

# BIG BANG TO BIOSIGNATURES: THE LUVOIR MISSION CONCEPT

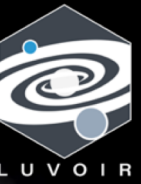


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Space Telescope Science Institute

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# What is LUVOIR ?



Large UV / Optical / Infrared Surveyor (LUVOIR)

Space telescope concept with broad science capabilities

**Exoplanets, Astrophysics, Solar System**

Far-UV to near-IR bandpass

Two concepts: 15-m (LUVOIR-A) and 8-m (LUVOIR-B) telescopes

Serviceable and upgradable

Primarily Guest Observer driven

- Expect that some major programs will be carried out most effectively as community-driven key projects
- Expect that there will be some GTO and DD time

# Charge to the STDTs



## Tasks for the Science and Technology Definition Teams (STDTs):

- Identify compelling science for these missions
- Identify technical challenges
- Identify technical solutions
- Demonstrate that high-level science goals can be accomplished with the telescope as designed
  - The STDTs are *not* attempting to define an optimal mission. They should show that there are solutions or pathways to the engineering and technology challenges.
- Offer options and scalability, if possible.

# Think big: ask hard, compelling questions

If LUVOIR is built, it will likely be the UVOIR space telescope for the next half century.

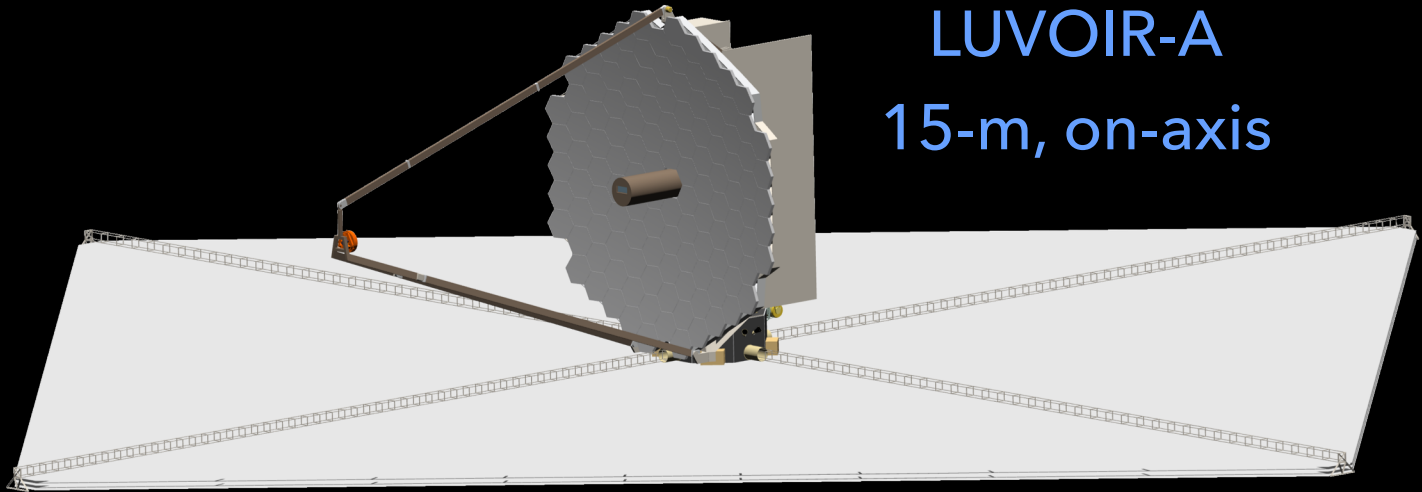
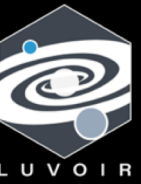
Don't shortchange future astronomers: make it as capable as possible.

