Planning for the Next UV-Opt-IR Space Telescope

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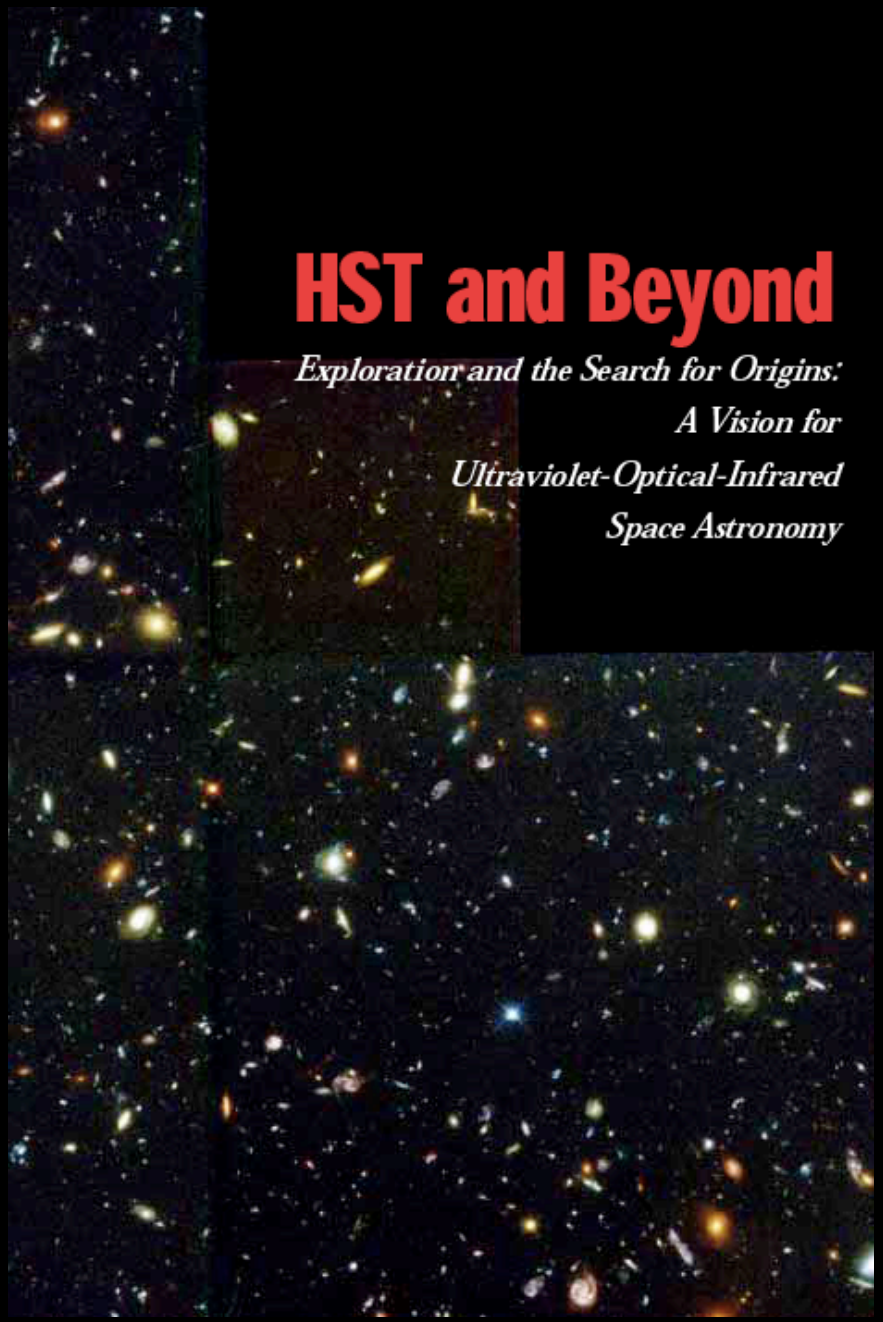
History



