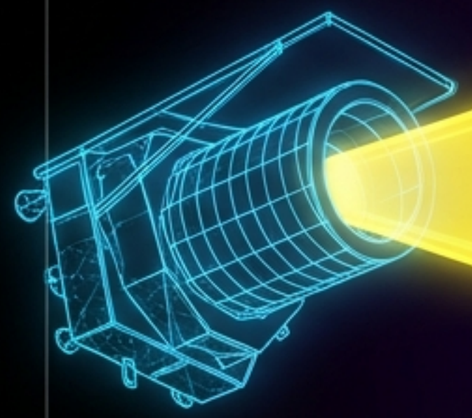


THE FIRST HARVEST: UNLOCKING THE DARK UNIVERSE

INSIDE EUCLID'S 'DR1 FOUNDATION' DATA RELEASE

Gemini Notebook

Mapping 14% of the Sky in a Single Year

1,900 Square Degrees
(The area mapped so far)

900 Million Galaxies
(Cataloged in 3D space)

160 Million Spectra
(Detailed chemical/distance fingerprints)

15,720 Gravitational Lenses
(Discovered in this release alone)

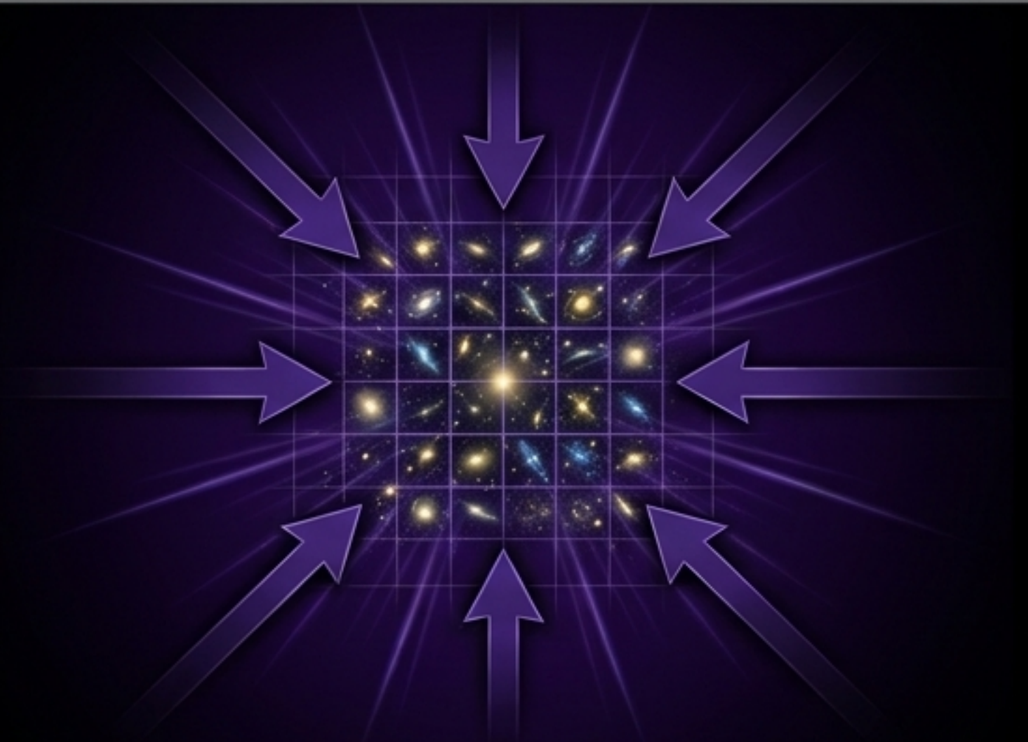


The “Foundation” Release.

Named as a nod to Isaac Asimov's sci-fi epic, this release forms the bedrock for all future cosmological science.

