UNLOCKING NEW **FRONTIERS**

Modern telescopes have revealed truly remarkable details about our universe, but they also have uncovered compelling mysteries and new questions. The Thirty Meter Telescope (TMT), with its unprecedented size and innovative technologies, will help to answer these challenges and expand the boundaries of our knowledge.

ASTRONOMY'S **NEXT-GENERATION** OBSERVATORY

Thirty Meter Telescope

तीस मीटर दूरबीन

30 m 望遠鏡

Télescope de Trente Mètres

三十米望远镜

TMT

TMT International Observatory
100 West Walnut Street
Suite 300
Pasadena, California 91124
USA

ENGINEERING A **NEW VISION**

LEARN MORE:
WWW.TMT.ORG

The TMT will be three times larger than the most powerful telescopes on Earth today. It will see fainter light, more distant objects, and finer details.

PRIMARY MIRROR

TMT's mirror will be made up of 492 individual segments. Precisely aligned, these segments will work as a single reflective surface 30 meters across.

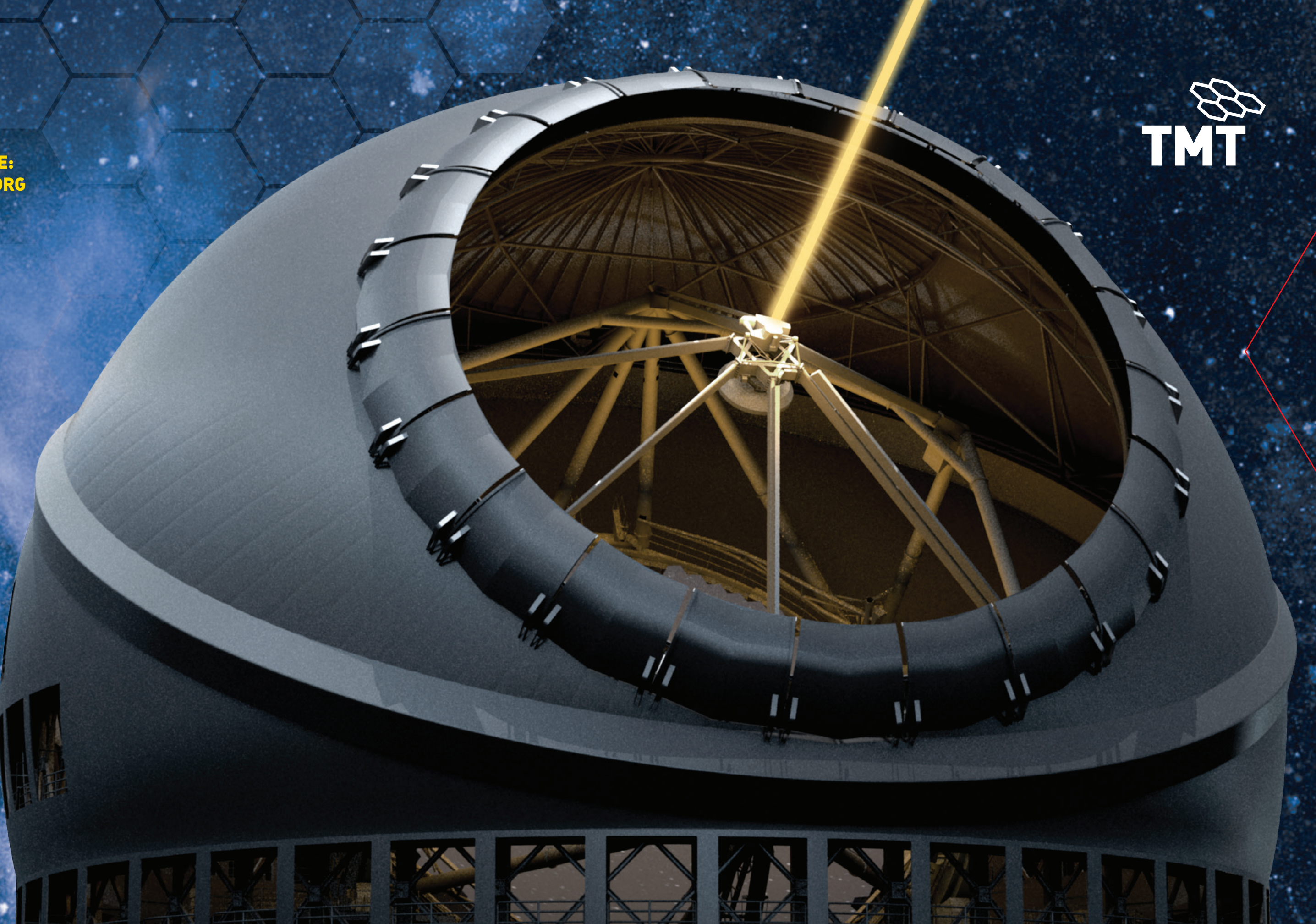
ADAPTIVE OPTICS

Using adaptive optics, the TMT will correct for the blurring of Earth's atmosphere, providing much sharper images and science that will transform our understanding of the universe.

