The Large Synoptic Survey Telescope (LSST)

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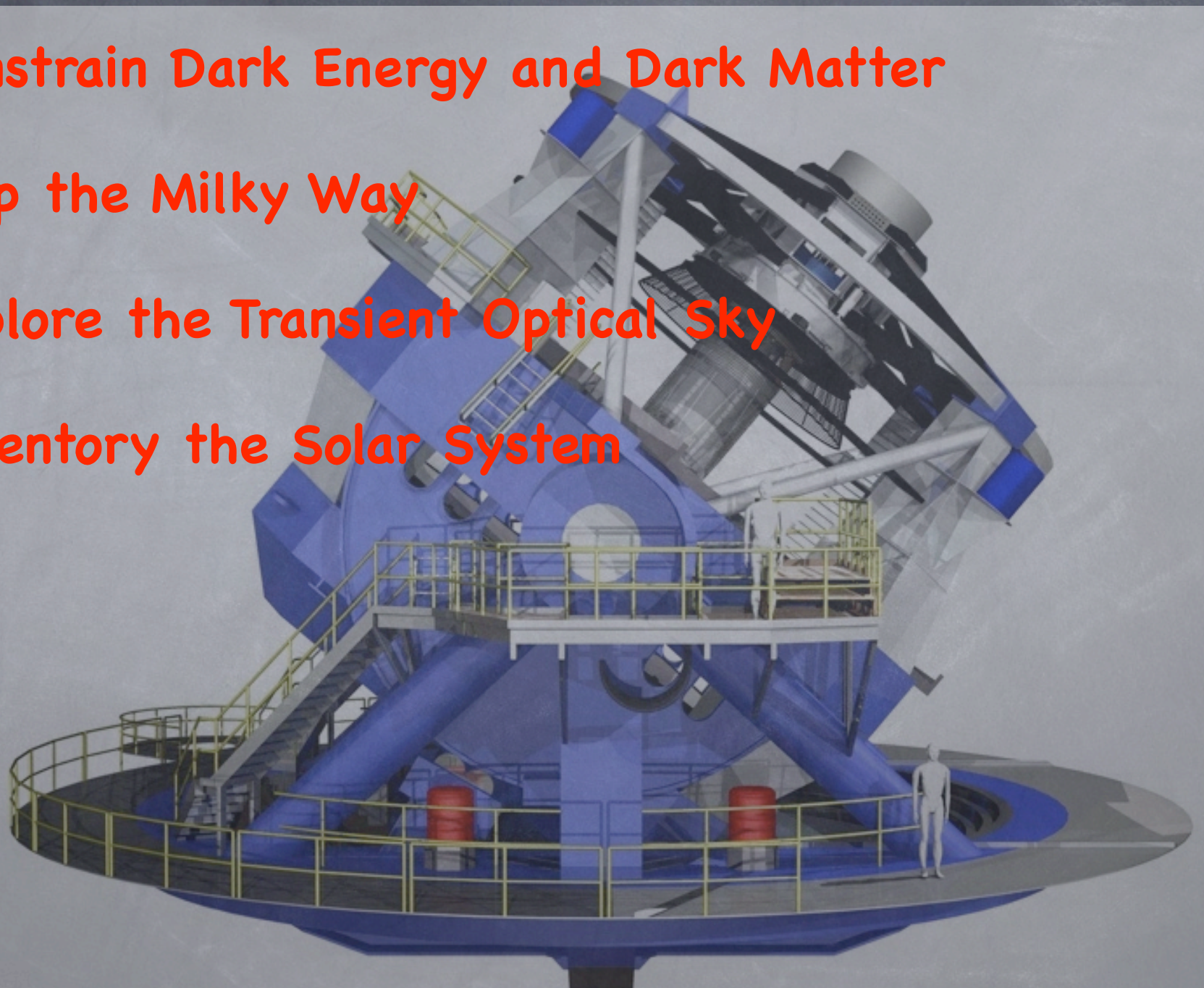
Science Goals

