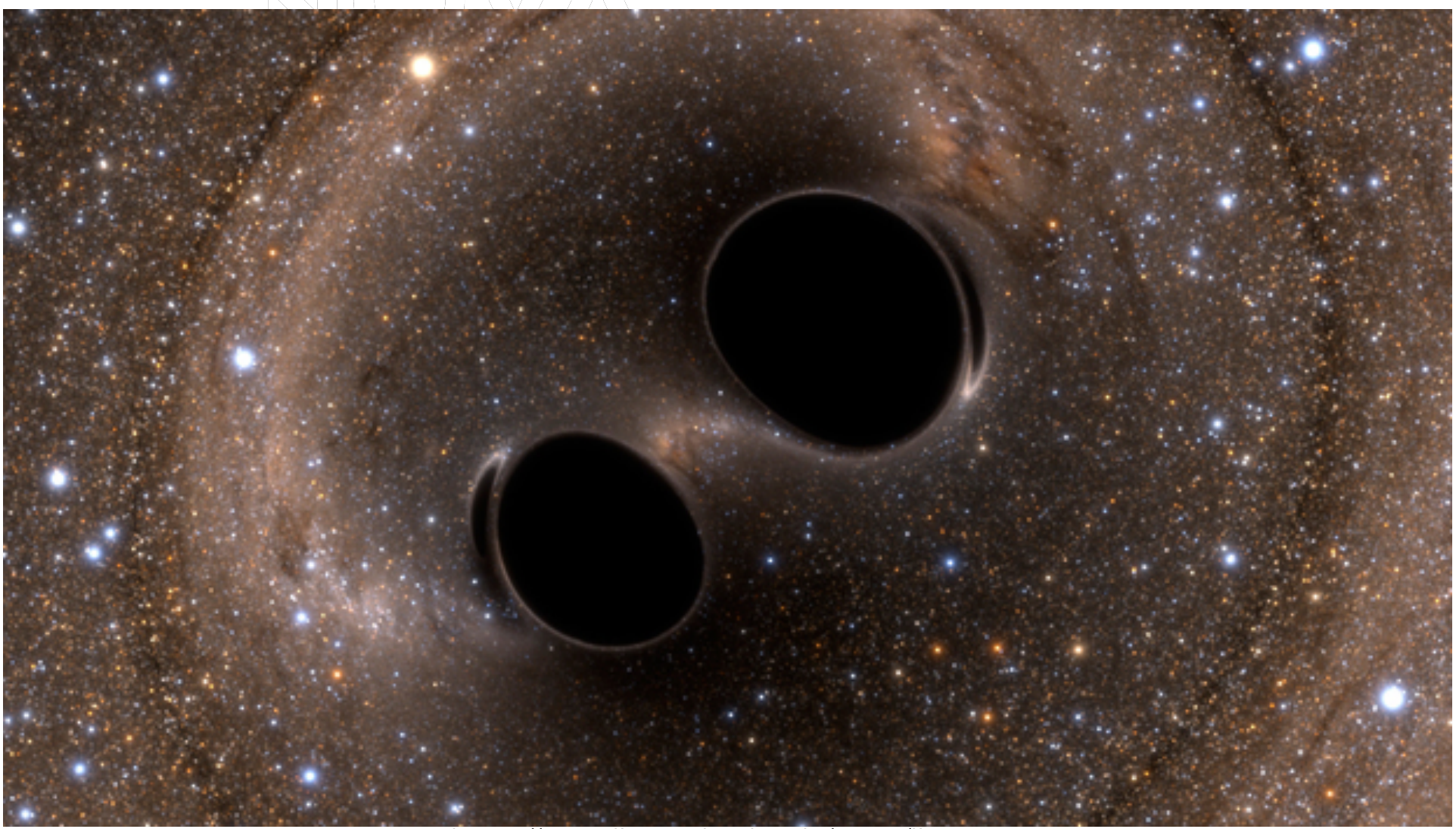
LIGO+VIRGO DISCOVERIES

April 25, 2019, Neutron Star merger

https://www.ligo.caltech.edu/news/ligo20190502

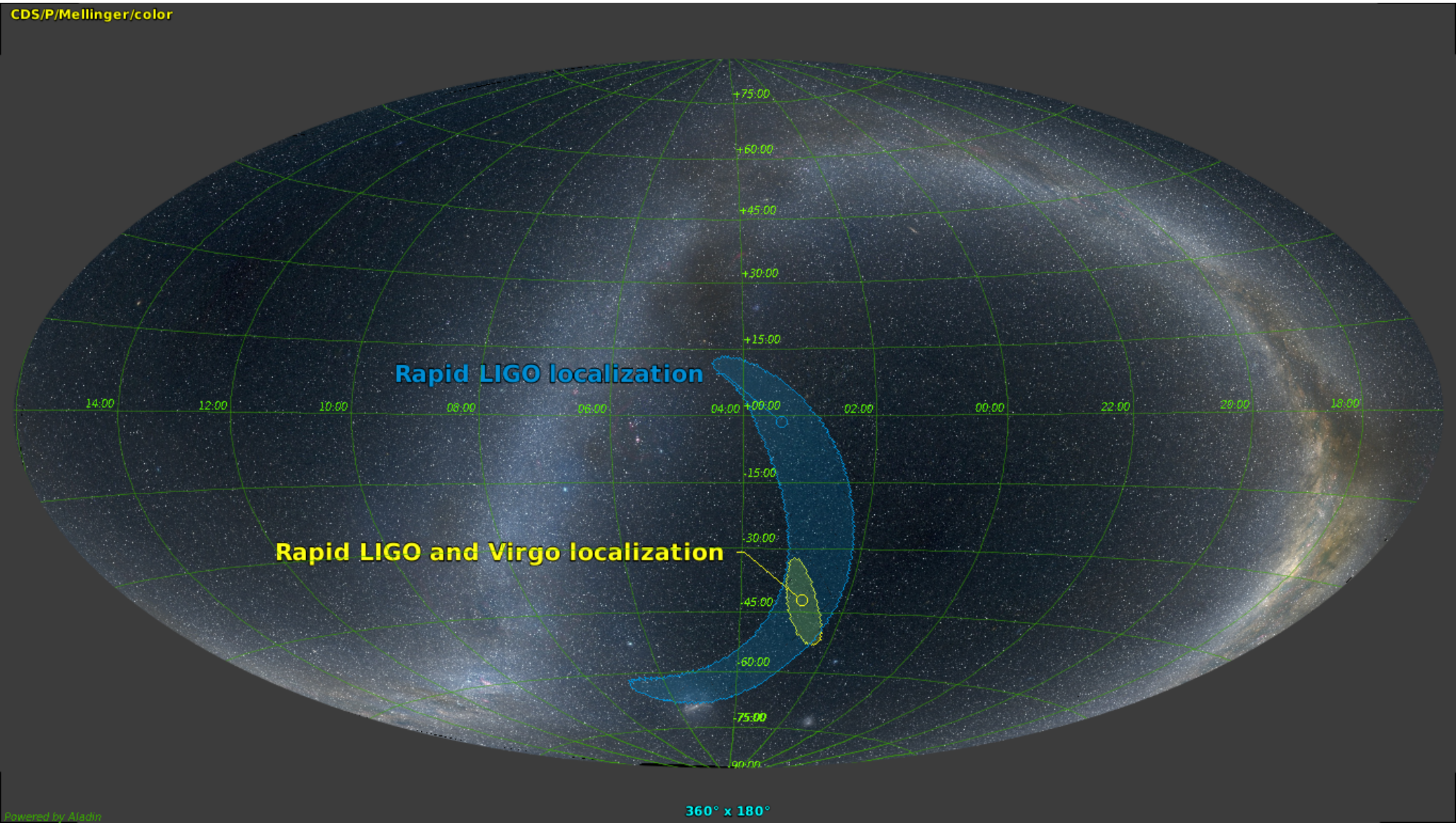
LIGO+VIRGO DISCOVERIES

Black hole mergers