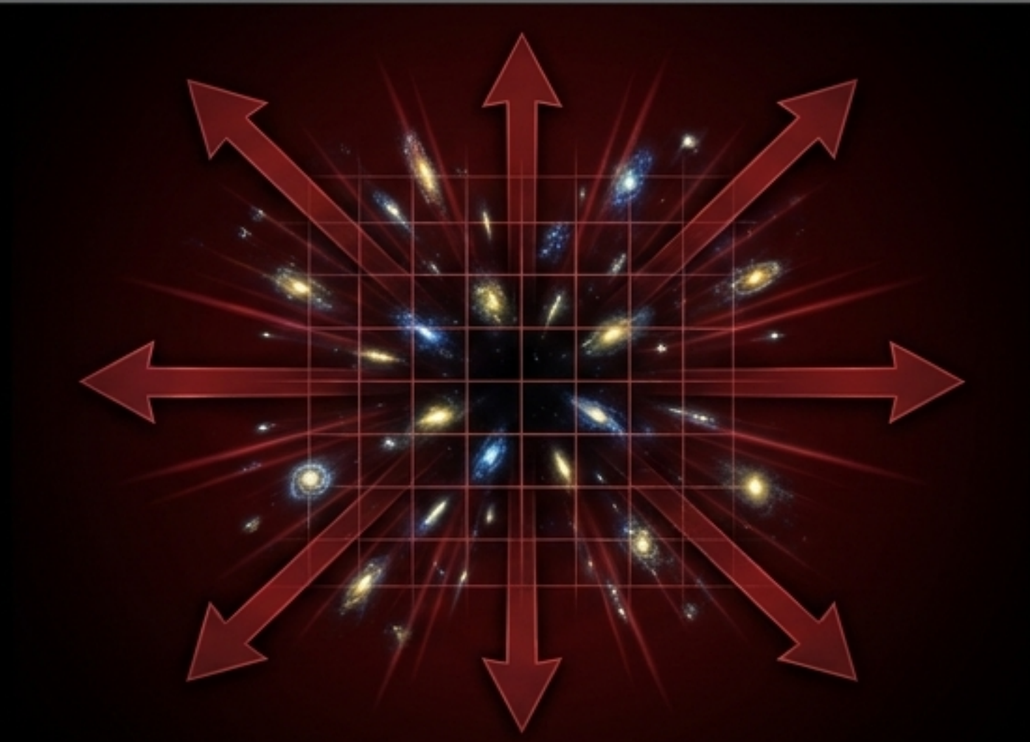
Gemini Notebook

The Cosmic Tug-of-War Dictating Our Universe



Dark Matter

- The “Cosmic Glue.” Pulls galaxies together. Dominated the dynamic structure of the early universe.



Dark Energy

- The “Cosmic Expander.” Pushes space apart, accelerating expansion. Dominates the modern universe.

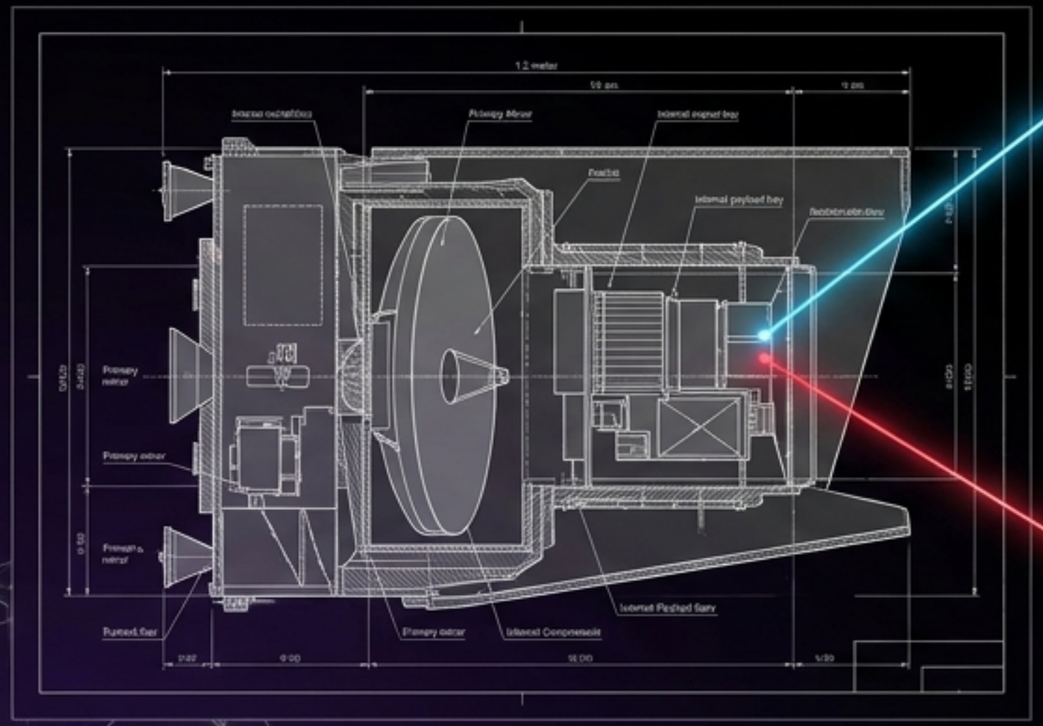
Big Bang

Euclid's Mission: Map the exact epoch (at 1/3 the universe's current age) where Dark Energy overtook Dark Matter to drive cosmic acceleration.