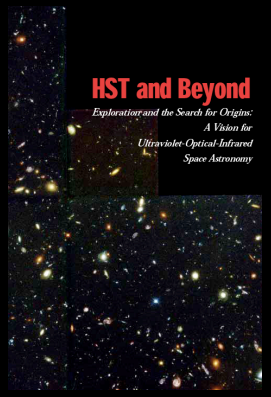
1995
Commissioned by AURA

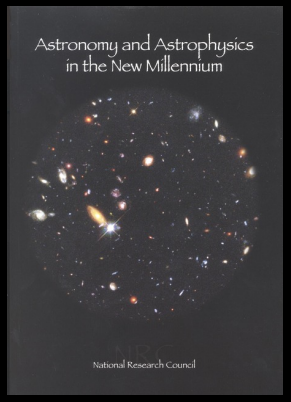
1. Extend HST lifetime
2. Build JWST
3. ~~Develop space interferometry~~

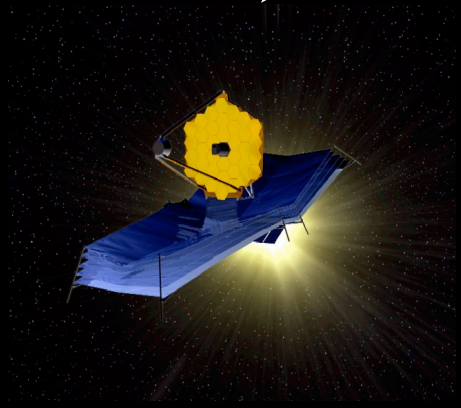
23+ year lead time between report & launch

Why This Exercise?

1995 2000 2018







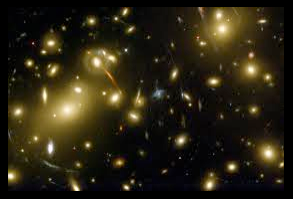
2014 2020 2035

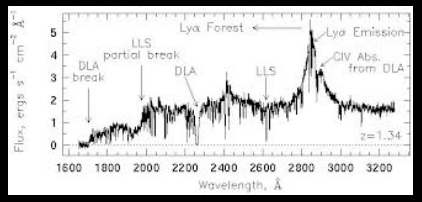
Why This Exercise?

EXOPAG

In the UVOIR, the goals and requirements are very similar

COPAG





One mission + Broad science = Large Community

Committee

- Chaired by Julianne Dalcanton & Sara Seager
- Broad mix of technologists and scientists
- AURA, NASA, & ESA observers

Not exclusive. Drawing expertise broadly from community.

Committee

Suzanne Aigraine
Steve Battel
Niel Brandt
Charlie Conroy
Julianne Dalcanton
Lee Feinberg
Suvi Gezari
Olivier Guyon
Walt Harris
Chris Hirata
John Mather
Marc Postman
Dave Redding
David Schiminovich
Sara Seager
Phil Stahl
Jason Tumlinson

technologists
scientists

Observers:
Heidi Hammel (AURA)
Paul Hertz & Mike Garcia (NASA)
Arvind Parmar (ESA)

Process

- Draw heavily from rich body of existing work (ATLAST, TPF-C, THEIA, EUVO)
- Outreach to community (one-on-one now, broader soon)
- Phone cons. Oh golly, the phone cons.
- Face-to-Face Meeting: Dec 2013, Spring 2014
- Report: Summer 2014

Key Goals

- Compelling science theme that resonates universally (Congress, Public, etc)
- Compelling capabilities that engage the astrophysics community
- Feasible, fundable technology path

Emerging science themes

Detecting & characterizing habitable exoplanets.

