Beyond JWST Committee Update

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STUC
May 9, 2014

AURA "Beyond JWST" Committee

Charter:

The "Beyond JWST" committee will study future space-based options for UV and optical astronomy (UVOIR) that significantly advance our understanding of the origin and evolution of the cosmos and the life within it. The committee, which has been commissioned by AURA, has the objective of developing a plan for UVOIR missions and programs in the post-Webb era.

AURA "Beyond JWST" Committee

Committee Members:

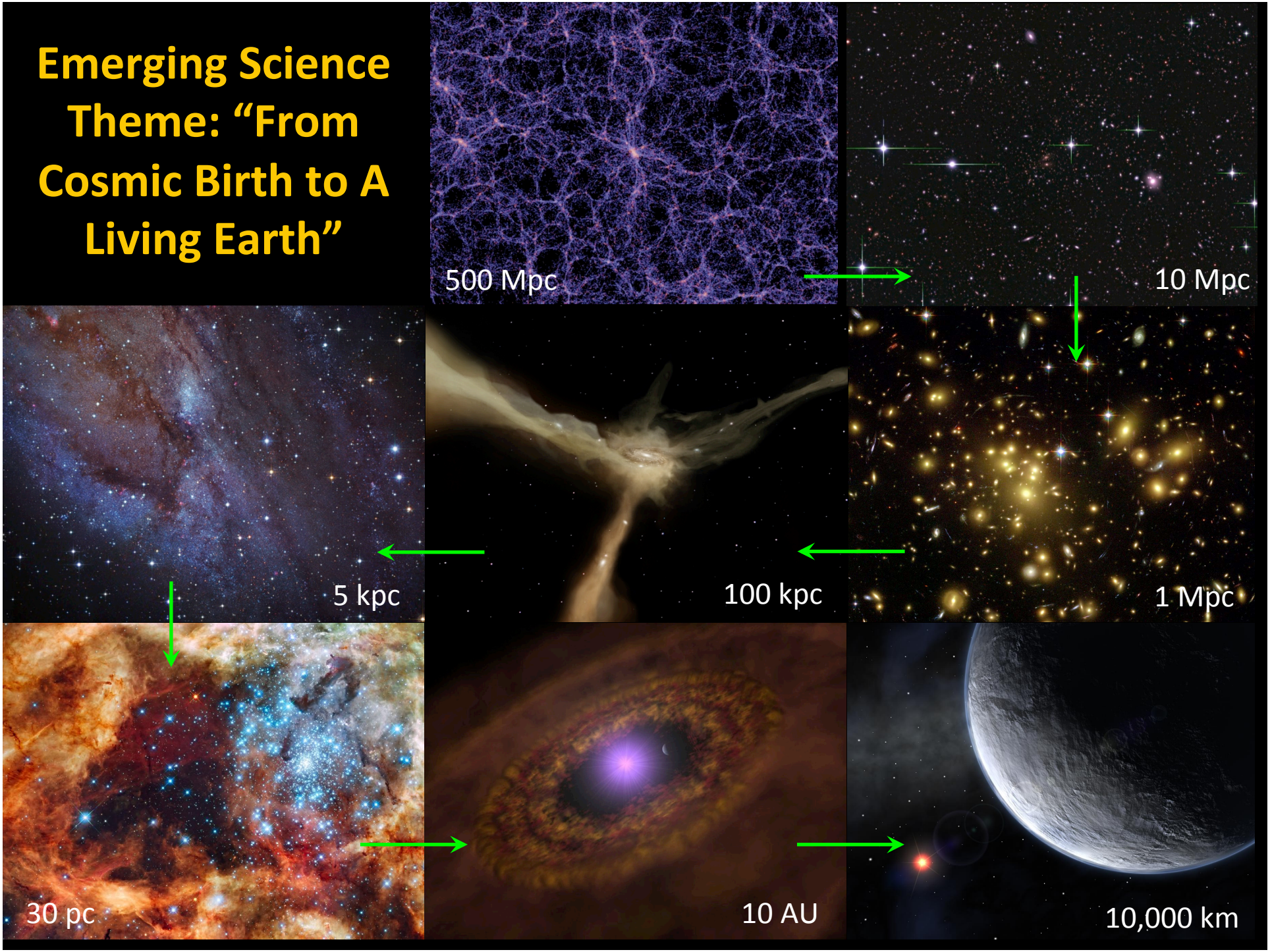
- Steve Battel (Battel)
- Niel Brandt (Penn State)
- Charlie Conroy (UC Santa Cruz)
- Lee Feinberg (GSFC)
- Suvi Gezari (U. Maryland)
- Olivier Guyon (Subaru Obs.)
- Walt Harris (LPL)
- Chris Hirata (OSU)
- John Mather (GSFC)
- Marc Postman (STScI)
- Dave Redding (JPL)
- Phil Stahl (MFSC)
- Jason Tumlinson (STScI)
- David Schiminovich (Columbia U.)