https://www.ligo.caltech.edu/news/ligo20190502

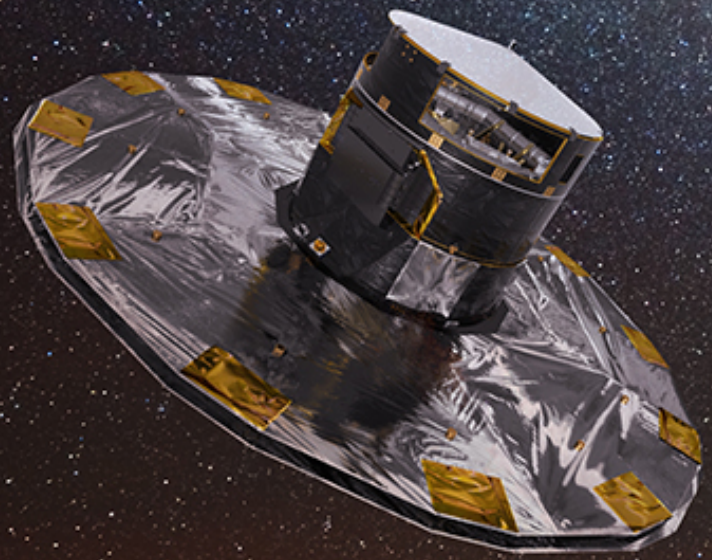
LIGO+VIRGO SKY LOCALIZATION



http://www.virgo-gw.eu

GAIA SATELLITE

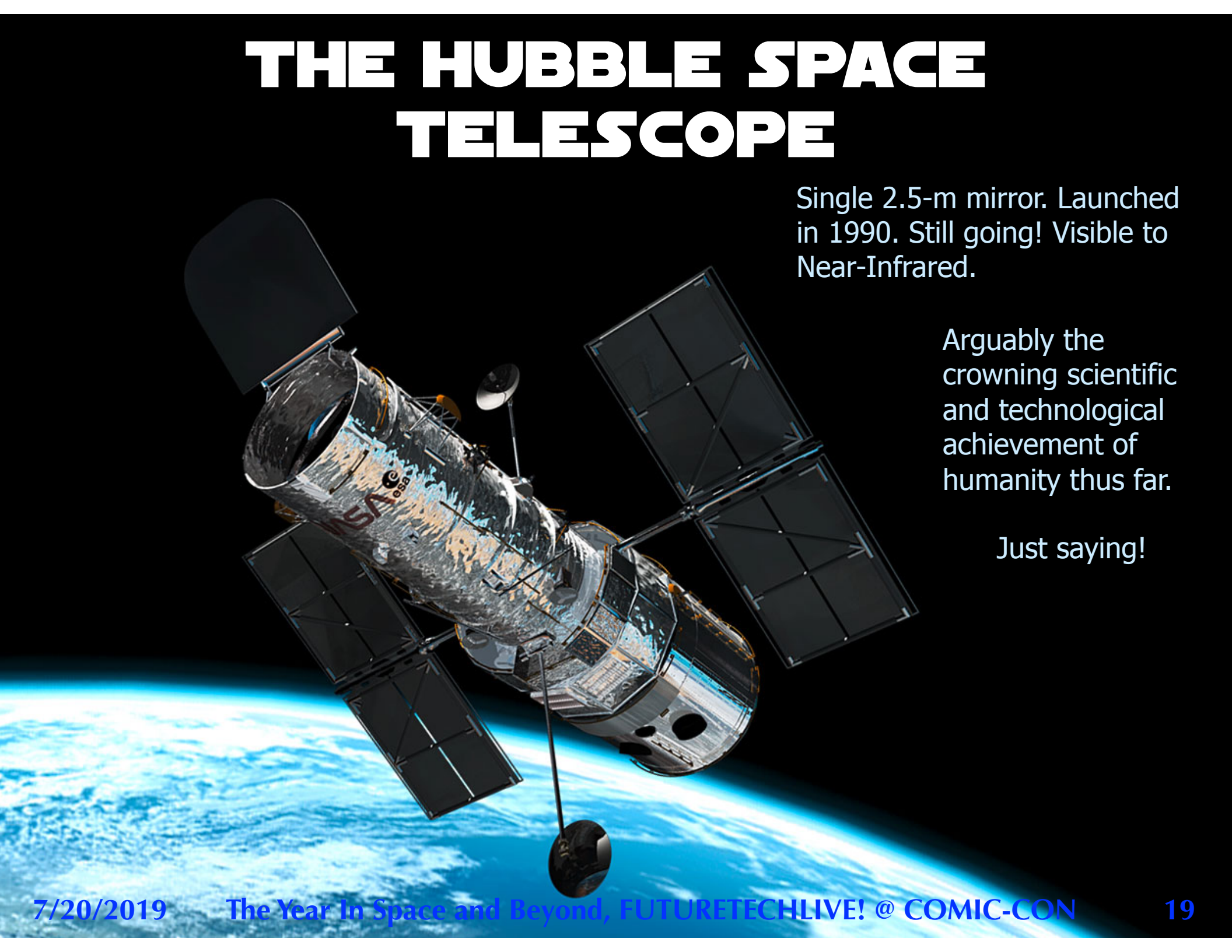
European Space Agency



http://sci.esa.int/gaia/

GAIA satellite is measuring parallax angles for 1 billion = 10^9 stars with an accuracy of micro arcseconds (10^{-6})

THE HUBBLE SPACE TELESCOPE



Single 2.5-m mirror. Launched in 1990. Still going! Visible to Near-Infrared.