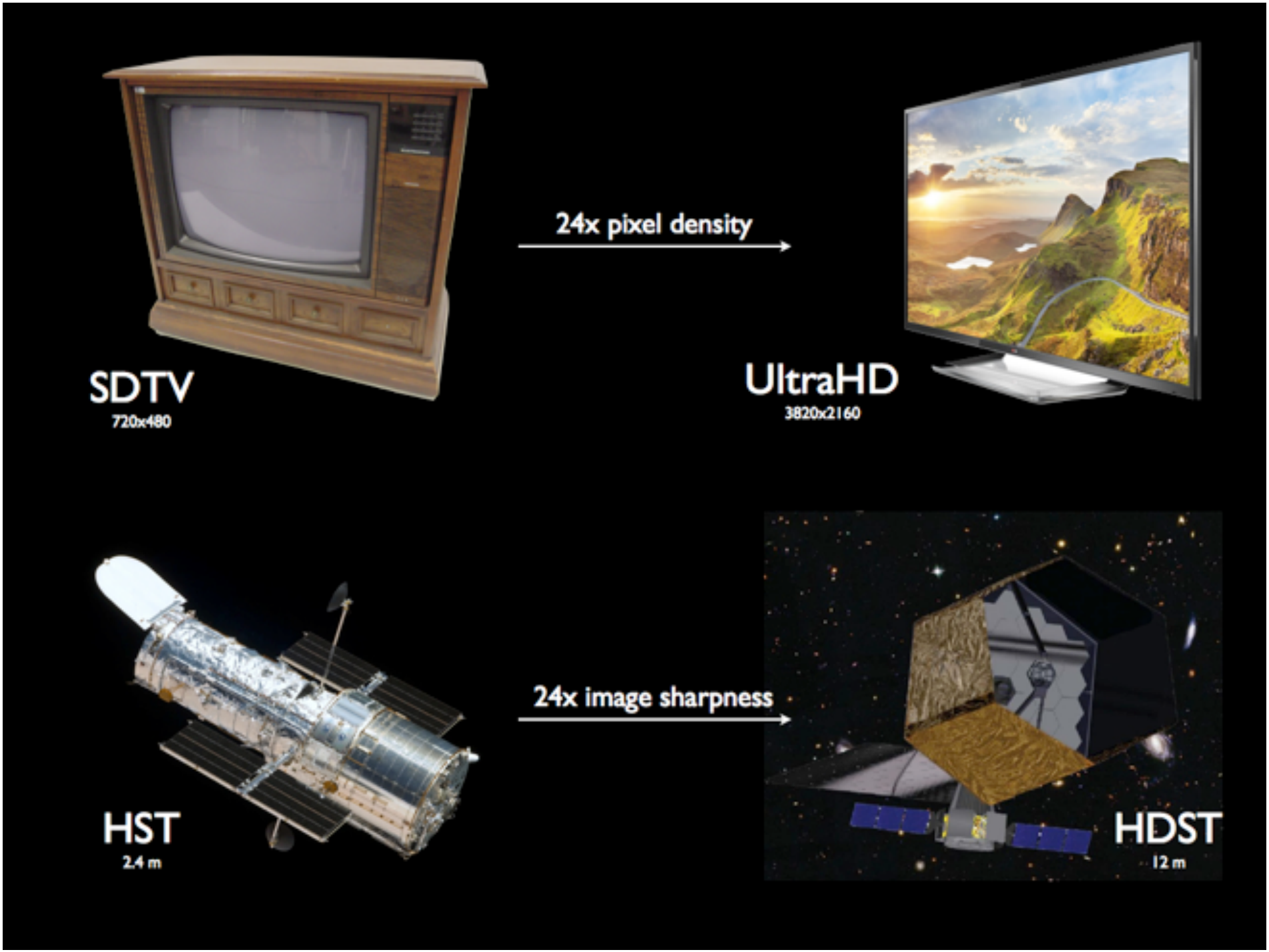
Exoplanets Drivers

- Large aperture
  - Issues: How large? Requires mature DRM. Launch vehicle?
- Superb mirror (10's of picometer stability)
  - Issues: stable over what timescale & mode?
- Coronagraphic capability
  - Issues: Internal (hard requirements) vs external (inefficient, limited lifetime)