Co-Chairs

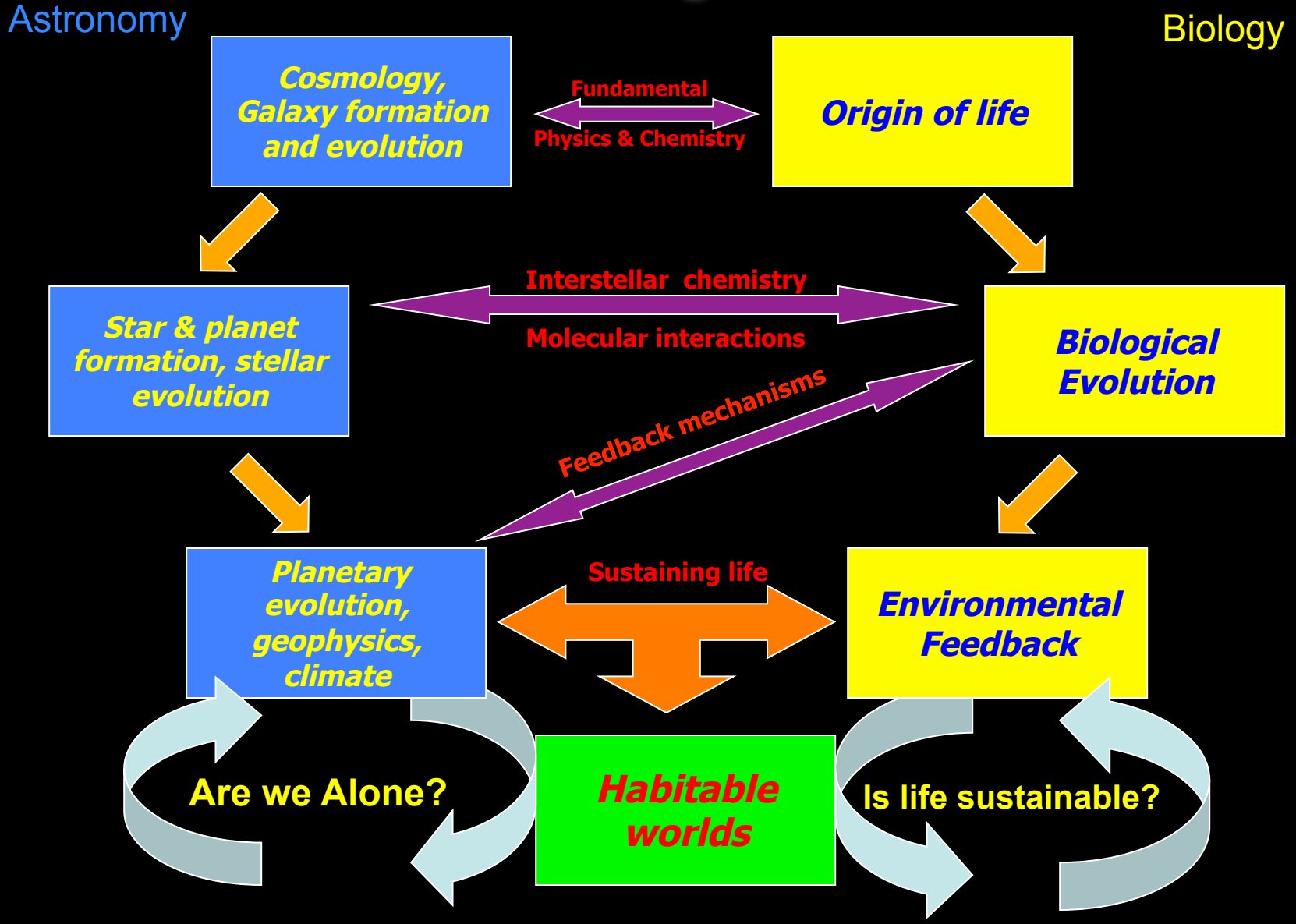
- Julianne Dalcanton (U. Washington)
- Sara Seager (MIT)

