WHAT IS LUVOIR AND WHERE DID IT COME FROM?

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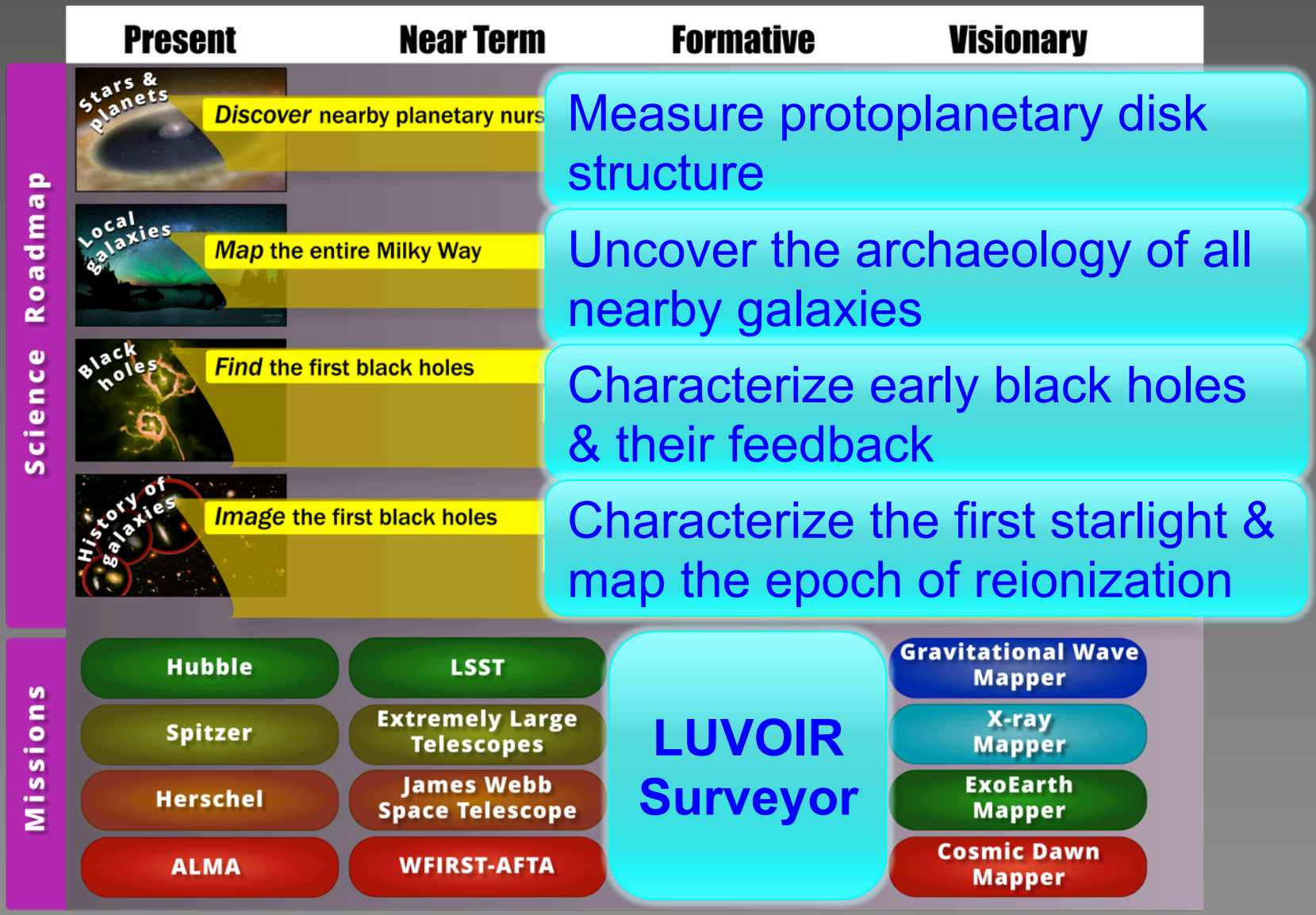
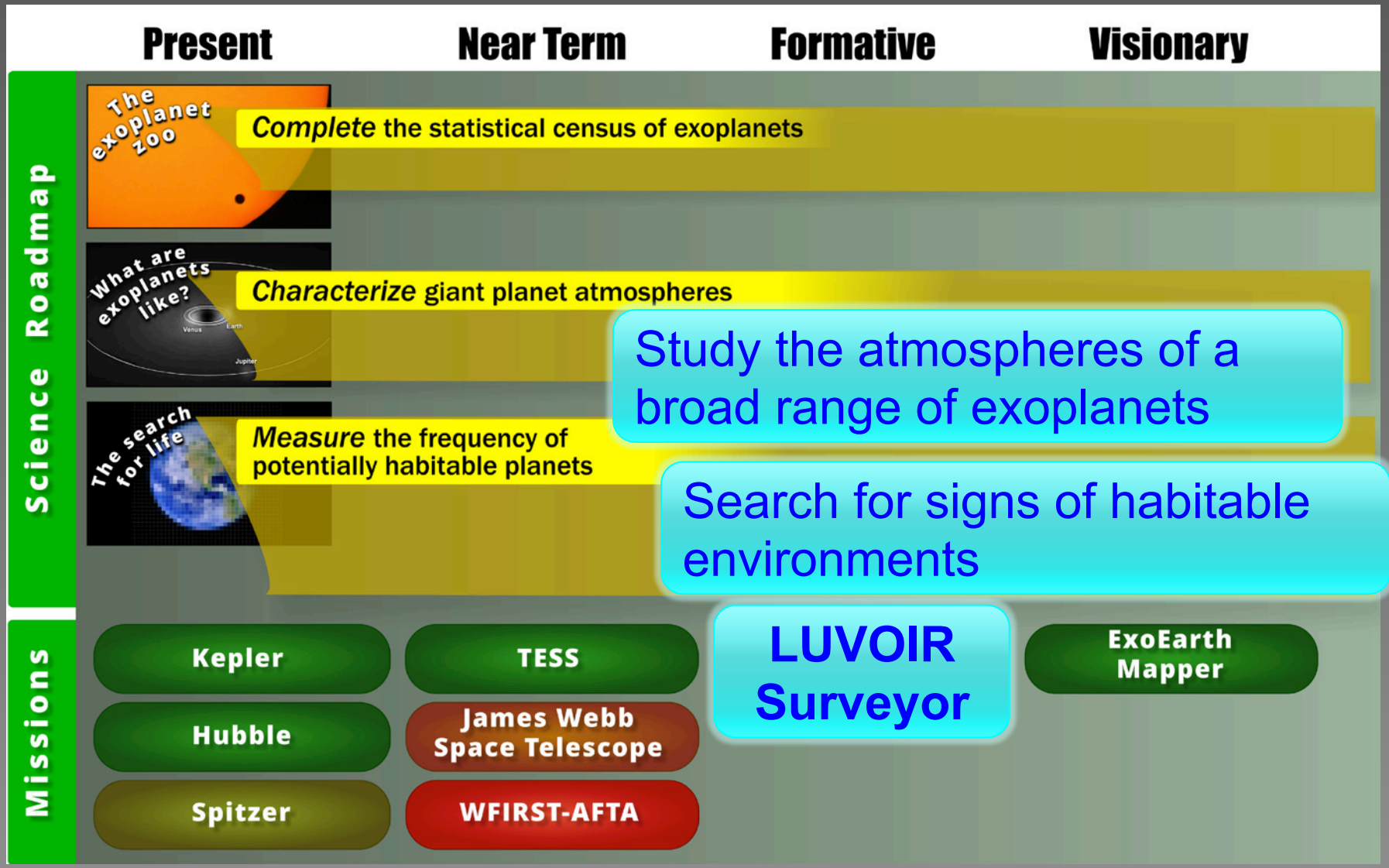
What is LUVOIR ?