Today

Gemini Notebook

Two Pristine Instruments Working in Perfect Unison



VIS (Visible Instrument)

- **Capability:** Captures ultra-precise galaxy shapes (0.1 arcseconds/pixel resolution).
- **Goal:** Measure space-time distortions to map invisible Dark Matter.

NISP (Near-Infrared Spectrometer)

- **Capability:** Captures colors and spectra to measure redshift.
- **Goal:** Calculate exact 3D distances to map the deep structure of Dark Energy over time.

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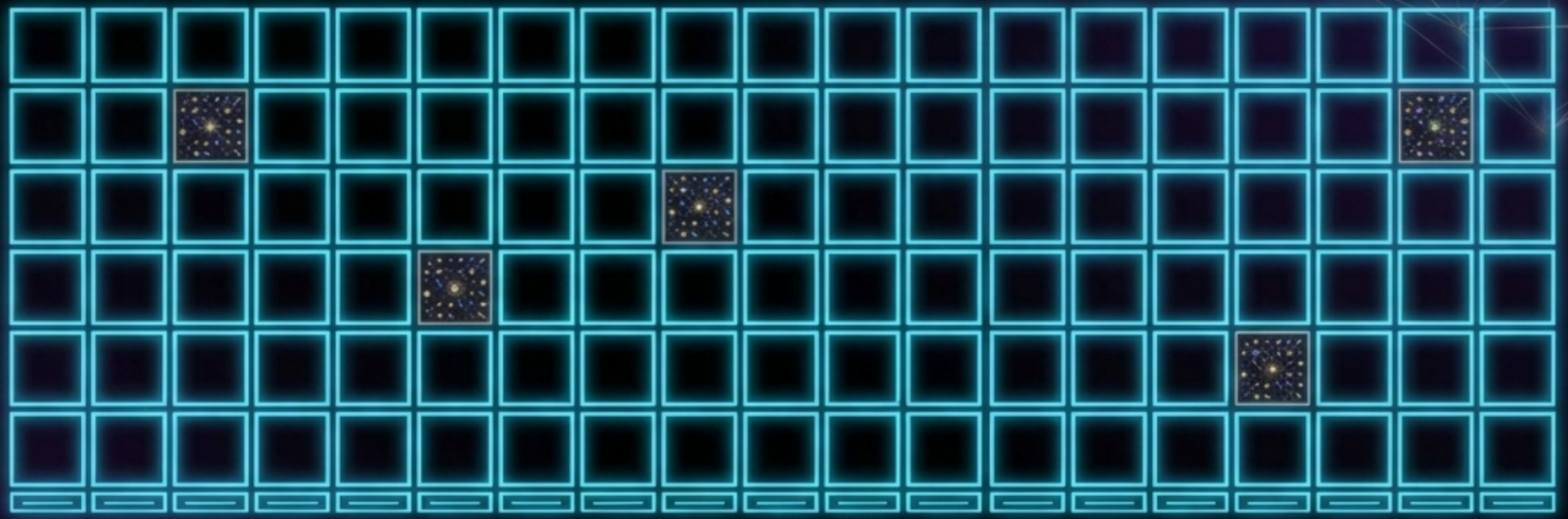
Moving from Fortunate Discoveries to Systematic Sweeps



Hubble Space Telescope

Unmatched clarity, but narrow focus.

(Telescope mirror: 2 meters).