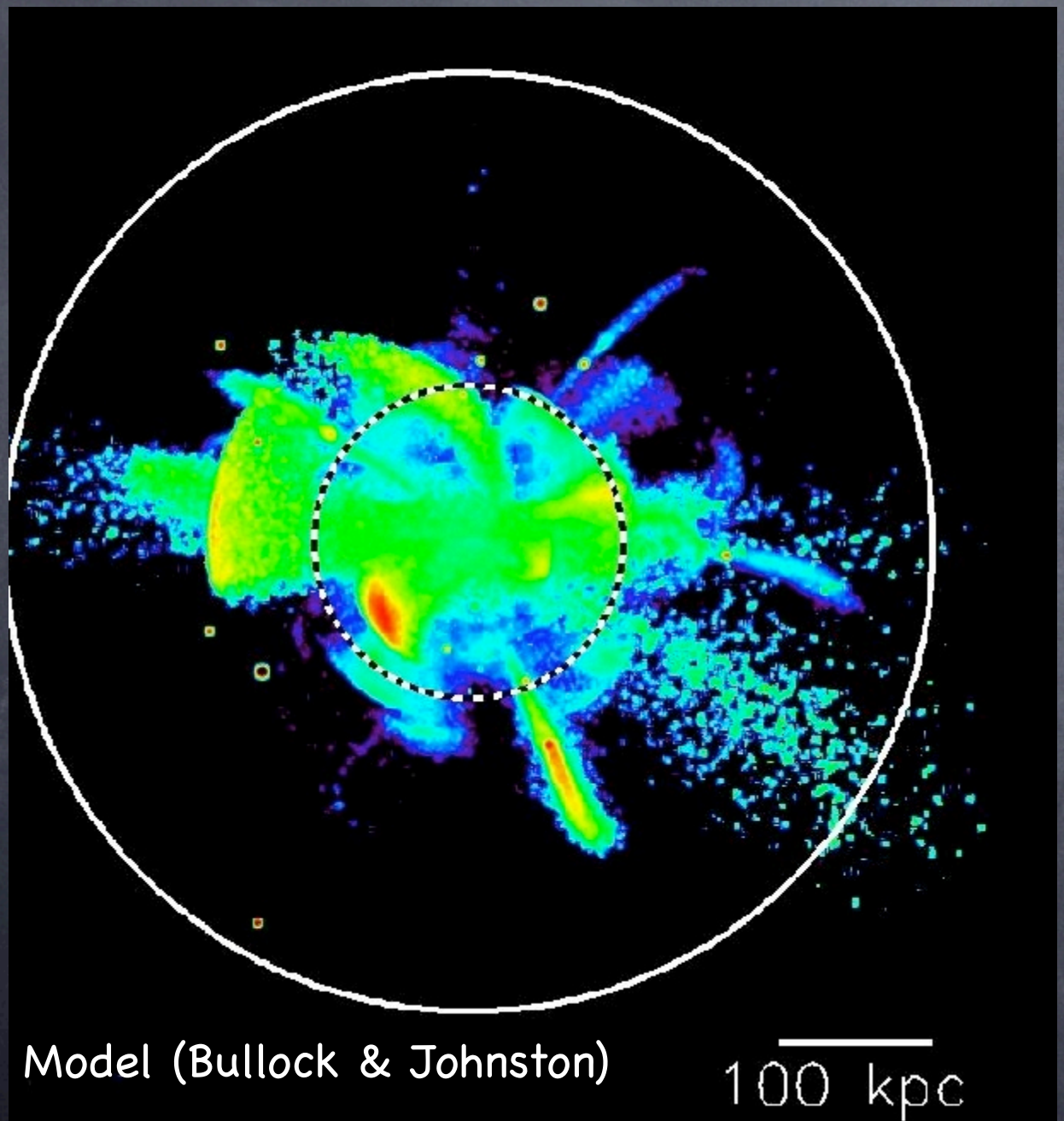
- Constrain Dark Energy and Dark Matter
- Map the Milky Way
- Explore the Transient Optical Sky
- Inventory the Solar System