Make LUVOIR as big as possible:

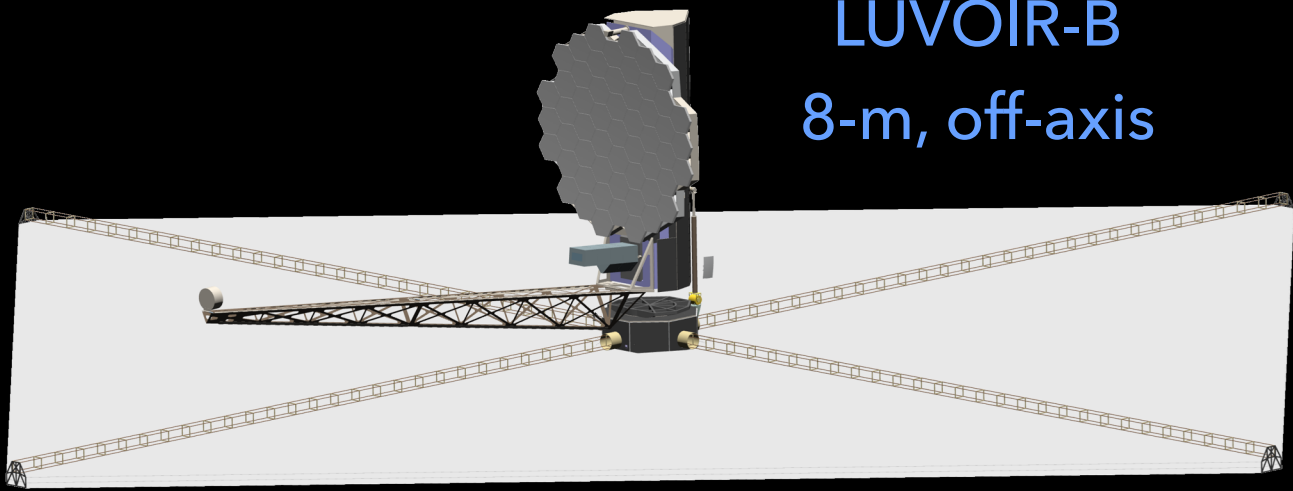
**Enabling** for certain goals (e.g., search for habitable exoplanets).

**Enhancing** for other goals (even if you only require a smaller telescope, more science becomes possible with larger telescope).

