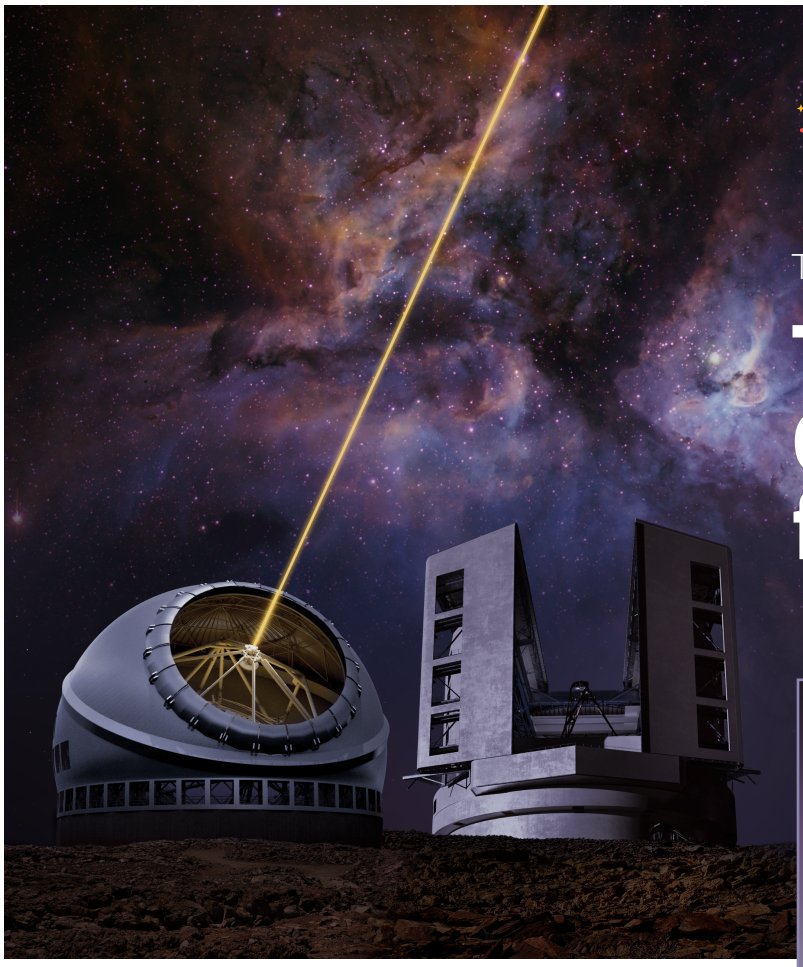


NOIR Lab · TMT THIRTY METER TELESCOPE · GIANT MAGELLAN TELESCOPE

The US Extremely Large Telescope Program

Two Telescopes, One System, for America

The **US Extremely Large Telescope Program** (US-ELTP) is a joint initiative of the **Giant Magellan Telescope** (being built by the GMTO Corporation), the **Thirty Meter Telescope** International Observatory (TIO)**,** and **NSF's NOIRLab.** The program is the highest priority ground-based project in the Astro2020 Decadal Survey report and will:

- Provide US astronomers with **nationally-funded, open access** to observing time on both telescopes.
- **Empower US astronomers to observe objects anywhere in the northern and southern sky** and carry out transformational research using two powerful, next-generation observatories.
- Capitalize on **synergies with the James Webb Space Telescope, other NASA orbital astronomy missions, and existing ground-based telescopes** to enable US researchers to conduct forefront scientific investigations into topics ranging from planets around neighboring stars to the first galaxies to form in the early Universe.
- **Promote partnerships** among the US national scientific community, international members of the GMTO and TIO consortia, private organizations, and the US government, with work in more than 20 states.
- **Leverage more than two billion dollars of existing investments** from the GMTO and TIO global consortia, as the US-ELTP seeks federal investment from the NSF at an approximately 50% funding level.

The **Giant Magellan** and **Thirty Meter Telescopes** are next-generation observatories with unmatched capabilities:

- Images that are **4 times sharper than the James Webb Space Telescope** with state-of-the-art adaptive optics systems.
- Up to **200 times the sensitivity of today's largest telescopes**.
- **Complementary designs** yield powerful scientific capabilities for faster and more detailed observations addressing nearly all aspects of astronomy — from searching for signs of life on distant exoplanets to investigating the cosmic origins of chemical elements.