Understand Dark Matter & Dark Energy

10 billion galaxies

Map the Milky Way

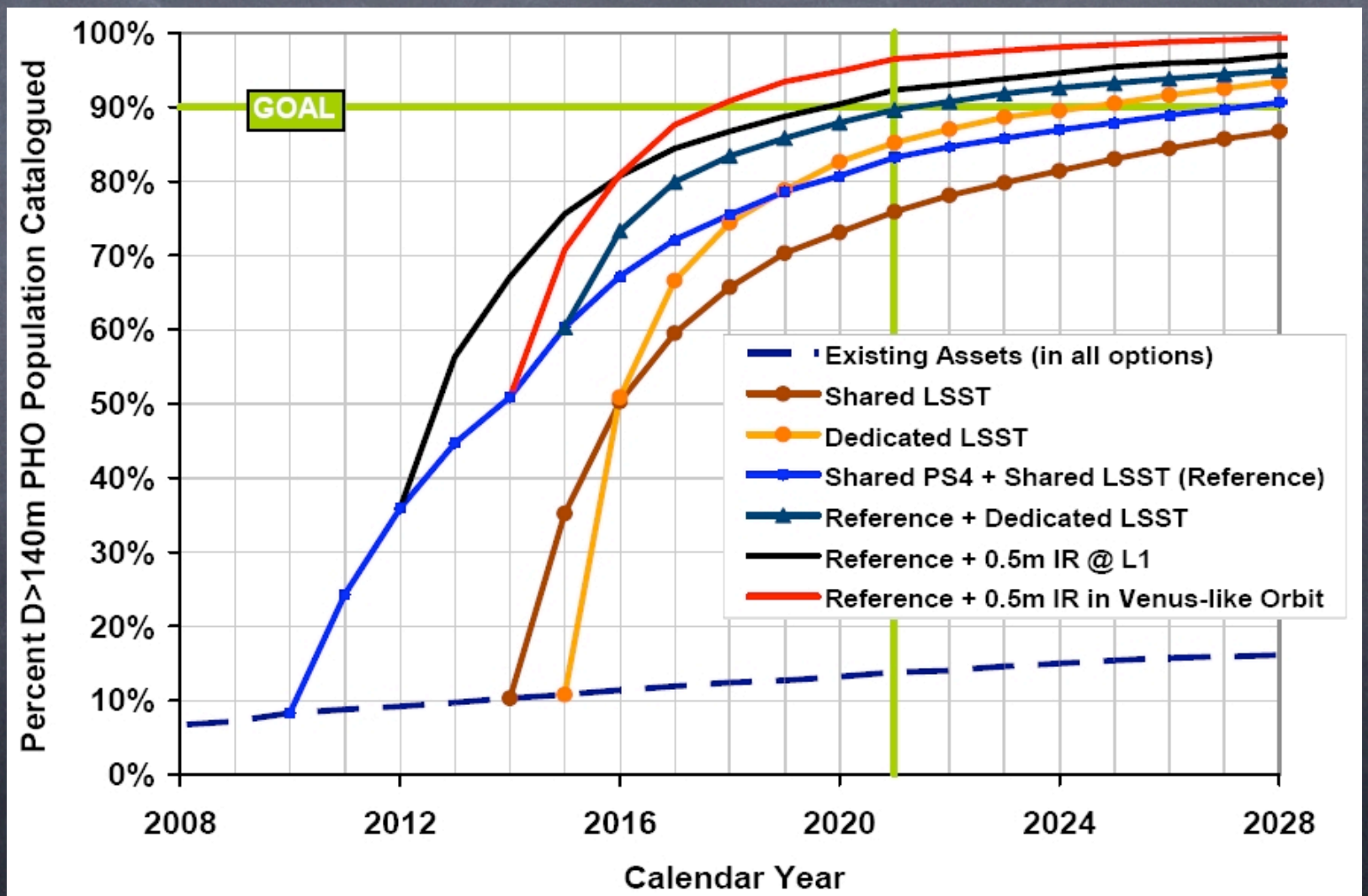


10 billion stars