Euclid Observatory

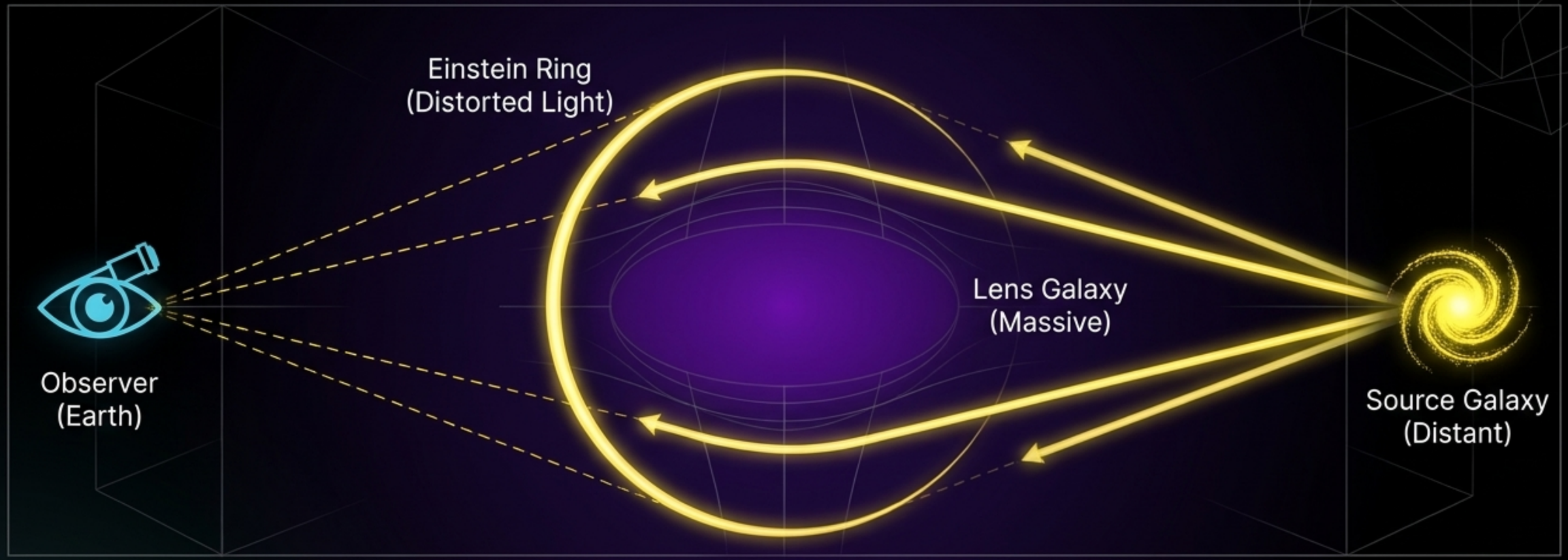
Pristine optical quality matching Hubble across a massive field of view.

(Telescope mirror: 1.2 meters).

The Transformation: What would take Hubble centuries of observation to map, Euclid will complete in just 6 years.

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The Cosmic Magnifying Glass



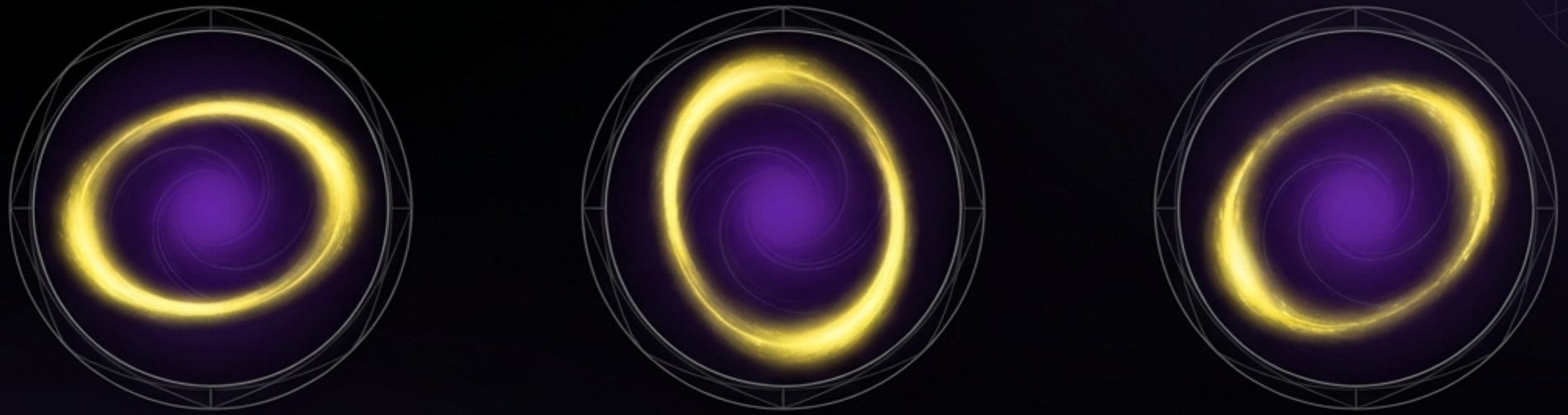
The Physics: Massive objects warp the fabric of space-time, bending the light of galaxies hidden behind them.

The Prize: By studying the exact distortion of these light arcs, scientists can mathematically “weigh” the invisible Dark Matter halo surrounding the lens galaxy.