Arguably the crowning scientific and technological achievement of humanity thus far.

Just saying!

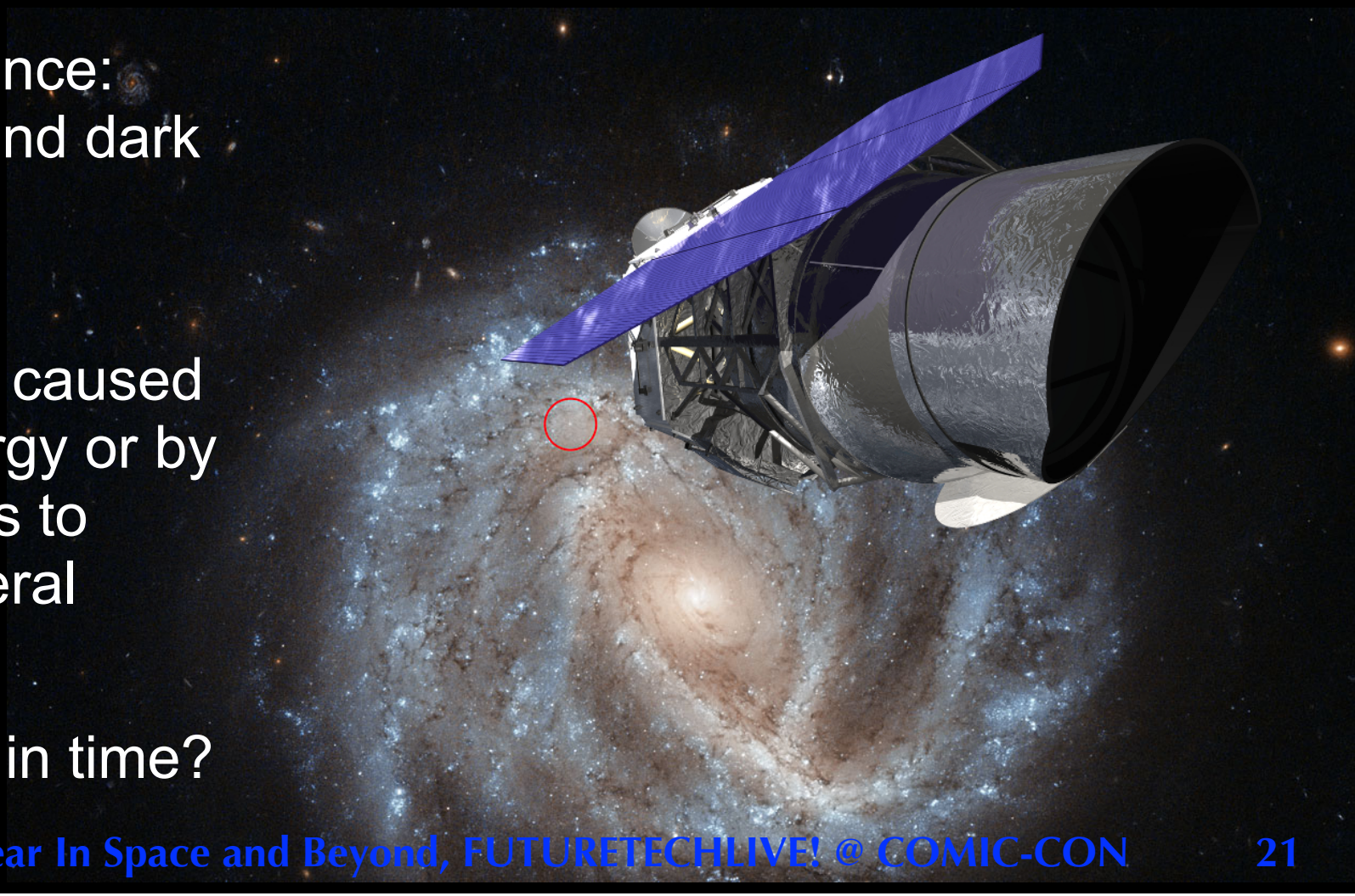
JAMES WEBB SPACE TELESCOPE

18 hexagonal mirror (6.5-m combined mirror). Launch scheduled March 2021. Visible to mid-Infrared.

