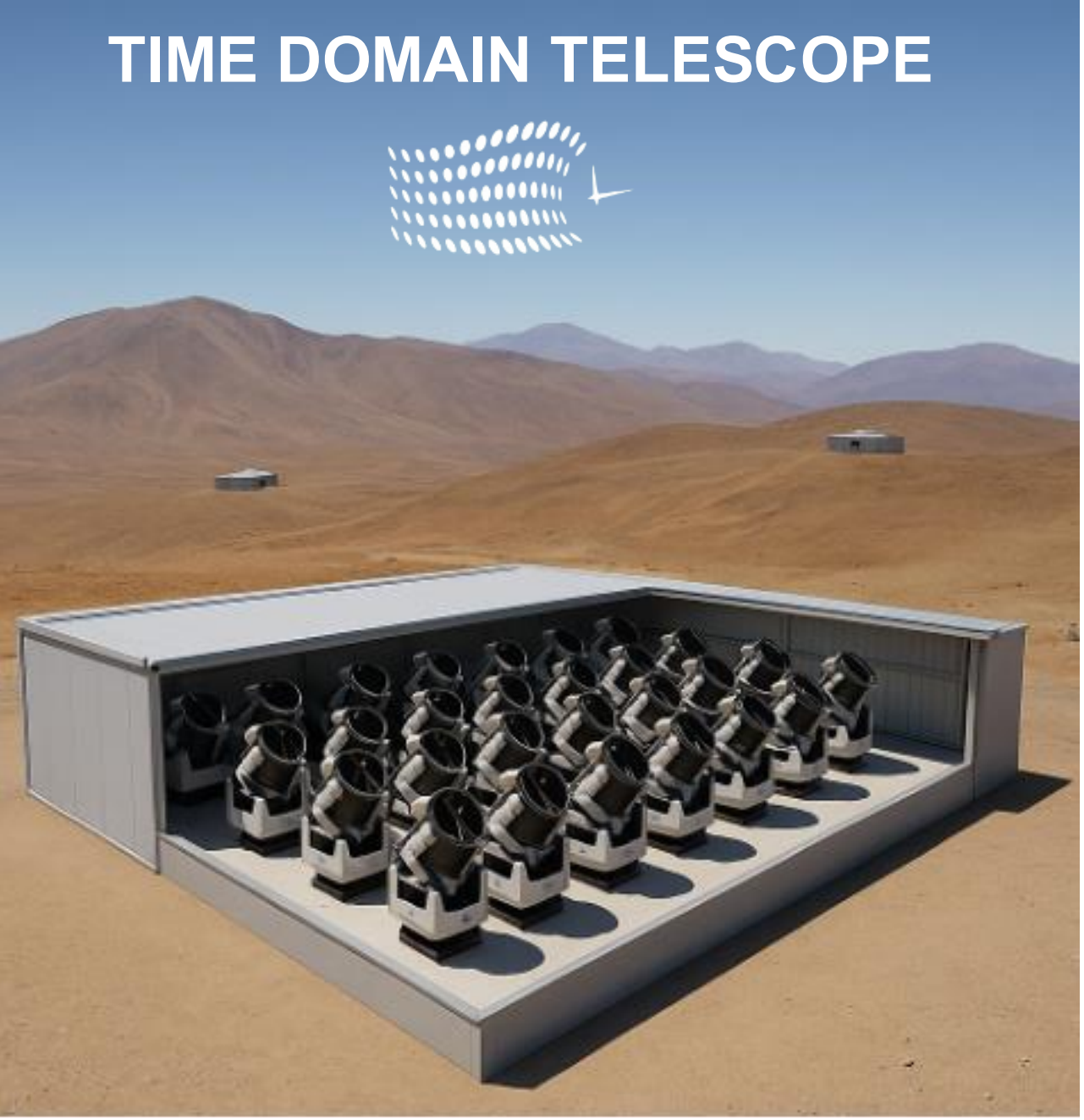
# TIME DOMAIN TELESCOPE



**Robotic *spectroscopic* telescope array**

**Unit telescopes of size ~2 m, AO enabled – Diffraction limited**

*→ a 2m@0.12" resolution equal in SNR to a 6.5m@0.8" resolution*

*→ Essential in background-limited regime (21 < m < 27)*

*→ Essential in crowding-limited regions (Bulge, Globular cluster etc.)*

**Multiple units ('25') feed cluster of spectrographs**

*→ e.g. R ~ $10^3$, $10^4$ and $10^5$ per cluster): VIS-NIR: 0.35 – 2.5 μm*

**Unit telescopes *individually* steerable/programmable**

*→ Go big or go wide: N x 1 unit or 1 x N units or m x n units*

**Proposal/PI-based observing**

*→ from regular scheduled to hard-ToOs*

**Key technological characteristics:**

***1)Robotic AO in the visual***

***2)Near read-noise-free detectors → No read-noise penalty***

***3)On-the-fly scheduling (<1 min response time)***


***" Spectra when you need them. Anywhere, Anytime!"***

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# Key Science questions

***An array of telescopes for everyone***

**Q1: What is the origin of the elements?**

→ *Gravitational wave mergers*
→ *Supernovae & Gamma-Ray Bursts*
→ *Stellar furnaces*

**Q2: What powers the Universe?**

→ *Accretion physics at all scales, from YSO to QSO*
→ *Stellar mergers incl. LISA sources*
→ *Growth of supermassive black holes*

**Q3: What is the expansion history of the Universe?**

→ *Supernovae Type Ia as tracers*
→ *Gravitational wave sirens*
→ *Cosmic Distance Ladder, near and far*

**Q4: What is the structure of exoplanetary systems**

→ *Host star – planet interactions/interplay*
→ *Remnants of exoplanetary systems*
→ *The outer Solar System*

**Relativistic transients**

GW counterparts, GRBs, and the new zoo of fast blue transients.

**Supernovae**

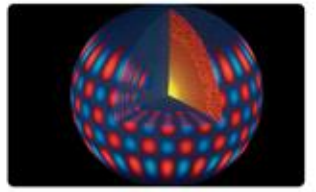
Forensic analysis of stellar death, from shock breakouts to failed detonations.

**Accretion across the scales**

Spectral-timing of turbulent flows, from compact binaries to supermassive black holes.

**Stellar & binary evolution**

Dynamic interactions, common envelope phases, and the progenitors of GW sources.



**Stellar interiors**

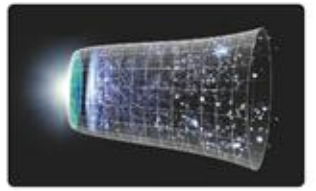
Asteroseismology, eclipsing binaries, stellar populations, protostars...

**Exoplanets and exomoons**

Transit spectroscopy, planets & remnants, disrupted systems...

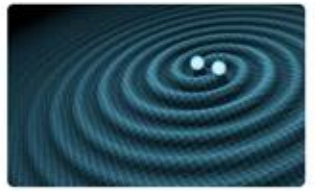
**Minor bodies of the Solar System**

Asteroids, comets, trans-Neptunian objects...



**Cosmology and Fundamental Constants**

Dark Energy, Dark Matter, and the expansion of the Universe...



**Synergies**

LISA, Athena, and other multi-messenger approaches...