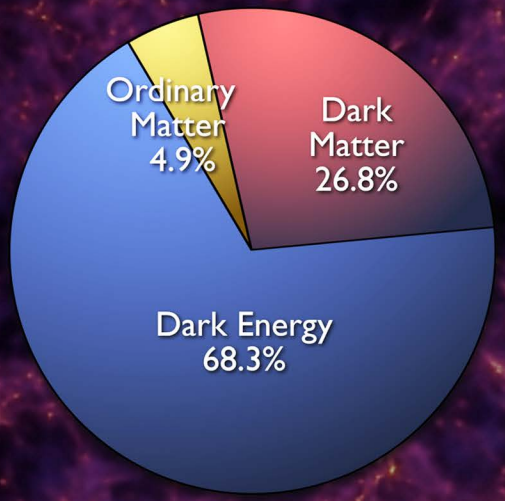
EUCLID



Euclid is a European Space Agency (ESA) M-class mission to map the geometry of the Universe, and better understand the mysterious dark energy and dark matter. The mission is the second medium-class mission (M2) in the Cosmic Vision program (2015-2025). Euclid was adopted by ESA's Science Program Committee (SPC) in June 2012, and is planned to be launch-ready in 2023.

- 1.2-m Korsch telescope
- **VIS instrument:** 550-900 nm band with 36 4k x 4k CCDs, covering 0.56 deg²; 0.1" pixels
- **NISP instrument:** NIR slitless spectroscopy and imaging, with 16 2k x 2k detectors, 0.55 deg² with 0.3" pixels. Imaging in Y,J,H; blue grism (0.92-1.3 microns) and red grism (1.25-1.85 microns) with R~380 for 0.5" object

http://www.euclid.caltech.edu

http://sci.esa.int/euclid/

http://www.euclid-ec.org

MAPPING THE GEOMETRY OF THE DARK UNIVERSE

The Euclid mission has been optimized for the two primary probes of Dark Energy:

- **Weak Lensing:** This method observes tiny distortions in images of ~1.5 billion galaxies, which are caused by the gravitational lensing resulting from foreground mass concentrations. These data enable mapping the dark matter distribution, and probe dark energy via the cosmic expansion history and the growth of structure.
- **Galaxy Clustering:** This method measures the positions and grism redshifts of ~30 million galaxies. These data enable measurement of the cosmic expansion history through baryonic acoustic oscillations (BAO), which originated from primordial sound waves frozen when the Universe first became transparent. The galaxy distribution also probes the growth history of large scale structure through redshift-space distortions (RSD) -- artifacts in redshift space caused by galaxy clustering dynamics.

AND MORE!

Euclid will enable unprecedented advances in many areas of astrophysics, from objects in our own Solar System and the Milky Way halo to the light of the first stars detected in background fluctuations. Euclid will deliver high quality morphologies, masses, and star-formation rates for billions of galaxies out to $z = 2$.

NASA PARTICIPATION

In January 2013 NASA joined the Euclid mission. NASA has contributed 16 state-of-the-art infrared detectors and four spare detectors for the NISP instrument. In addition, NASA nominated three U.S. science teams for the Euclid Consortium:

- "Exploring Dark Energy and Modified Gravity With Euclid," PI J. Rhodes.
- "Looking at Infrared Background Radiation Anisotropies with Euclid," PI A. Kashlinsky.
- "Precision Studies of Galaxy Growth and Cosmology Enabled by a Physical Model for Nebular Emission," PI R.-R. Chary.

Today, more than 100 US scientists and engineers are members of the Euclid Consortium, an international body of more than 1,000 members who will oversee development of the instruments, manage science operations and analyze data.

EUCLID SURVEYS

Wide Survey:

- survey ~15,000 square degrees of the extra-galactic sky with galactic latitude $|b| > 30$ deg
- galaxy shear measurements of about 1.5 billion galaxies, and spectroscopic measurements for ~30 million galaxies

Deep Survey:

- approximately 2 magnitudes deeper than the wide survey, total area of approximately 50 deg² in patches of approximately 10 deg²

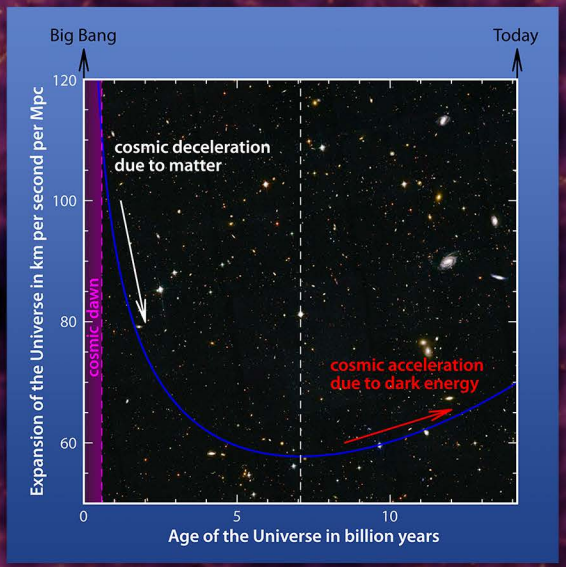
SCIENCE OBJECTIVES

1. Dark Energy Properties: Measure the dark energy equation of state parameters, w_p and w_a to a precision of 1.5% and 15%, respectively, using Euclid's primary probes alone, and 0.7% and 3.5% when combined with additional probes and results from Planck.

2. Beyond Einstein's Gravity: Distinguish general relativity from modified-gravity theories by measuring the galaxy clustering growth rate exponent γ, with a precision of 1%.

3. Dark Matter: Test the cold dark matter paradigm for structure formation, and measure the sum of the neutrino masses to a precision better than 0.02 eV when combined with Planck.

4. Seeds of Cosmic Structure: To investigate the conditions in the Universe after the Big Bang that seeded the large-scale structure of the Universe observed today.



ABOUT ENSCI

NASA established the Euclid NASA Science Center at IPAC (ENSCI) in order to support US-based investigators using Euclid data. ENSCI participates in the Euclid Consortium's Science Ground Segment, providing algorithm and software development, participating in data quality assurance, and performing data processing. In addition, ENSCI will support US archival researchers by providing expert insight into the Euclid surveys, data pipelines, calibration, and products.

ENSCI is funded by NASA through JPL and implemented by IPAC at Caltech.

Background Image: a slice of the Millennium Simulation (Springel et al. 2005, Nature, 435, 629)

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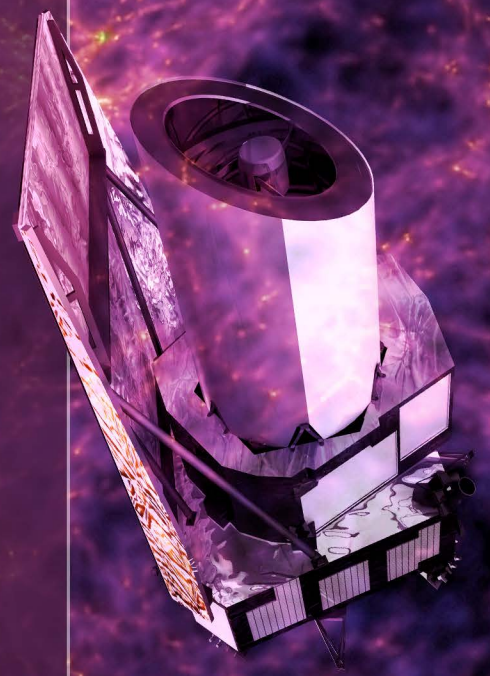

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