NASA Observer: Paul Hertz
ESA Observer: Arvind Parmar
AURA Facilitator: Heidi Hammel

Emerging Science Theme: "From Cosmic Birth to A Living Earth"

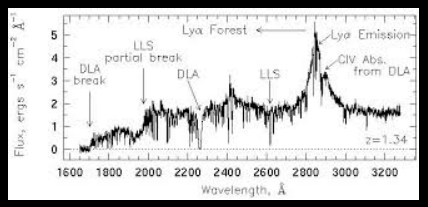


Connecting Cosmic Birth to finding a Living Earth



Developing a Shared Vision

Cosmic Birth

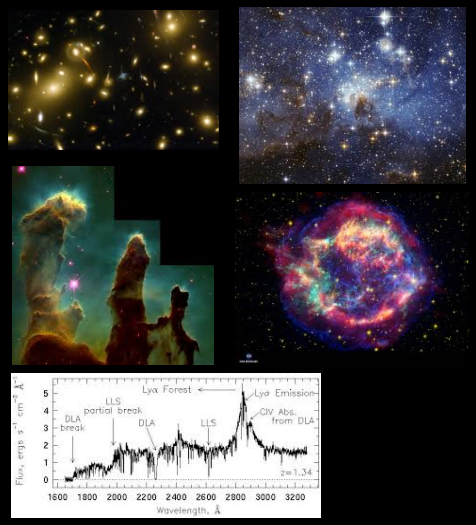


In the UVOIR, the goals and requirements are very similar.

Living Earth

Developing a Shared Vision

Cosmic Birth



- UV capabilities
- Broad instrument suite

Both

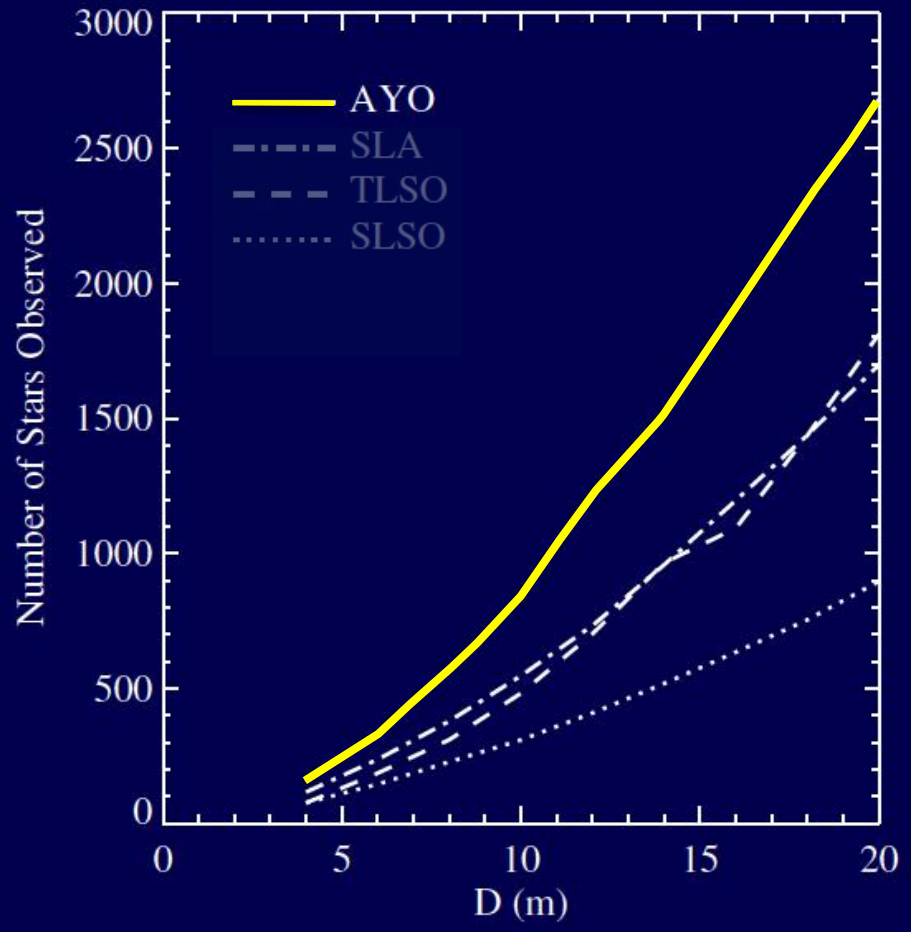
- Large aperture
- Diffraction limited
- Optical & NIR