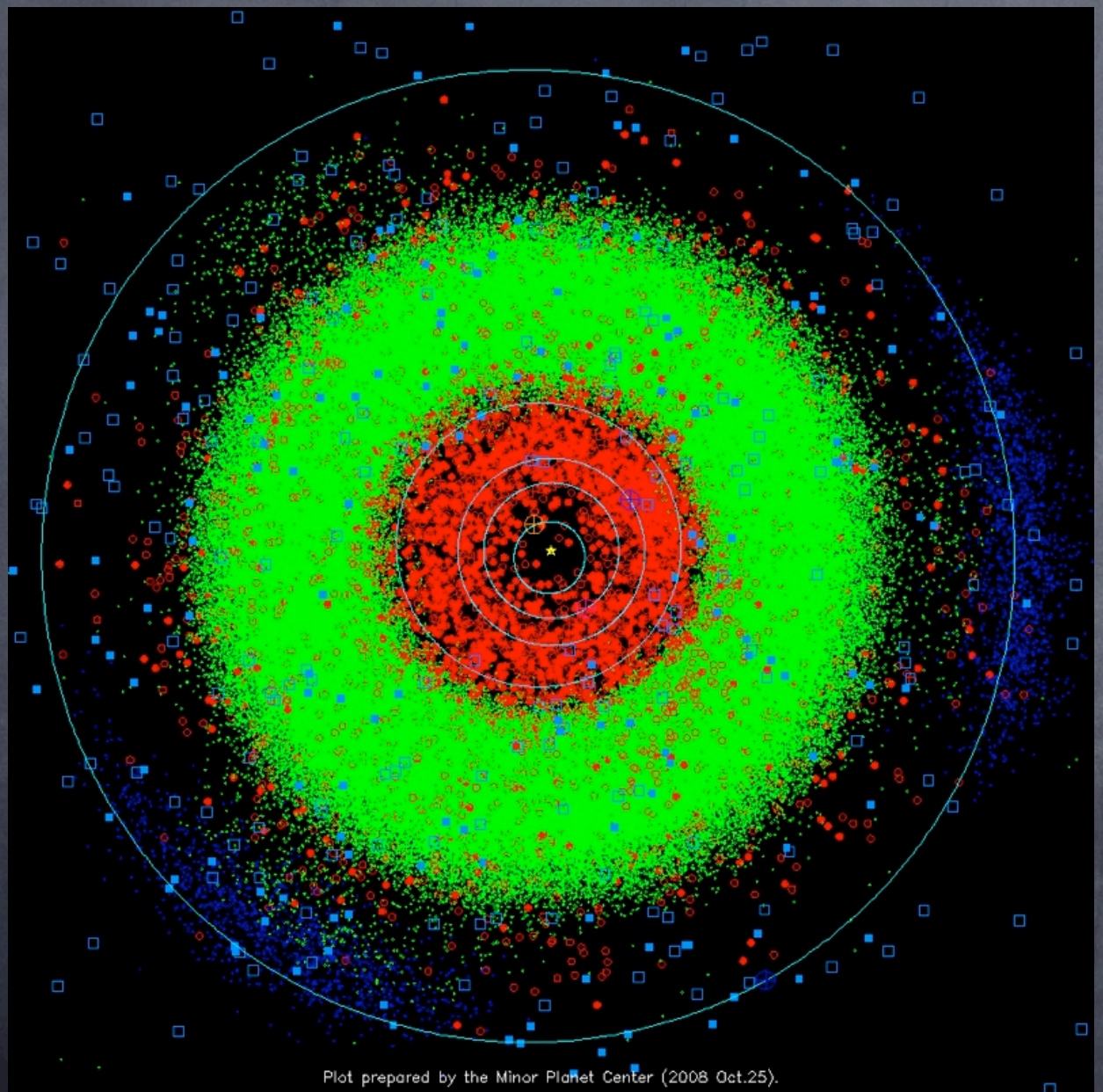
Inventory the Solar System

90% of PHAs with D>140m by 2020

"Killer Asteroids"