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Turning Rare Anomalies into Statistical Goldmines

The Surprise: Over 1,000 of the new lenses are spiral galaxies (like our Milky Way). Previously, almost all known lenses were massive, round elliptical galaxies. This allows physicists to finally compare dark matter profiles across entirely different galaxy shapes.

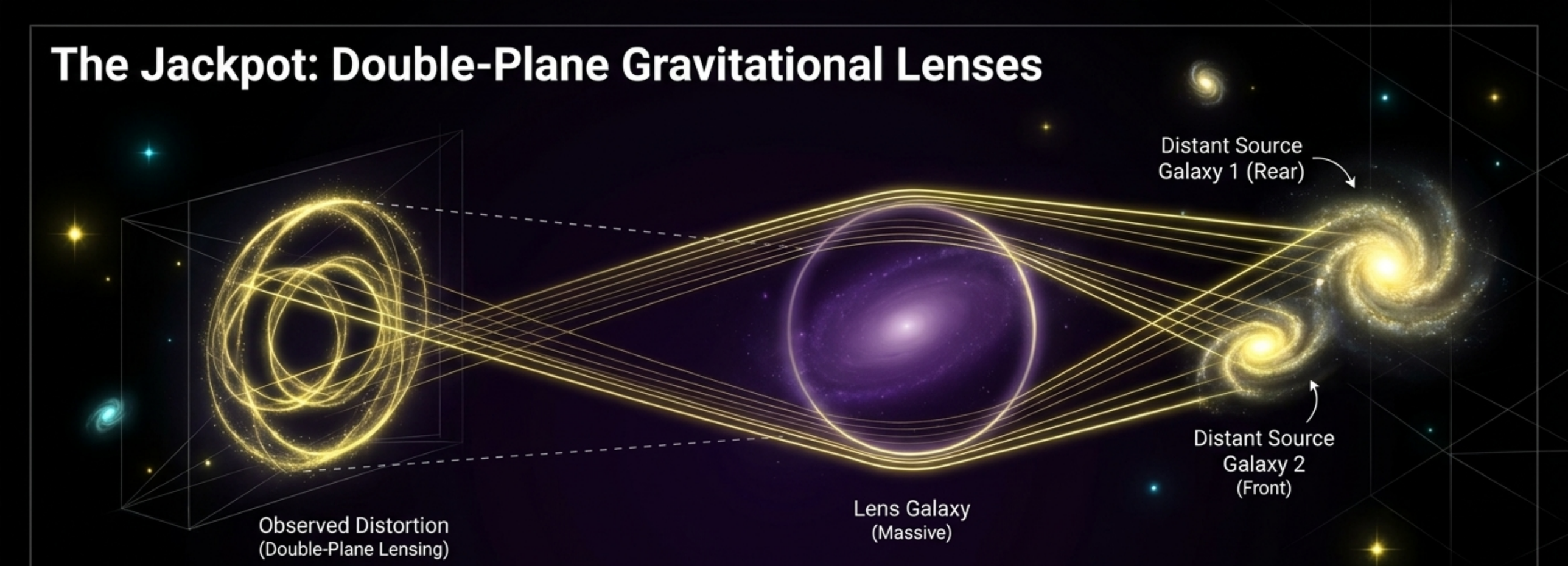


The Haul: Euclid has transformed gravitational lensing from a game of chance into a cataloged certainty.



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The Jackpot: Double-Plane Gravitational Lenses



The Phenomenon

- A near-impossible alignment of **THREE** distinct galaxies sitting at completely different depths of the universe.

The Jump

Euclid just took humanity from **4 known systems** to **11 confirmed systems** (with 80 more high-probability candidates in DR1).