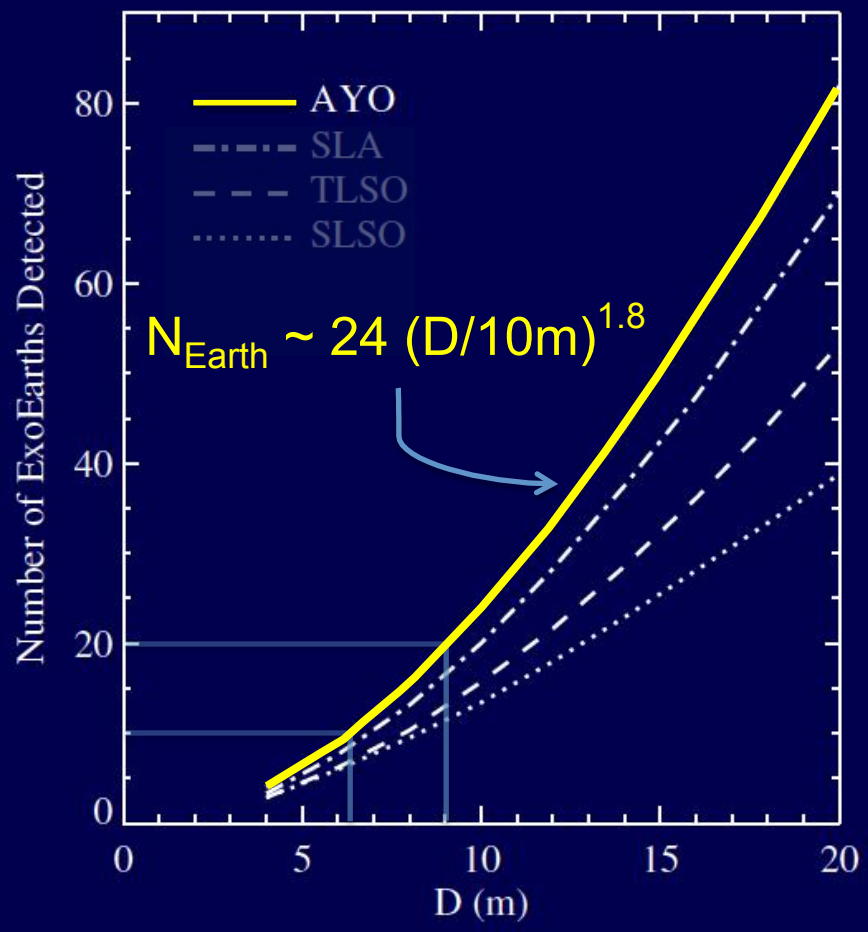
Living Earth

- Coronagraph or starshade
- Superb mirror stability

Exo-Earth Yield vs. Telescope Size

and Target Prioritization



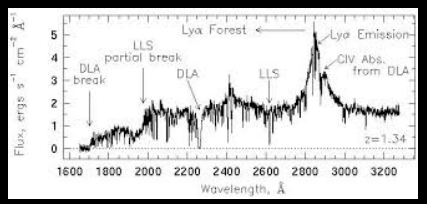


Stark et al. 2014, in prep.