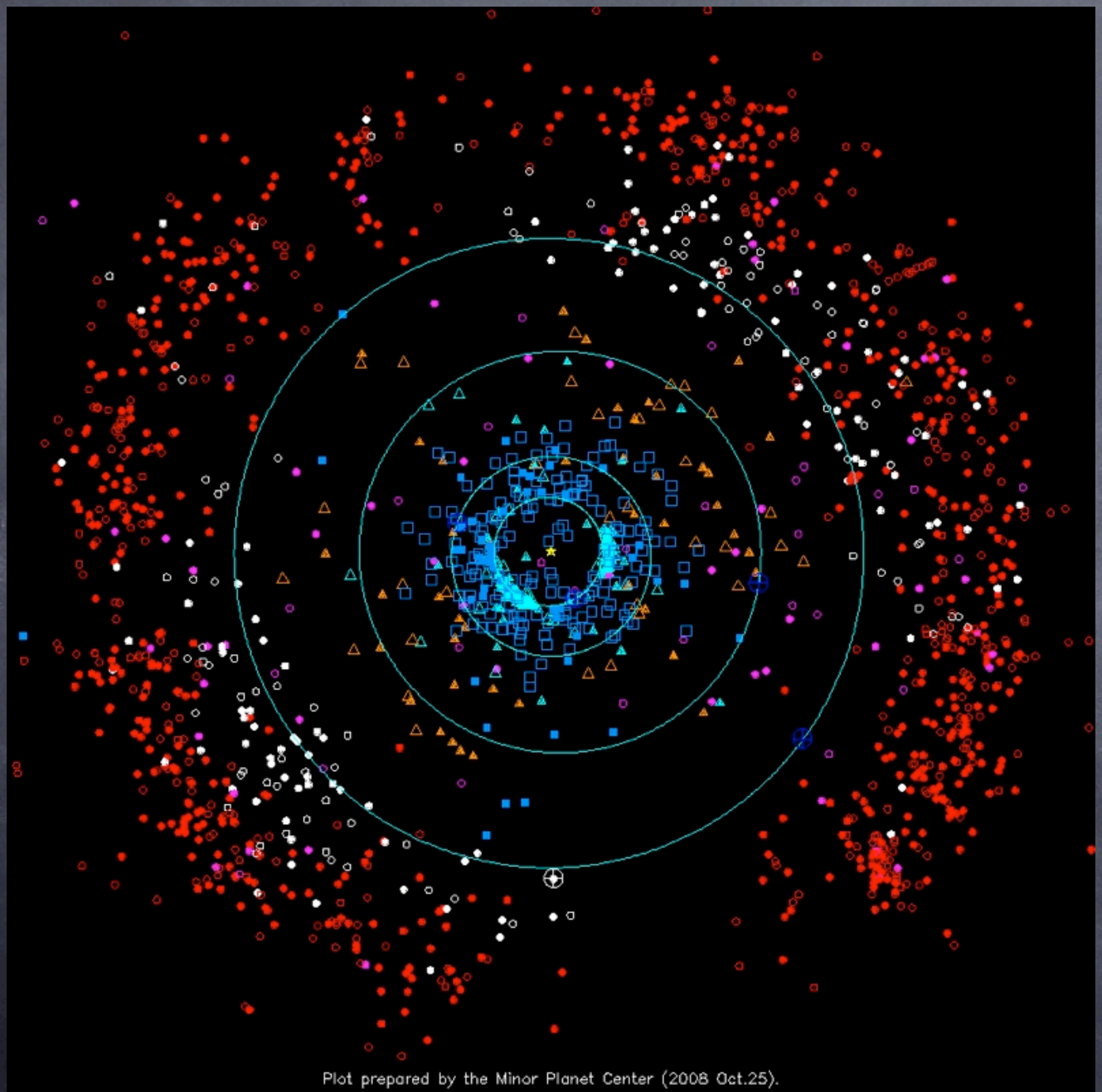


Inventory the Solar System



1,000,000's Asteroids with colors

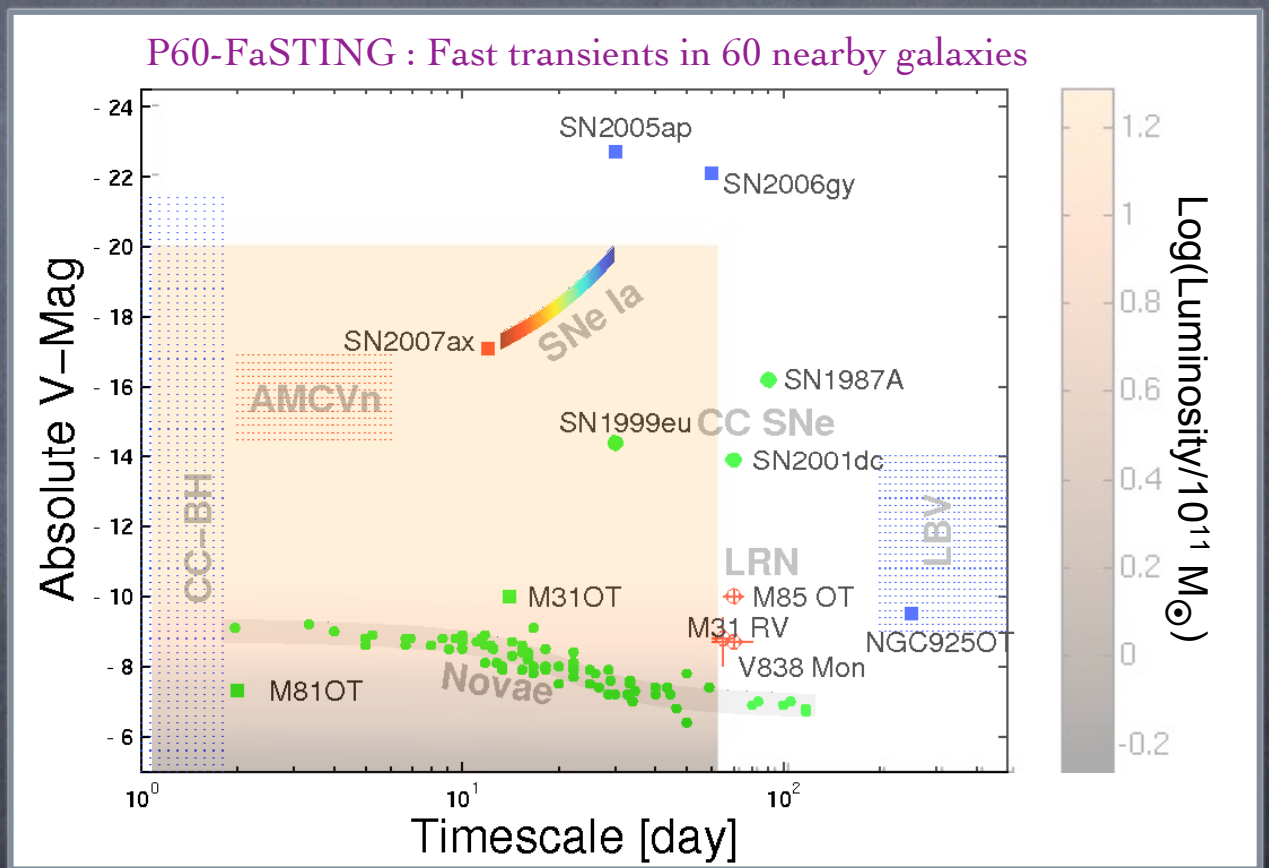
Inventory the Solar System



30,000
Kuiper Belt
Objects