LOCATION

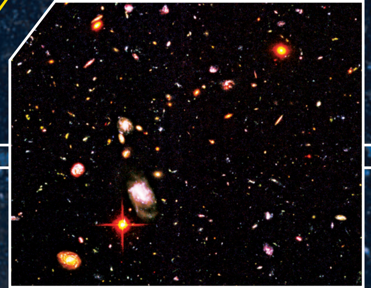
An outstanding telescope requires an equally outstanding home. TMT has found two such locations in the northern hemisphere: near the summit of Maunakea in Hawaii, and at the Observatorio del Roque de los Muchachos in La Palma, Canary Islands (Spain) — the alternate site for TMT should construction at Maunakea not be feasible. These mountains have an atmosphere that is cold, dry and stable — ideal conditions for astronomy.

The TMT International Observatory (TIO) is a collaboration among Caltech, the University of California (UC), the National Institutes of Natural Sciences of Japan, the National Astronomical Observatories of the Chinese Academy of Sciences, the Department of Science and Technology of India, and the National Research Council of Canada.



TMT SCIENCE **MISSION**

The TMT will explore nearly every area of astronomy and astrophysics.

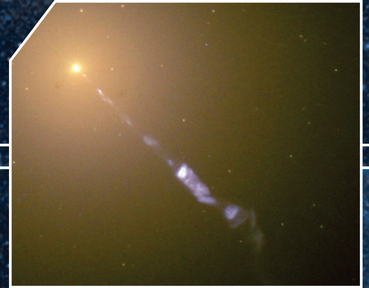


BIRTH OF THE FIRST STARS AND THE FORMATION OF THE EARLIEST GALAXIES

The universe began 13.7 billion years ago in a rapidly expanding burst of matter and energy. We see the imprint of that event today as the cosmic microwave background. As the universe continued to expand and cool, matter began to collapse under gravity, eventually forming the first stars in the universe. The TMT will reach back farther than ever before to search for the first star clusters and primordial galaxies.

NATURE AND COMPOSITION OF THE UNIVERSE

Normal matter—the stuff of stars, planets, and life—makes up only a small fraction of the universe. Much more plentiful is dark matter, material that neither emits nor reflects light. The vast majority of space, however, is made up of dark energy, a mysterious repulsive force filling the universe. By studying the most distant stars and galaxies, the TMT will help scientists understand these phenomena and how they impact the evolution of the cosmos.

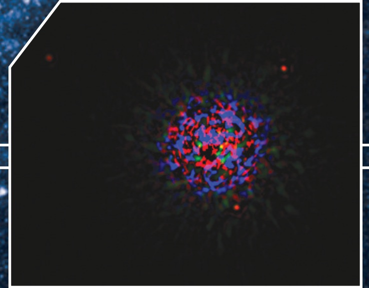


RELATIONSHIP BETWEEN BLACK HOLES AND GALAXIES

At the center of our Milky Way Galaxy, and perhaps every large galaxy, lurks a supermassive black hole—an infinitely dense point that can warp space and trap light. Did black holes form the nuclei around which galaxies coalesced? Do they influence the evolution of galaxies? The TMT will study the turbulent region surrounding black holes, both in our own Milky Way and other nearby galaxies.

FORMATION OF STARS AND PLANETS IN THE UNIVERSE TODAY

Deep within towering clouds of dust and gas, pockets of higher density collapse to form swirling disks, which are destined to become new stars and new solar systems. Leftover debris around these stars collides and combines to build up rocky objects. The largest of these become planets, gathering up the remaining gas and dust as they orbit. TMT's infrared vision will peer into these dusky areas, revealing new solar systems in the making, helping us better understand how our own world formed 4.6 billion years ago.



NATURE OF PLANETS AROUND DISTANT STARS

About 500 planets have been detected orbiting distant stars. The vast majority of these planets are gas giants larger than Jupiter. Smaller rocky worlds have also been discovered, including some potentially in their star's habitable zone. With TMT's sensitivity and resolution, astronomers will be able to detect more planets, bringing us closer to eventually detecting a true analog of Earth.

Images: (HubbleSite) NASA, ESA, R. Windhorst (Arizona State University) and H. Yan (Spitzer Science Center, Caltech); NASA, A. Fruchter and the ERO Team [S. Baggett (STScI), R. Hook (ST-ECF), Z. Levay (STScI)] (STScI); NASA and The Hubble Heritage Team (STScI/AURA), Dana Berry, Keck Observatory, NASA

POTENTIAL FOR LIFE IN THE UNIVERSE

If the same wet, warm cocktail of chemicals that was present on the early Earth exists on other planets, then the galaxy could be teeming with life. Actually detecting life would be extremely challenging, but it is possible to detect planets that potentially could harbor life. TMT will tease out starlight that passes through the atmosphere of some planets. By analyzing that light, TMT will detect the elements and molecules in the planet's atmosphere. Depending on what TMT finds, scientists may be able to infer the presence of life.