Assumed Eta_Earth = 0.1
IWA = 2λ / D

Developing a Shared Vision

Cosmic Birth



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Living Earth

One mission + Broad science = Large Community

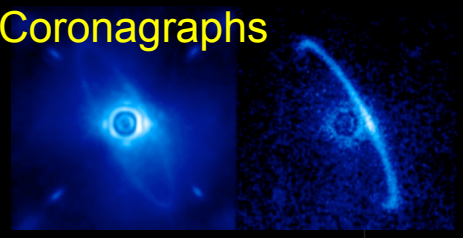
The path has been laid …

CoRoT

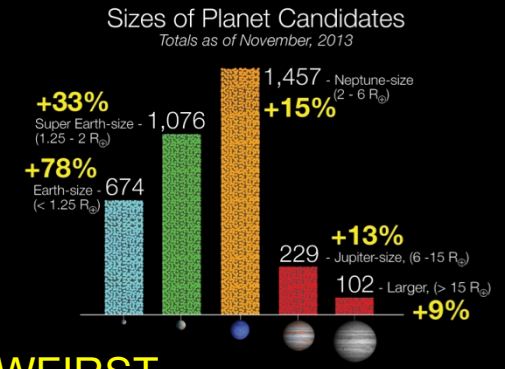
Hubble

Spitzer

Kepler



Gaia

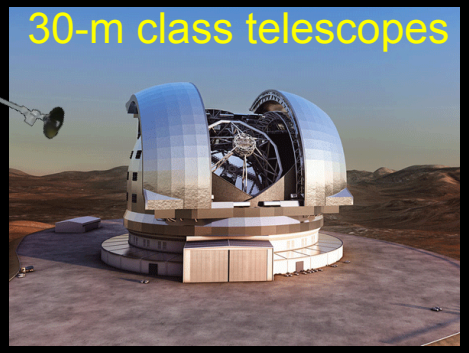


WFIRST

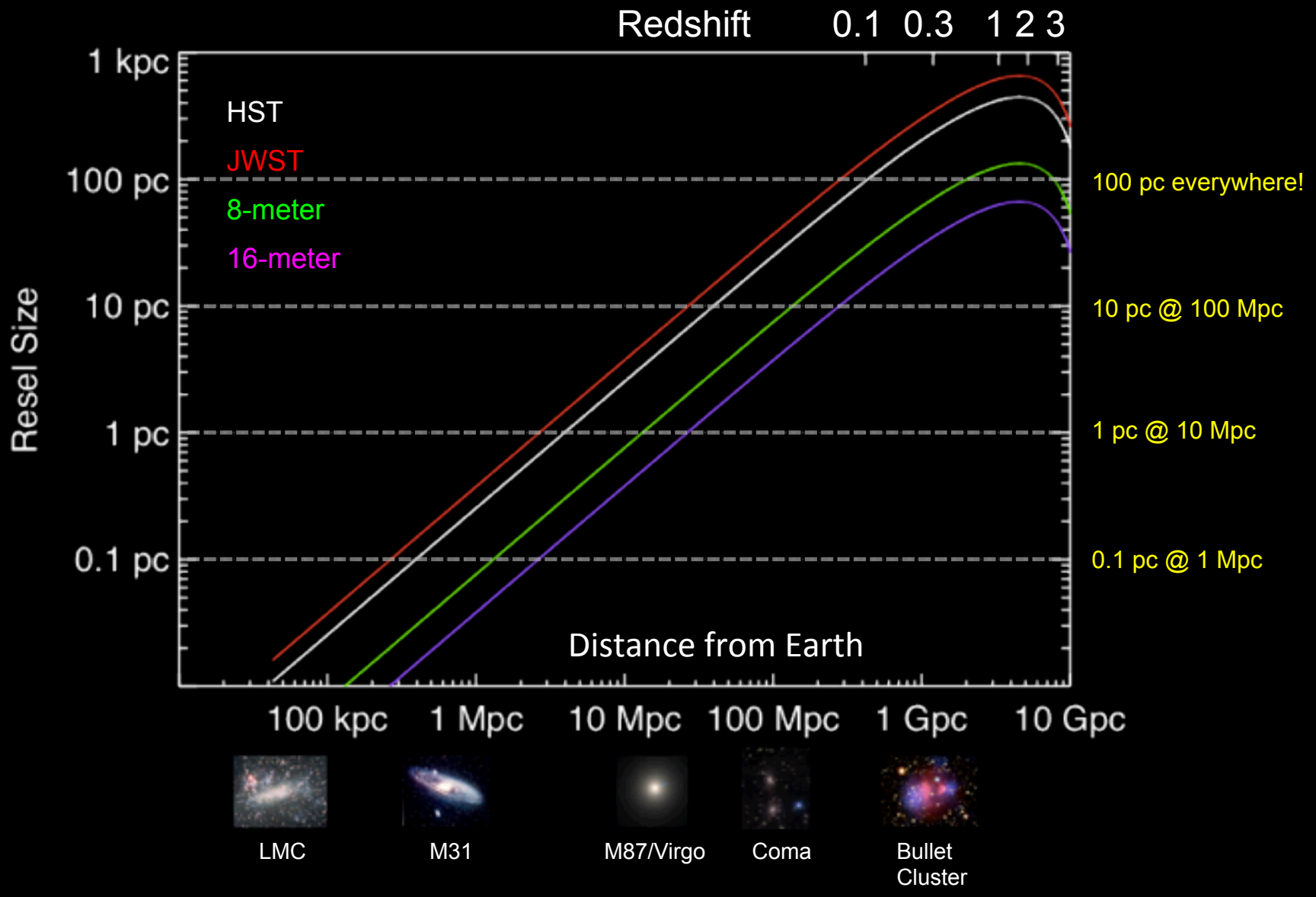
TESS

PLATO

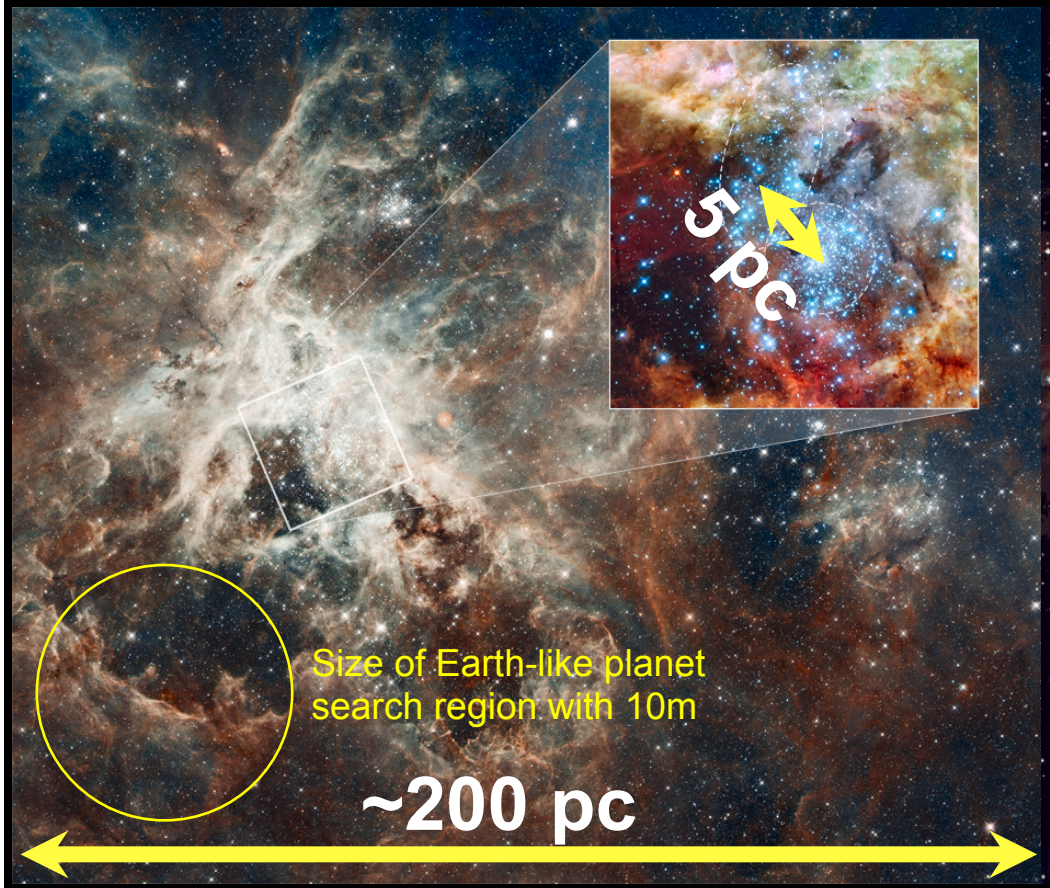
JWST

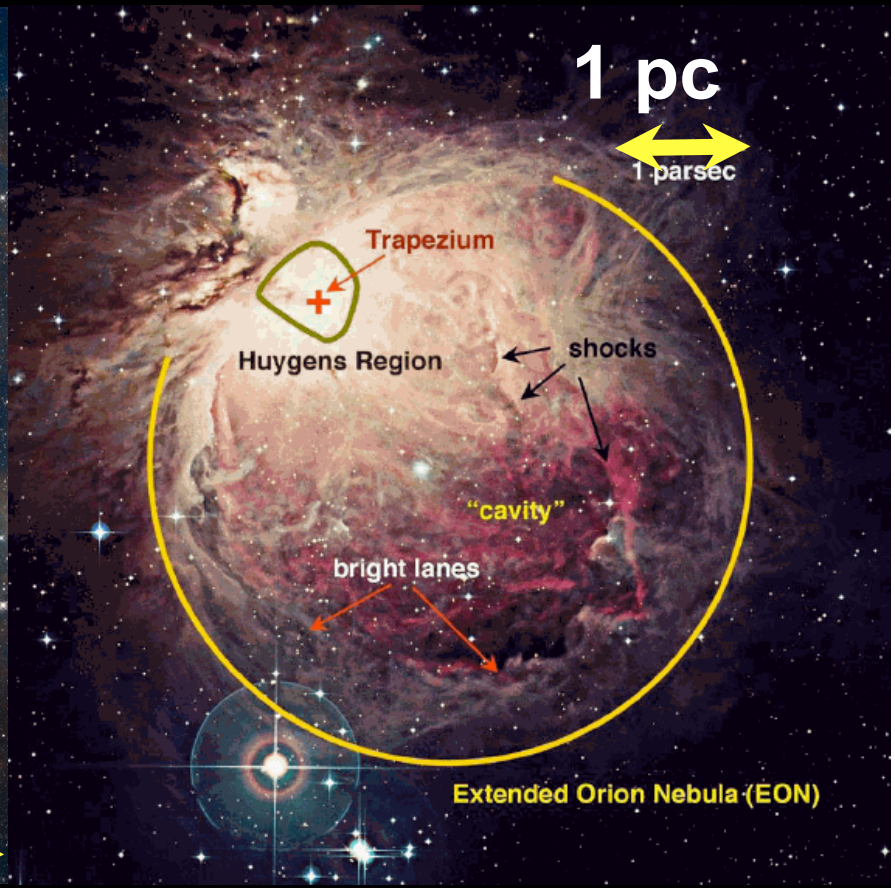


Breaking Resolution & Sensitivity Barriers in the UVOIR



Size scales



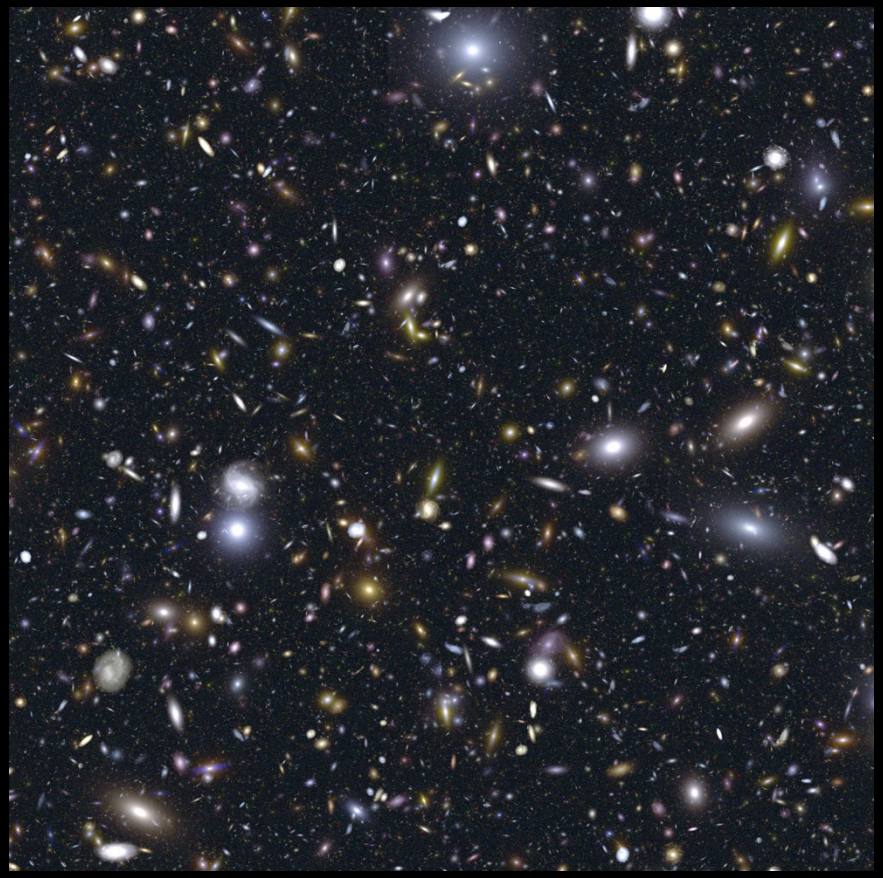