with colors

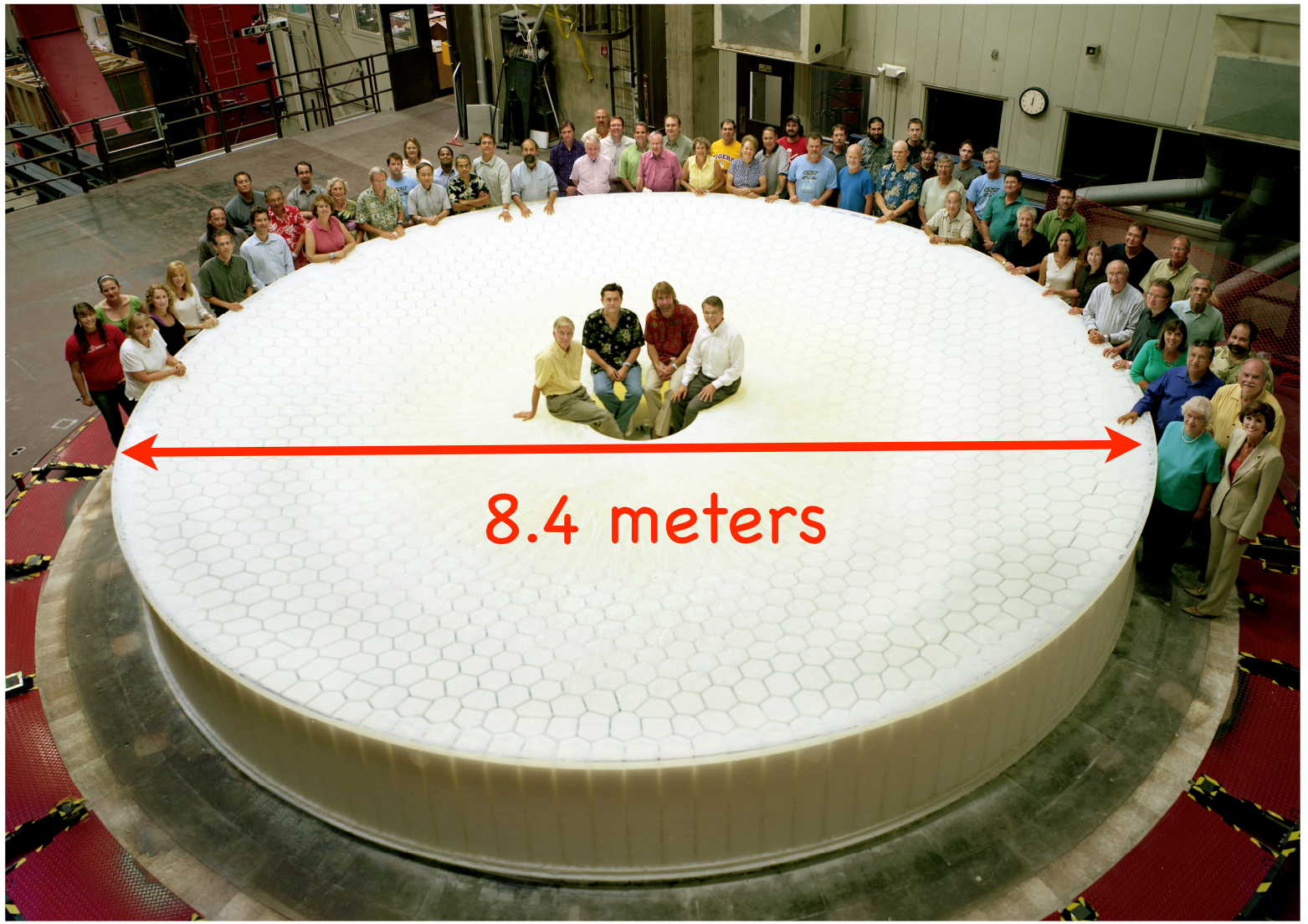
Explore the Transient Optical Sky

- Pulsating stars
- Flaring stars
- Exploding stars
- Transiting planets
- Eclipsing binaries
- Gamma Ray Bursts
- What else??