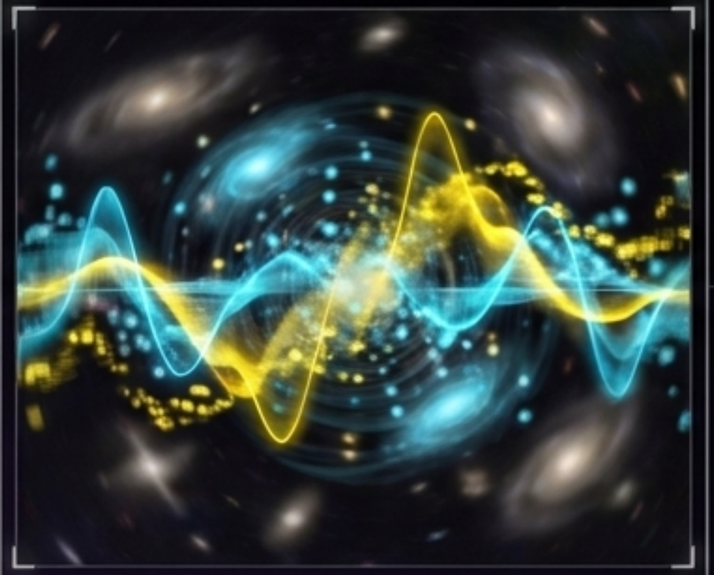
The Value

The geometry of a double-lens is so constrained that it allows physicists to **independently calculate the Hubble Constant** (the universe's expansion rate), bypassing traditional cosmic measurement debates.

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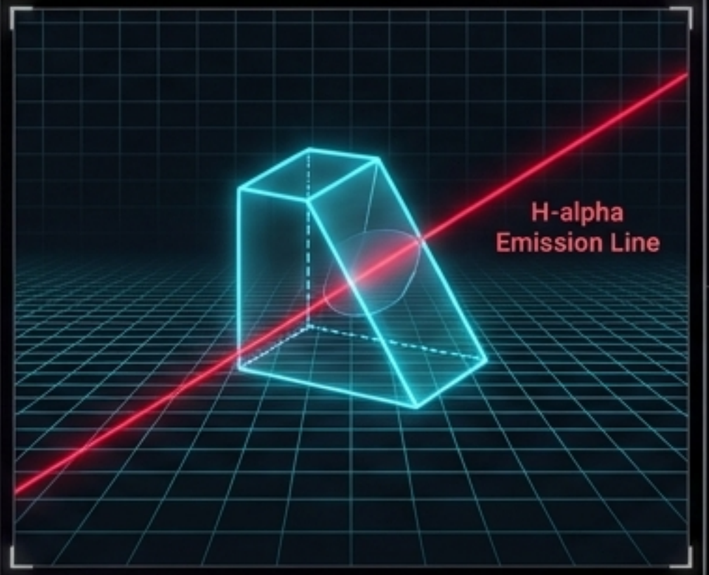
The Spectroscopy Trick
Saving Thousands of Hours

The Problem



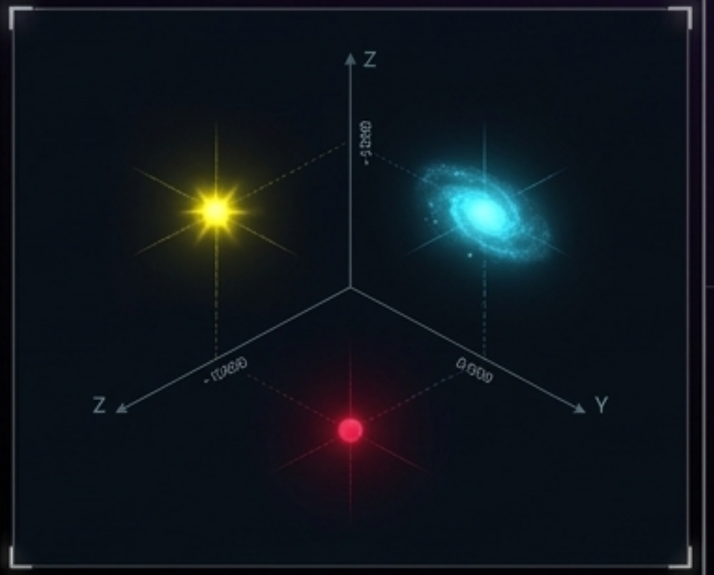
Confirming the 3D distances of lens galaxies usually requires booking scarce time on massive 8-meter ground telescopes.

The Solution



The Euclid team realized they could merge NISP's infrared mini-prisms with VIS's ultra-sharp imagery to isolate the H-alpha emission lines of overlapping galaxies.

The Result



Euclid can now autonomously confirm its own deep-space discoveries without ground support.