Resolving 100 pc star forming regions *everywhere* in the universe would be a remarkable capability. And 1 pc resolved out to 10-25 Mpc.

ALMA: molecular gas on ~0.1-0.5" scales
JWST: Heavily enshrouded stars
ATLAST: Emerging stars

"Parallel" Astrophysics During Long Exoplanet Spectroscopic Observations

- Estimated median single-visit exposure time for obtaining an exoplanet spectrum is ~100 ksec.
- Will allow parallel deep imaging of nearby fields to 10-sigma limiting depths of 33 AB mag in UV, visible and 32 AB mag in NIR.



Where We Are

- UVOIR access from space is fundamental to understanding the universe and the life within it.
- “Game Changing” science requires substantial increase in aperture.
- Enabling such a capability requires alliances, so the exoplanet and astrophysics communities need to work together to make their next generation large UVOIR space telescope the SAME mission.
- NASA can lead such a mission but the mission will require significant international partnerships.
- Soliciting input on science cases, ideas for advancing technologies, science instruments concepts and strategies for international collaboration.

Considerations:

- 4m class telescope not a viable scientific option. Need at least 8-meters or larger.
- Guaranteed discovery space, even with long launch time.
- *Highly synergistic* with many upcoming facilities
  - TESS, JWST, EUCLID, WFIRST, PLATO, ATHENA+
  - 20-40m ground-based telescopes, LSST
  - ALMA, SKA

How do we get there?

U.S. Activities:

- ATLAST NASA Center (GSFC/JPL/MSFC) Study
- AURA "Beyond JWST" Committee
- NASA "EXOPAG" & "COPAG" working groups
- Coronagraph & Starshade developments for WFIRST and Exoplanet Probe concepts

Goal: Mature technology and mission concepts in preparation for 2020 Decadal

Schedule

- Committee is aiming to have its report ready for public dissemination before the end of the year.
- Will plan to have a special session at January 2015 AAS meeting (Seattle) to present the findings.
- Leadership to advocate for the report's findings beyond 2014 will be an important item for the committee to consider.