How can we do all that in one survey with one telescope?

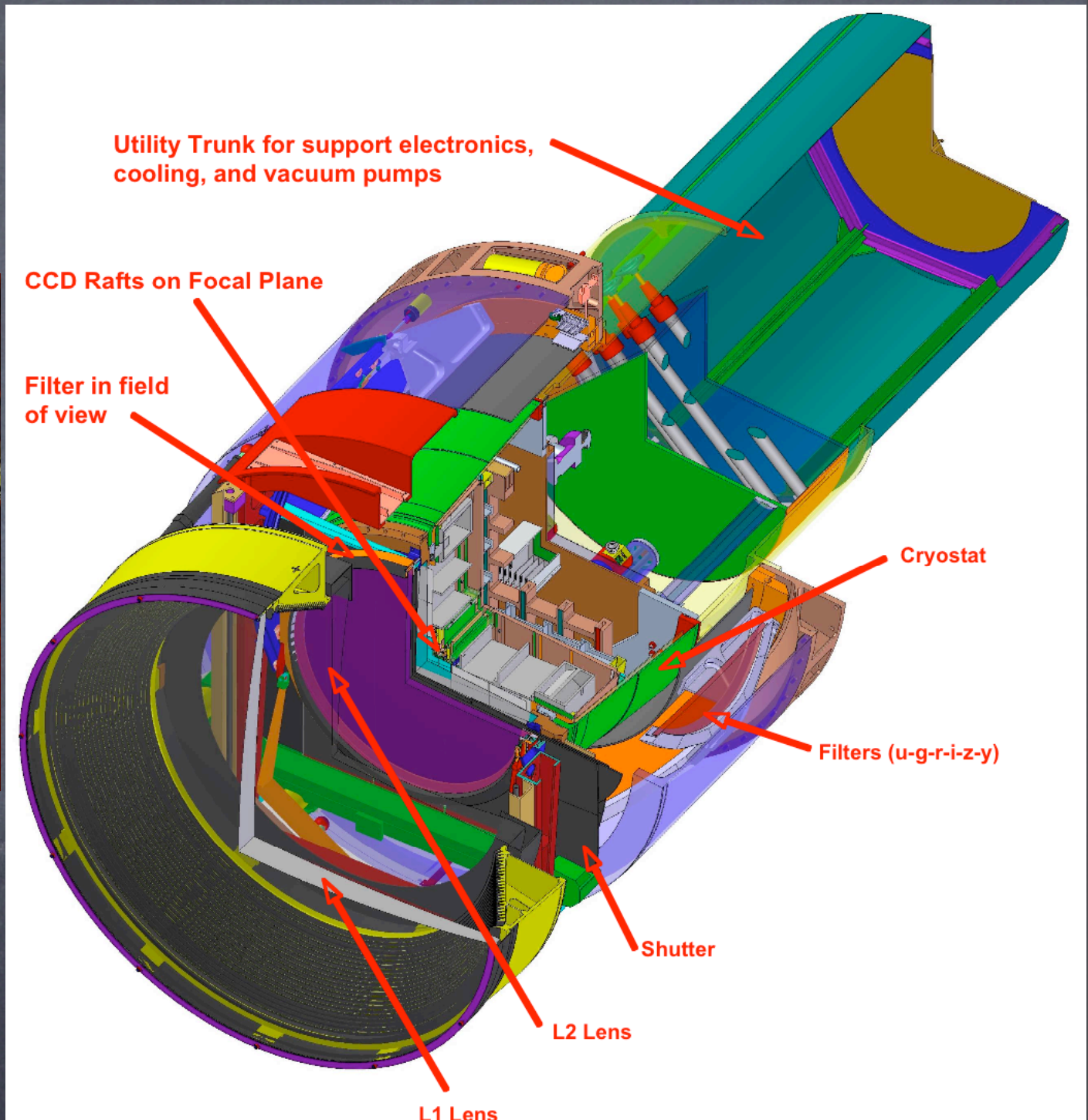
- Big mirror (8-m)
- Big field of view (9.6 square degrees)
- Survey the entire visible sky every three days in two filters
- Very careful data management (accuracy)