NASA WFIRST MISSION

- Wide-Field Infrared Survey Telescope
- Mid 2020s launch date
- 2.4m Infrared telescope, 6-year mission

- Primary science: supernova and dark energy
- Is cosmic acceleration caused by dark energy or by modifications to gravity, general relativity?
- Does it vary in time?



CANARY ISLANDS TELESCOPES

Roque de los Muchachos Observatory on La Palma

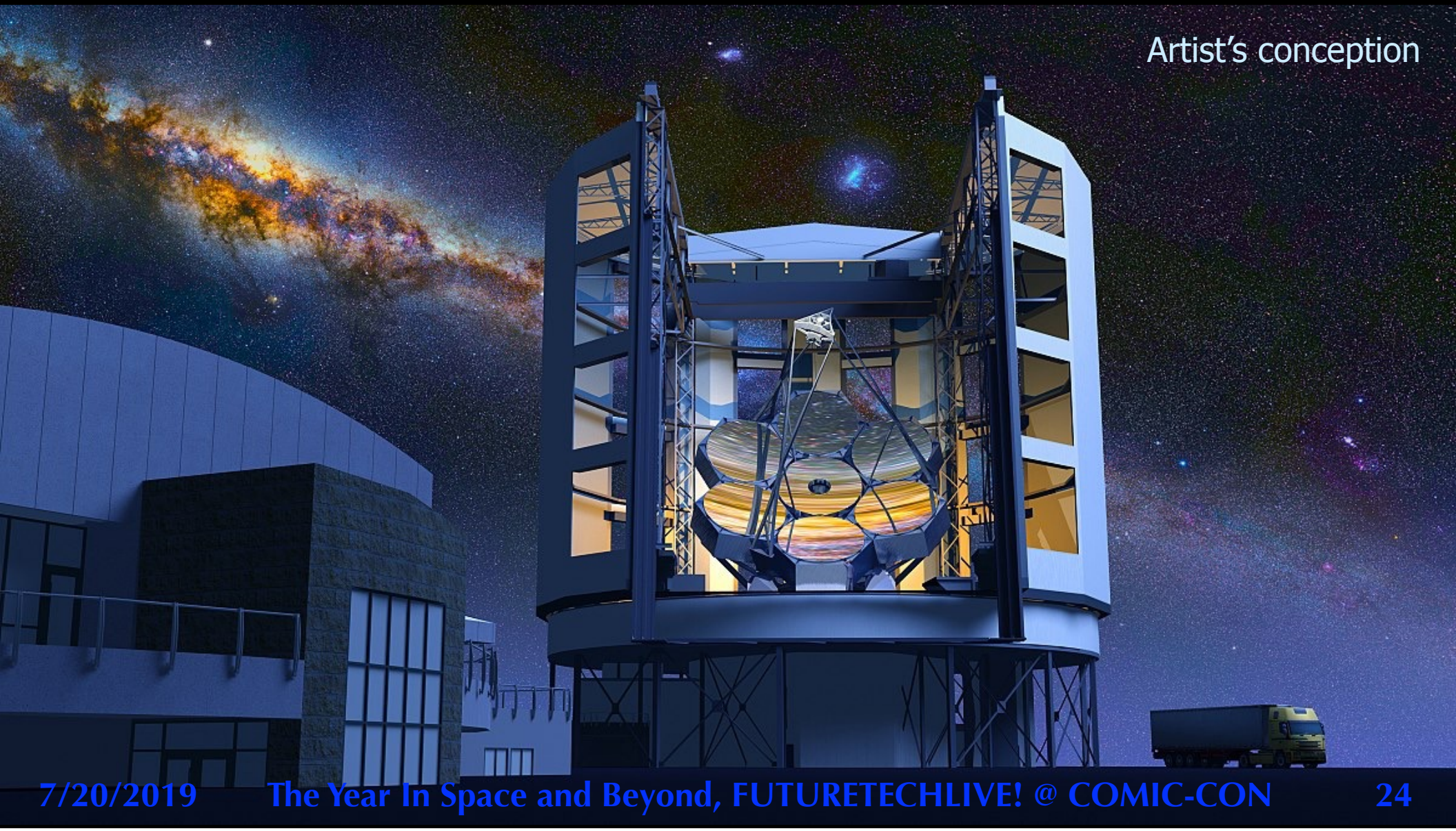
Teide Observatory on Tenerife

CANARY ISLANDS TELESCOPES

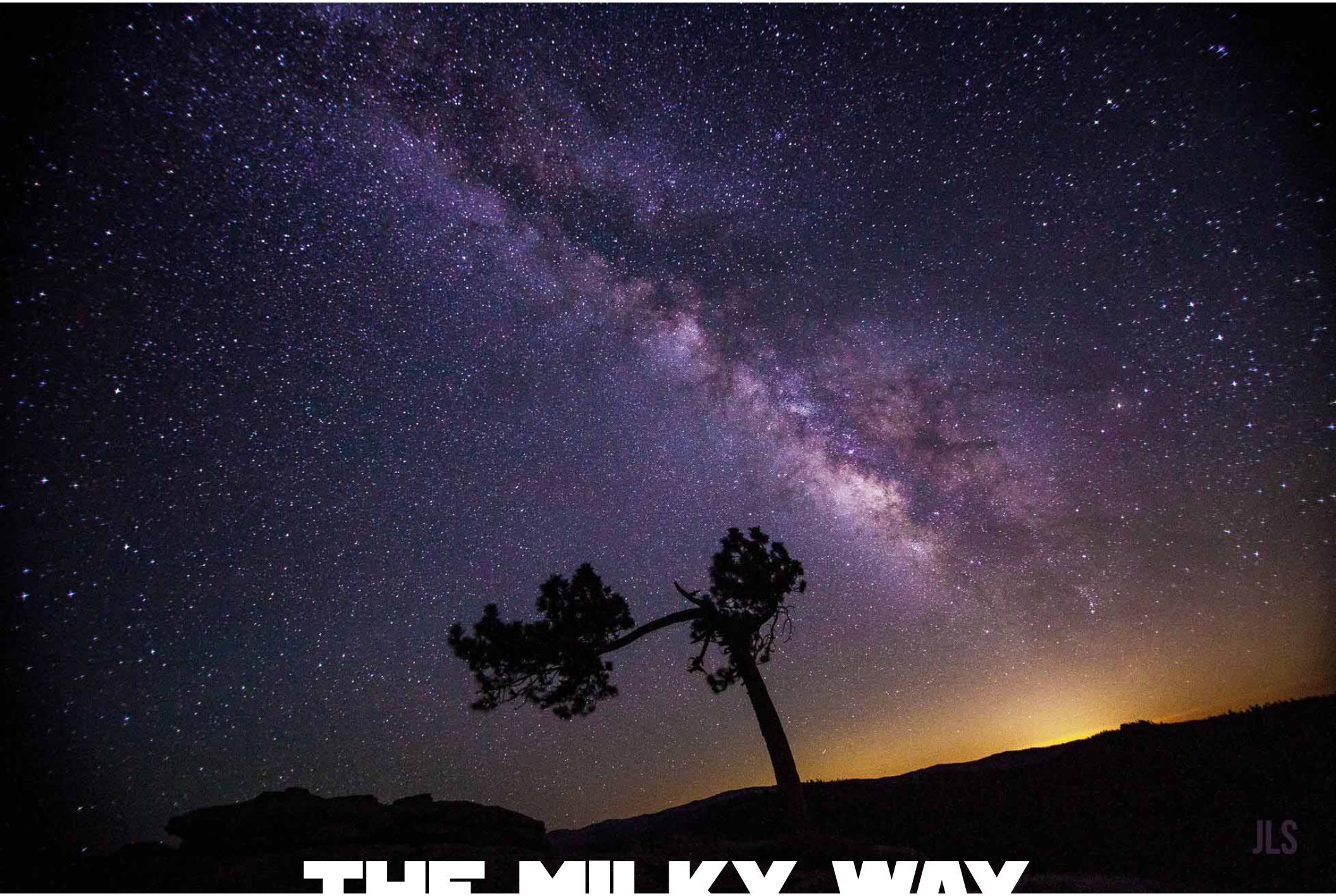
Largest optical telescope in the world! 10.4 m mirror.