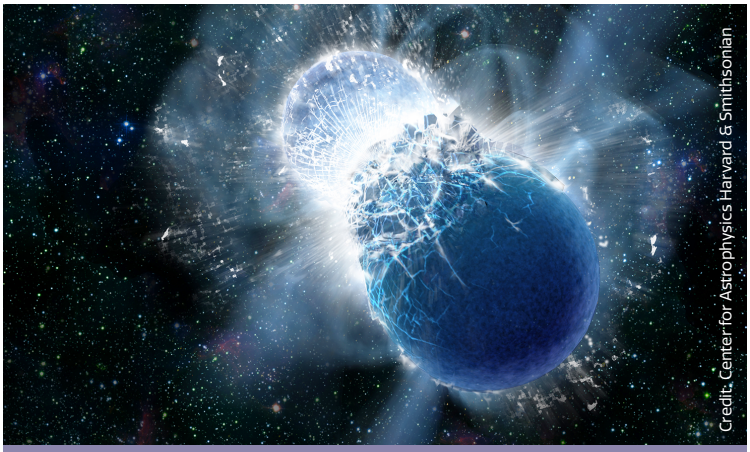
NSF's NOIRLab is the inclusive portal to the US-ELTP for the US community, which will:

- Deliver an extensive suite of **user-centric services** throughout the lifecycle of scientific inquiry, from creating observing proposals to performing detailed analyses and publishing key results from high-quality observational data.
- Provide **dedicated support for all members of the US astronomical community** wishing to leverage the promise and power of the GMT and TMT.
- **Archive all scientific data** from both observatories, enabling archival scientists access to a rich source of observations.
- Support participation of the broadest possible US astronomical community by providing access to all researchers, **including those at small and under-resourced institutions**.

Without the US-ELTP, the US would cede global leadership in observational optical astronomy to Europe and China, a field we have led for the past 100 years.

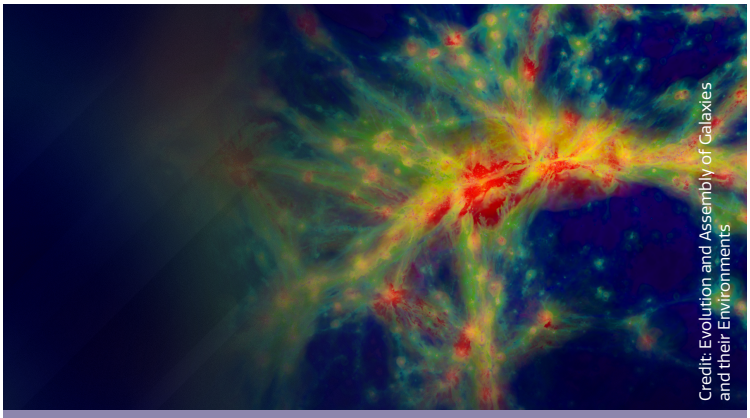
Transformative Science enabled by the US-ELTP

Is there life outside our Solar System?
The US-ELTP will study planets in the habitable zones around nearby stars in any part of the sky and measure atmospheric biomarkers that can indicate whether a planet harbors life.



What can gravitational waves teach us about the basic properties of matter?
The detection of gravitational waves in 2015 opened up a new vista of astronomical discovery and won a Nobel Prize. Observing transient events resulting from merging neutron stars and black holes with the US-ELTP will answer fundamental questions about gravitation and the age of the Universe.

Can we study hidden physics?
Less than 5% of the Universe is in the form of normal atoms. More than 95% of the Universe is composed of dark matter and dark energy which remain poorly understood. Observations with the US-ELTP system will reveal their nature in part through their effects on normal matter.



How did galaxies form and grow in the early Universe?
The US-ELTP will resolve the detailed inner structure of galaxies 13 billion years ago and measure the dynamics of intergalactic matter, improving our understanding of the early Universe and the galaxy formation occurring then.

What does the stellar fossil record reveal about the formation of galaxies and black holes?
The history of galaxy formation can be studied with the US-ELTP by identifying the oldest stars (stellar fossils) and searching for the missing links between stellar and supermassive black holes.

***Unexpected Discoveries Anywhere in the Sky*:**
The US-ELTP will allow US astronomers to make unexpected and surprising discoveries in both the northern and southern skies, opening new avenues of inquiry. The Universe never fails to astonish!

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