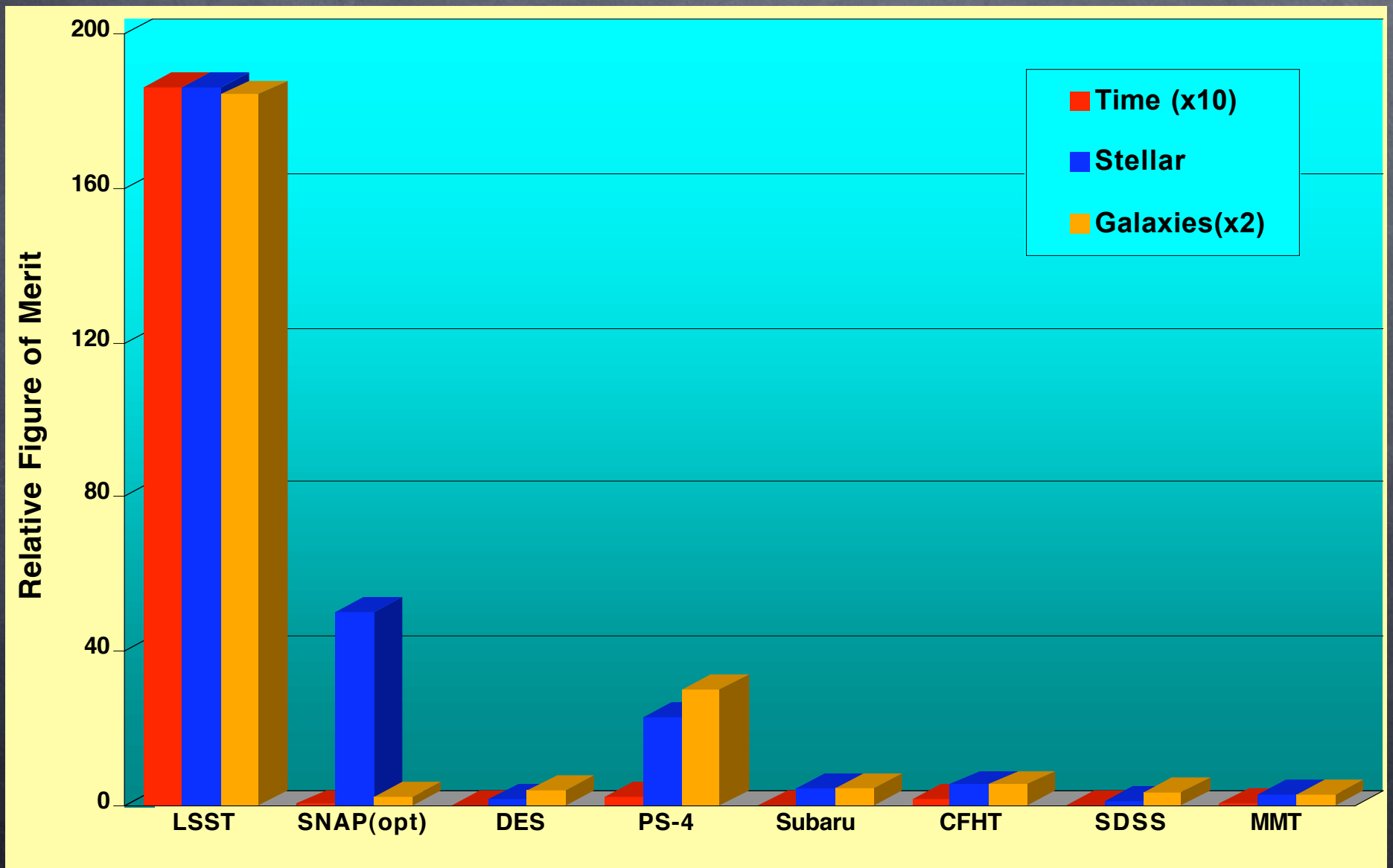
LSST
Large Synoptic Survey Telescope

August 2008
LSST Primary/Tertiary Mirror Blank
University of Arizona Steward Observatory Mirror Lab

SOML
The University of Arizona
Tucson Arizona


Utility Trunk for support electronics, cooling, and vacuum pumps
CCD Rafts on Focal Plane
Filter in field of view
Cryostat
Filters (u-g-r-i-z-y)
Shutter
L2 Lens
L1 Lens

Etendue = field of view * diameter of mirror => 'how fast can you survey the sky'



Data Management & Processing

- 60-s Alerts on variable objects
- High photometric precision (0.005 mag)
- High astrometric precision (0.01")


Cerro Pachón, Chile
El Peñón
Future site of the LSST
Gemini South
SOAR

Data Flow

15 TB raw image data/night

200 PB over 10 years

12+ PB online, query-able catalogs

LSST Large Synoptic Survey Telescope

- 2009 - Construction funding (mix of private and public funding)
- 2015 - First light

LSST Fun Facts

Greatest movie of all time -
11 months to 'view' it

Best sky image ever -
equivalent to 30M HDTV

20B objects -
for the first time in history,
more astronomical sources
than people on Earth