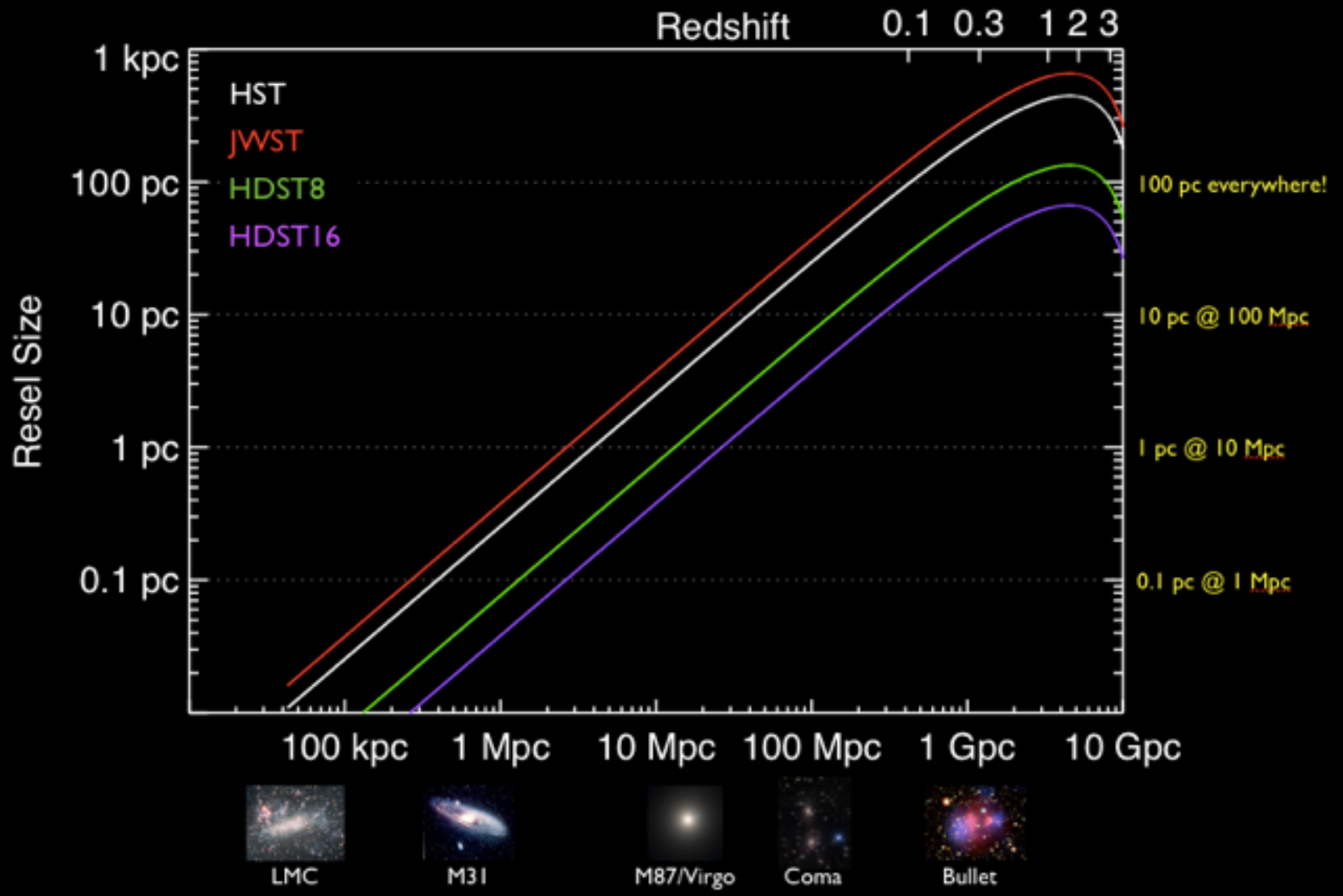
Emerging science themes

- Exoplanets
- "The Universe in High-Definition"