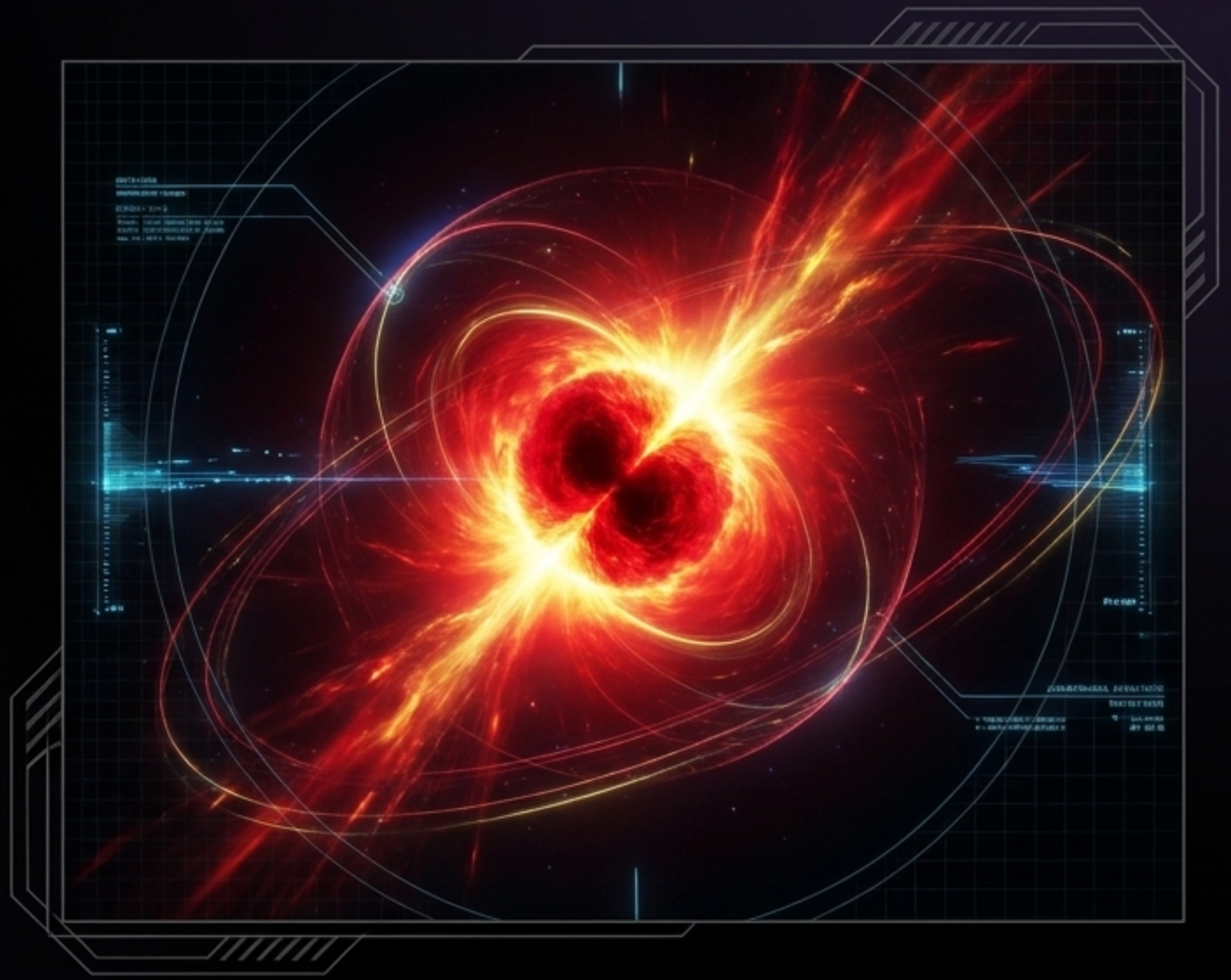
Gemini Notebook

Magnifying Giants at the Dawn of Time

The Mystery:
How did supermassive black holes grow to millions of solar masses when the universe was barely born? (Stellar collapse takes too long).

The Discovery:
Utilizing its lensing capabilities, Euclid is finding ancient Quasars (active supermassive black holes) at redshifts greater than 7—when the universe was just 5% to 10% of its current age.

The Impact:
Multiplying the known catalog of these primordial giants forces physics to rethink the ‘seeds’ that formed the first black holes.



Gemini Notebook

Revealing the Hidden Ghosts in Our Cosmic Backyard



The Capability: Because Euclid has a pristine instrumental response with zero optical glare, it can spot incredibly faint, low-surface-brightness objects right next to bright galaxies.

The Discovery: Euclid is executing an unblinking, systematic scan of the Local Group, uncovering hidden dwarf galaxies and diffuse star clusters.

Solving a Puzzle: Theories predicted giant galaxies should be swarming with small, captive satellite galaxies, but previous telescopes couldn't see them. Euclid is finding the missing satellites.