GMT (GIANT MAGELLAN TELESCOPE)

Six x 8.4-m mirrors (collecting area of a single 24.5-m mirror). 10 x resolution of Hubble Space Telescope. Completion scheduled for 2025. Optical and Near-Infrared.
Las Campanas Observatory, Chile.

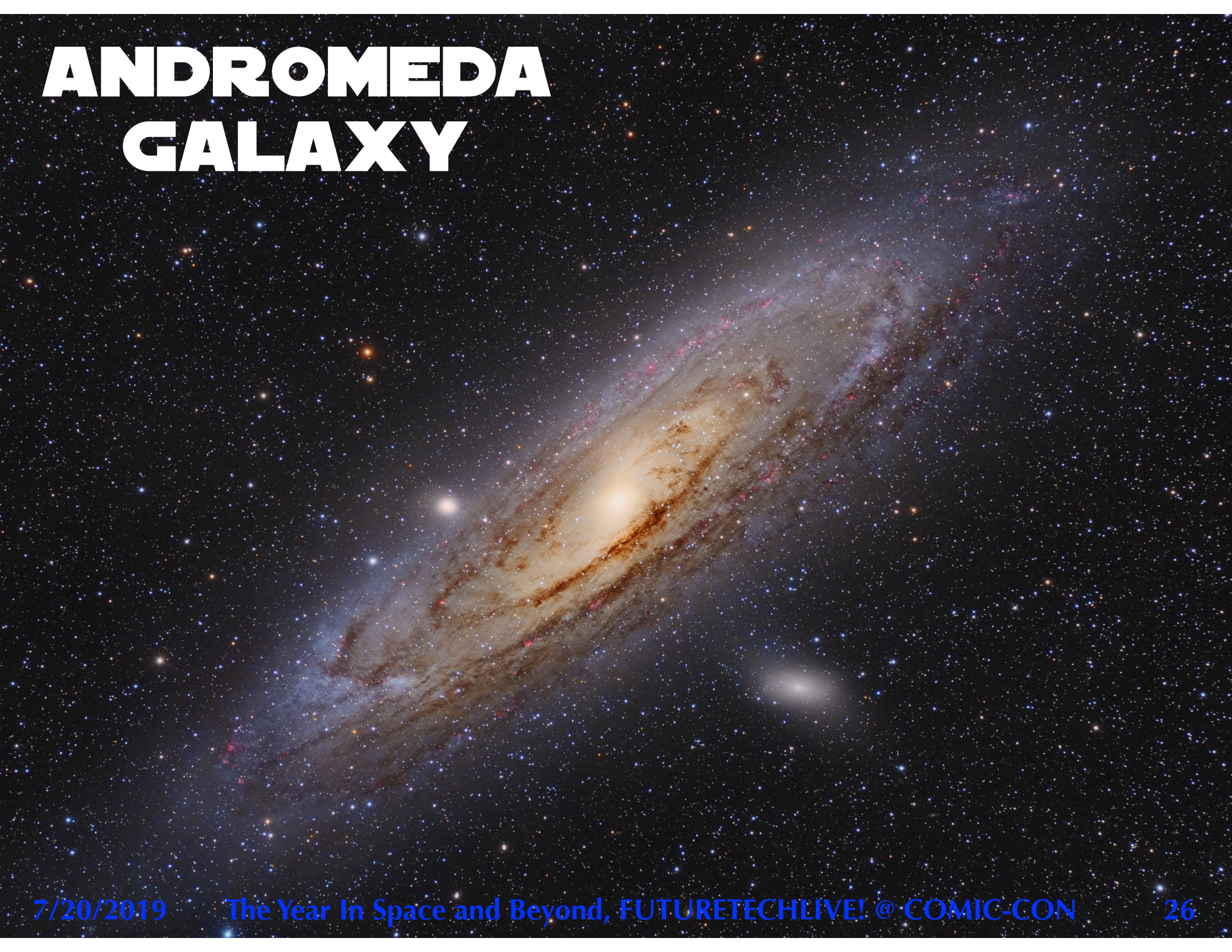


Artist's conception



THE MILKY WAY

ANDROMEDA GALAXY



HUBBLE ULTRA DEEP FIELD