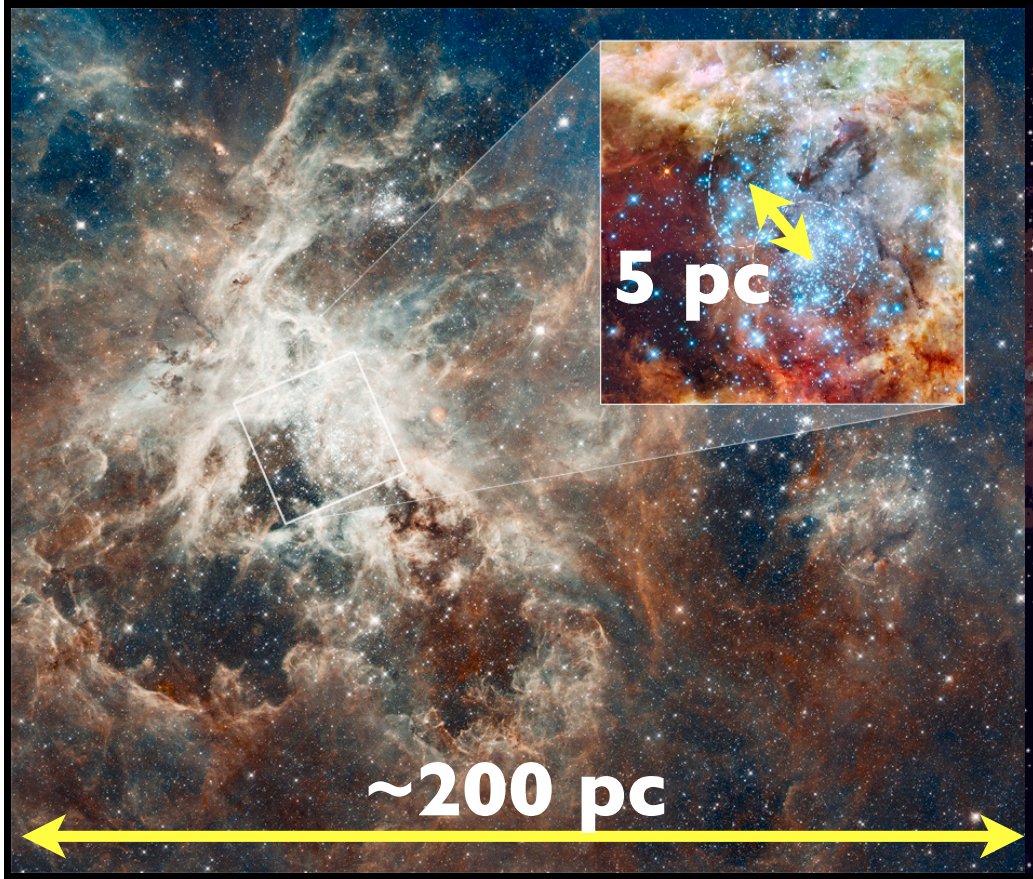
HDST: High-Definition Space Telescope

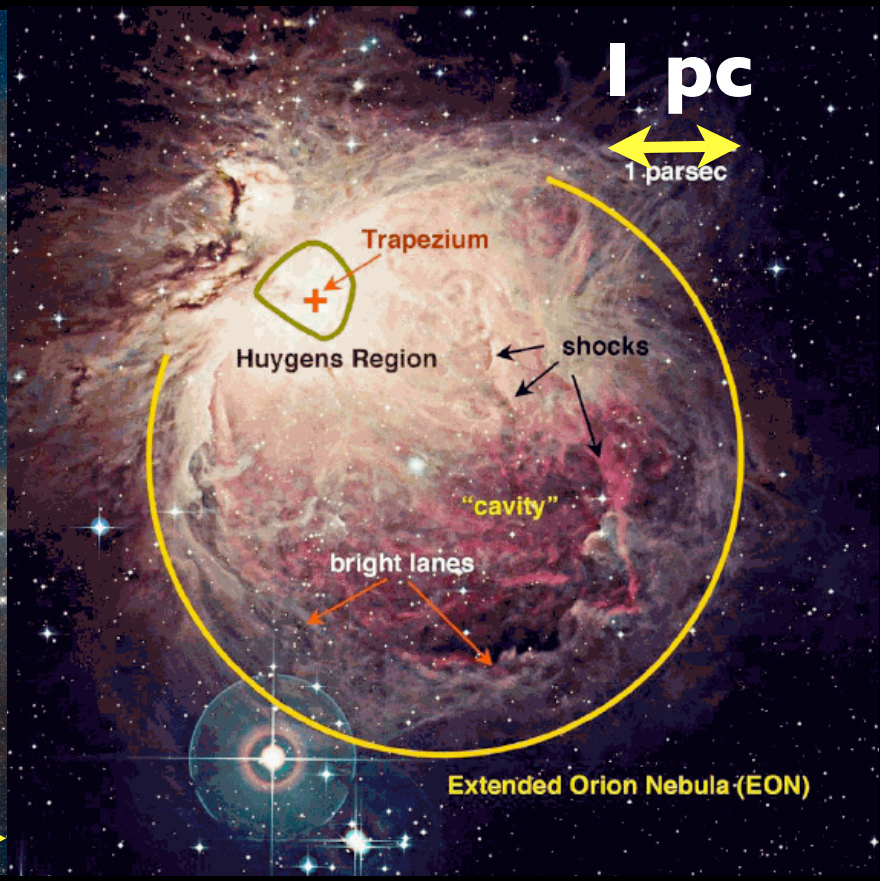

SDTV
720x480
24x pixel density
UltraHD
3820x2160
HST
2.4 m
24x image sharpness
HDST
12 m