Gemini Notebook

The Roadmap to Answering the Ultimate Question

2025
Early Preview
(63 sq degrees / CMB correlation)

Nov 2026
DR1 “Foundation” Release

June 2027
First Cosmology Results

2028
3-Year Data Release

2031-2032
Final Survey Complete

Working in the Dark

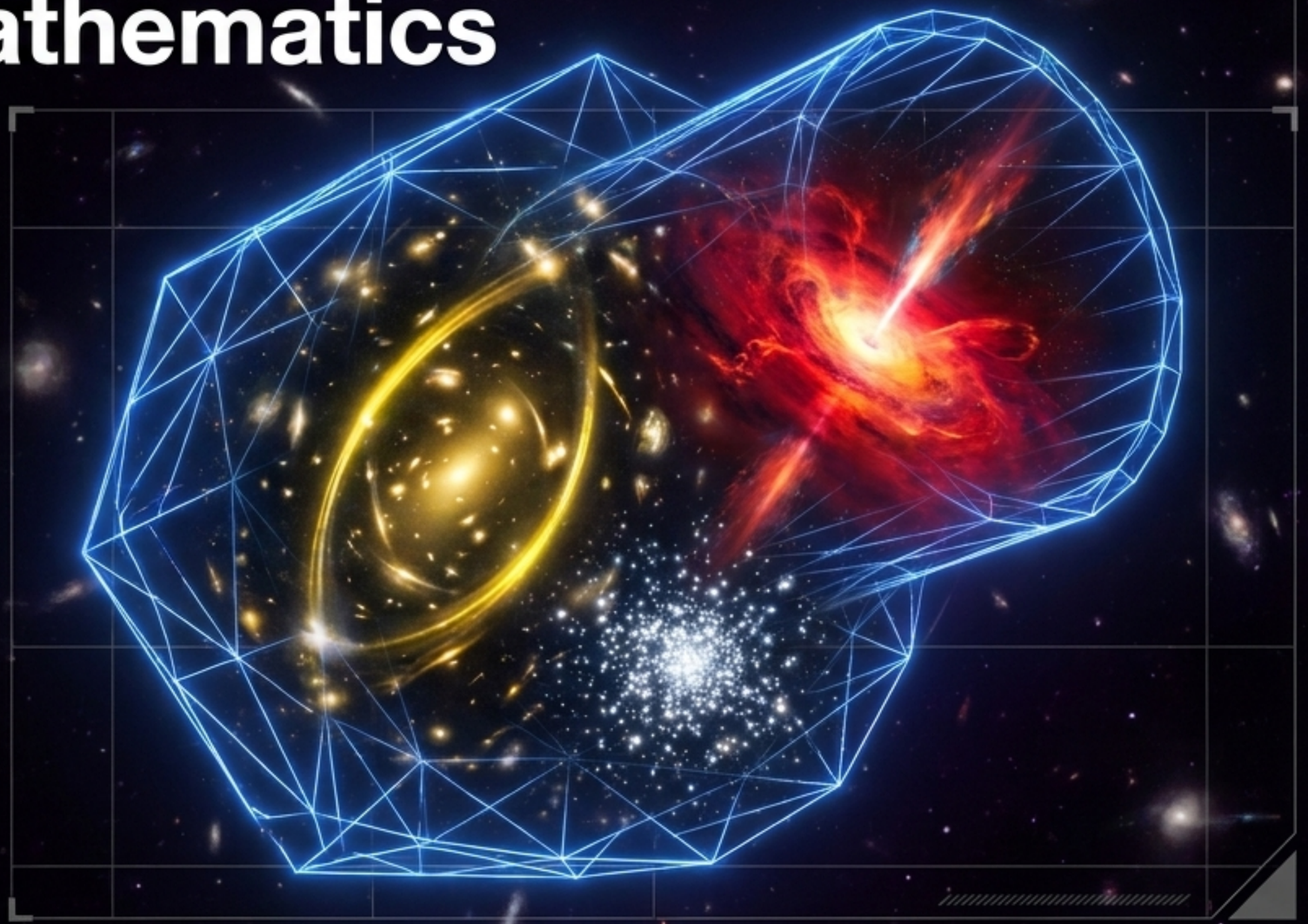
To prevent human confirmation bias regarding the nature of Dark Energy, the Euclid team is currently analyzing the cosmological data “blind”—using artificially biased data injected by computers. The true results will be unlocked in mid-2027.

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Moving from Guesswork to Precision Mathematics

Euclid is not just a telescope; it is the ultimate statistical machine. By turning rare cosmic anomalies into catalogs of **tens of thousands, it has laid the foundation to finally weigh the invisible.**

The dark blueprint of the universe is finally coming to light.



Gemini Notebook