- General purpose, multi-wavelength observatory with broad science capabilities
- Roots in previous studies over last decade(s)
  - See Thronson article in upcoming JATIS special issue for 30-year history
- Acronym comes from 2013 Astrophysics Visionary Roadmap

Cosmic origins goals in Roadmap

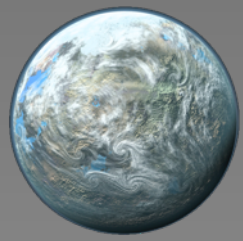


Exoplanet goals in Roadmap



2015 PAGs Large Mission Reports

- NASA APD charge to PAGs
  - Four large mission concepts to be studied in advance of Astro2020 Decadal Survey
  - Far-IR Surveyor, Habitable Planet Imaging Mission, LUVOIR, and X-Ray Surveyor
- LUVOIR primary science goals in ExoPAG report
  - Direct imaging of Earth analogs, search for potential habitability
  - Broad range of cosmic origins science



2015 ExoPAG Large Mission Report

- LUVOIR and HabEx have similar exoplanet science goals, differing in quantitative levels of ambition
  - HabEx to “search for” signs of habitability and biosignatures via direct detection of reflected light
  - LUVOIR to “constrain the frequency of” habitability and biosignatures = statistically meaningful survey of exoEarths

2015 COPAG Large Mission Report

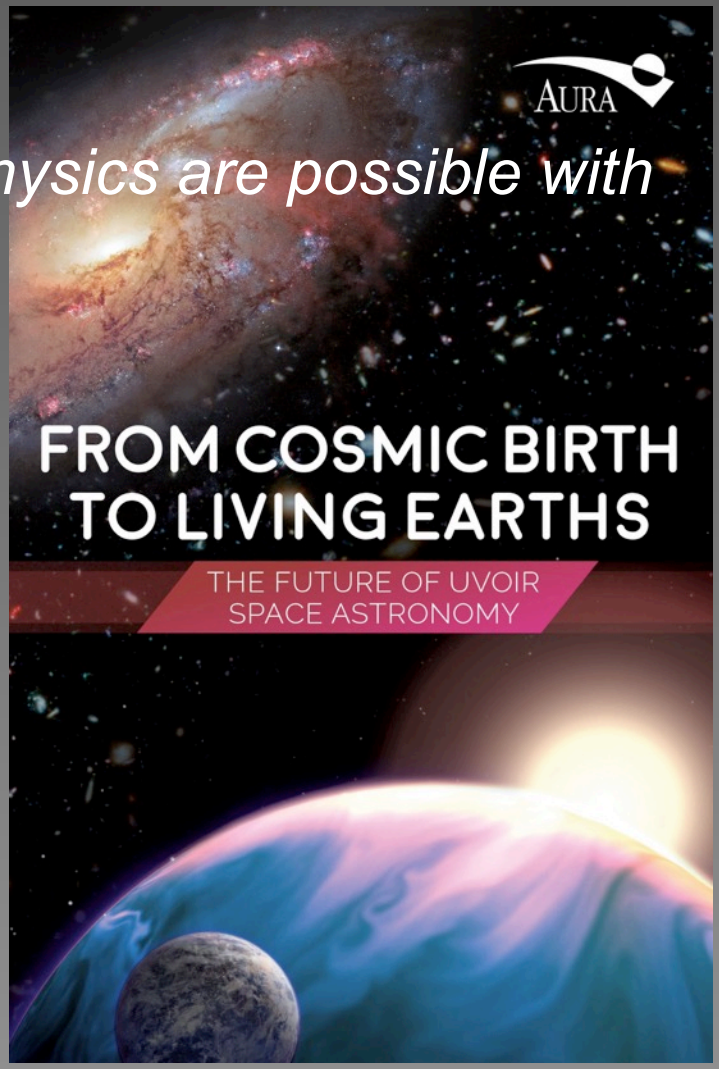
"A flagship mission offering high spatial resolution, high sensitivity, and access to the full range of wavelengths covered by HST (91.2 nm – 2 μm) is essential to advancing key Cosmic Origins science goals in the 2020s and 2030s."

- Many COR science goals for LUVOIR (more on this later)
- COPAG and ExoPAG not able to merge desires into single large mission
  - COPAG favored larger apertures. ExoPAG interested in both larger and smaller

2015 High-Definition Space Telescope Report

"*HDST's primary goal is to find and characterize dozens of Earth-like exoplanets.*"

"Major advances in all areas of astrophysics are possible with HDST."



- Other HDST science goals include ...
  - First galaxies, galaxy formation & evolution, star and planet formation in Milky Way, Solar System observations

Last 3 years … ATLAST study

- Engineering / science study of LUVOIR-like mission
  - Partner orgs: GSFC, JPL, STScI, MSFC
- Did *not* go into science goals or much instrument definition
- Focused on …
  - Large UV/O/IR telescopes
  - Coronagraphy (biggest challenge for telescope)
  - Big advance in exoplanet science yield calculations (see Stark talk tomorrow)

Summary

- Consensus in previous reports that LUVOIR has dual primary science goals
  1. Habitable exoplanets & biosignatures
  2. Wide range of general astrophysics
- Challenge to blend these goals into single powerful LUVOIR mission
  - HabEx will optimize for Goal 1
  - “Best effort” on Goal 2 ?
- Needs work : Solar System applications