HDST: Breaking Resolution Barriers



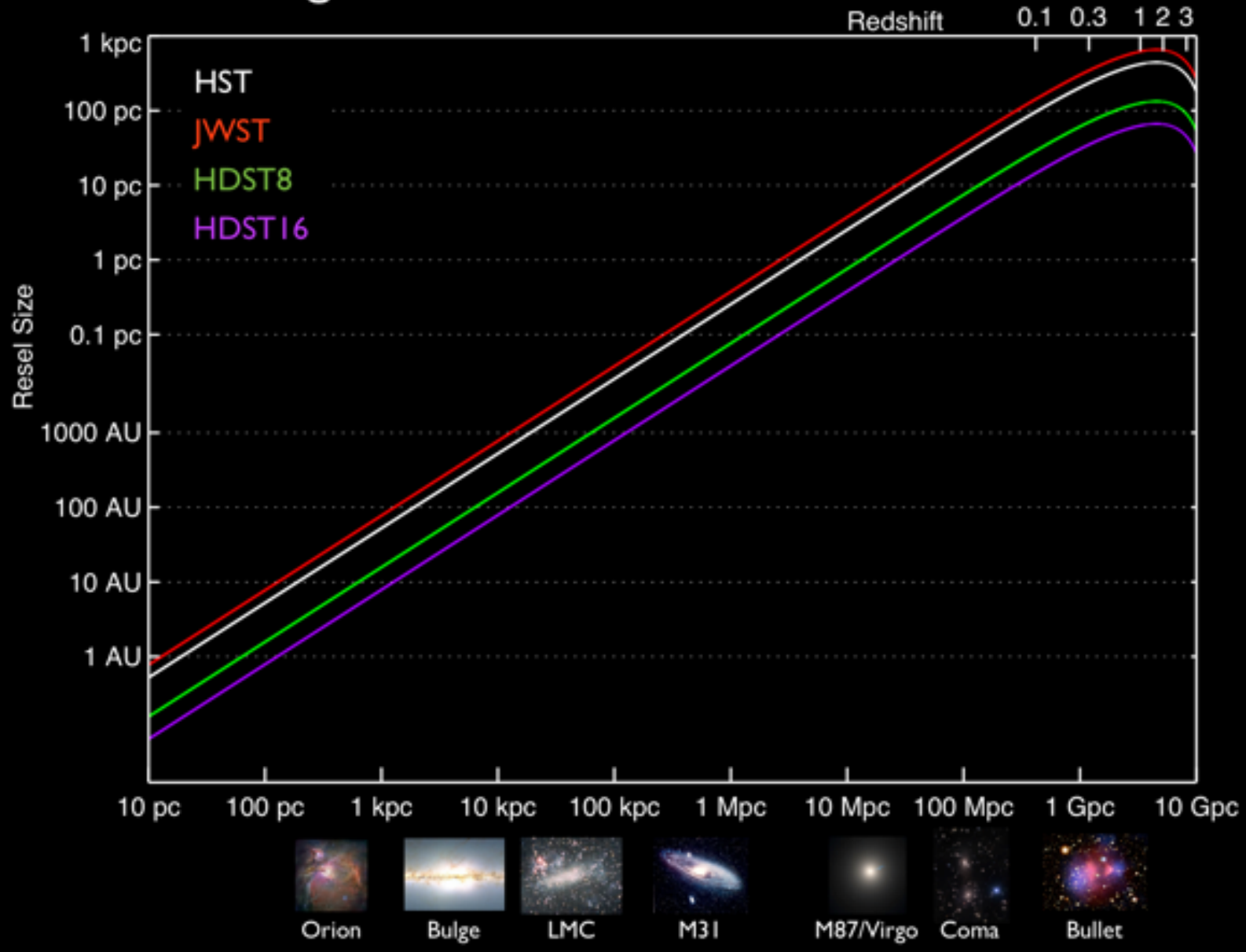
Size scales





HDST: Resolving 100 pc star forming regions *everywhere* in the universe! 1 pc resolved out to 10-25 Mpc.

HDST: Breaking Resolution Barriers



General Astrophysics Drivers

- Large aperture: Throughput + Resolution
- UV (102 nm) through NIR (2.5 μm, non-cryo)
  - Issues: Coatings, Compatibility w/ Coronagraphy
- Large FOV + Spectroscopic Multiplexing
  - Issues: Tradeoff between cost of more complex instruments vs efficiency gains

Additional Considerations

- Serviceable as means of risk reduction, possible lifetime extension
- If an internal coronagraph is used, explore providing capabilities to allow starshade at later time.

Technological issues

- Mirror technology
- Reducing vibration
- UV Coatings
- Coronagraphy
- Low read noise detectors
- Launch vehicle (<9.2m w/ existing)

Moving forward

- Improve science requirements, particularly those in support of coronagraphy (help from EXOPAG?).
- Identify aperture thresholds, based on DRMs.
- Create technology development plan for investment in advance of 2020.
- Present viable joint exoplanet-astrophysics space mission to 2020 decadal review.

Help from EXOPAG SAGs?

- Refine coronagraphy requirements on telescope stability (timescales, modes, etc)
- Improve understanding of interaction between coatings & coronagraphy
- Develop efficient strategies for minimizing time needed for exoplanet characterization (i.e., preselection of targets, reducing number of repeat visits to confirm planet, etc).
- Prioritization of wavelength ranges for band-limited coronagraphy.

Help from COPAG?

- May request help with technology assessment.

Input welcome!

- Please talk to any committee member, at any time.

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