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.**
- Collaborate **with the James Webb Space Telescope, other NASA space-based missions, and existing ground-based telescopes.**
- **Enable US researchers to conduct forefront science** — from searching for signs of life on exoplanets to finding the cosmic origins of chemical elements.
- **Promote international research partnerships and economic growth** in the US with work in more than 20 states.
- **Leverage more than two billion dollars of existing investments** from the GMTO and TIO global consortia, with investment sought from NSF at an approximately 50% funding level.

Next-generation system with unmatched capabilities:

- Images **4 times sharper than possible today.**
- Up to **200 times the sensitivity of today's largest telescopes.**
- **Complementary designs** for faster and more detailed observations.

NSF's NOIRLab will support the US community:

- Create **user-centric services** for the life cycle of scientific inquiry, from creating observing proposals to publishing key results.
- Provide **dedicated support for all members of the US astronomical community**.
- **Archive of all scientific data** from both observatories.
- Provide access for the entire US astronomical community of researchers, **including those at small and under-resourced institutions**.

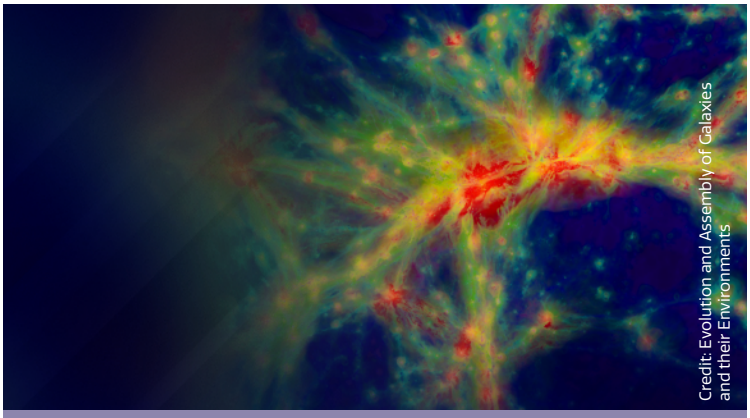
Without the US-ELTP, the US will cede global leadership in observational optical astronomy to Europe and China, a field we have led for the past 100 years.

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 gravity 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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