# Segmented, deployable telescopes



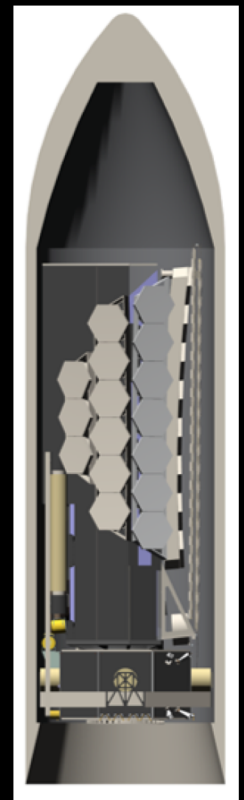
LUVOIR-A  
15-m, on-axis



LUVOIR-B  
8-m, off-axis

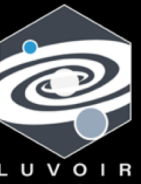


LUVOIR-A in  
SLS Block 2



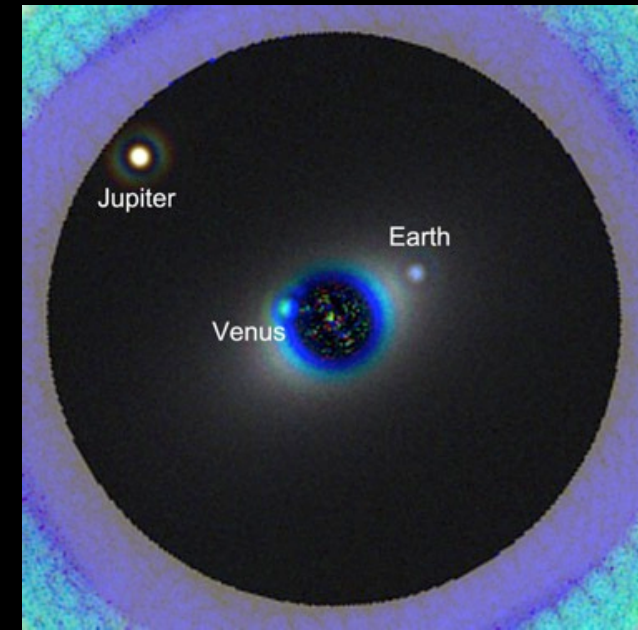
LUVOIR-B in  
5-m fairing

# The LUVOIR instruments



## Observational challenge

Faint planets next to bright stars



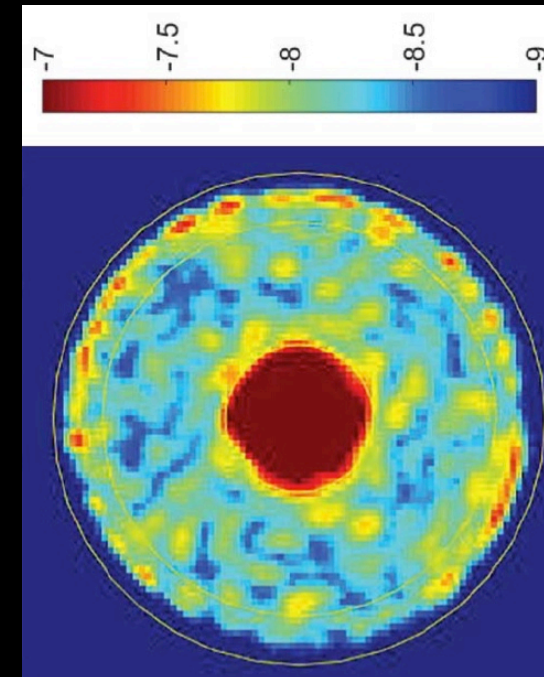
## Extreme Coronagraph for Living Planetary Systems (ECLIPS)

Contrast  $\sim 10^{-10}$

Bandpass: 0.2  $\mu\text{m}$  to 2.0  $\mu\text{m}$

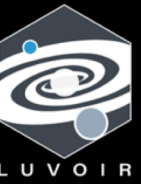
Imaging spectroscopy: Vis R=140, NIR R=70 & 200

Tech development via WFIRST coronagraph



WFIRST  
Hybrid Lyot  
Coronagraph

# The LUVOIR instruments



## Observational challenge

Very cold to very hot gases

## LUVOIR UV Multi-Object Spectrograph (LUMOS)

Bandpass: 100 nm to 1000 nm

$R = 500 - 40,000$

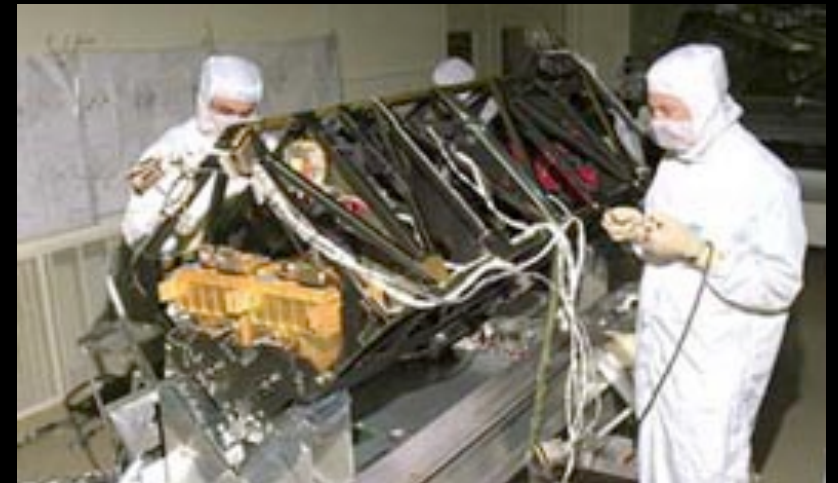
MOS FOV:  $2' \times 2'$

FUV imaging channel

Heritage from STIS, COS, & NIRSPEC



Europa geysers



HST STIS UV instrument

# The LUVOIR instruments

## Observational challenge

Imaging the ultra faint and very small at high resolution

## High-Definition Imager (HDI)

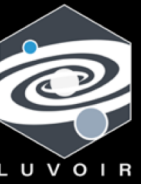
2 x 3 arcmin field-of-view

Bandpass: 0.2  $\mu\text{m}$  to 2.5  $\mu\text{m}$

Large suite of filters & grisms

Micro-arcsec astrometry capability (measure planet masses, etc.)

Heritage from HST WFC3 & WFIRST



HST Wide Field Camera 3



# POLLUX: a European contribution to the LUVOIR mission study

- ▶ UV spectro-polarimeter with high resolution point-source capability ( $R=120,000$ )
- ▶ Circular + linear polarizations and unpolarized light
- ▶ Defined & designed by consortium of 10 European institutions, with leadership/support from CNES
- ▶ Builds off Arago mission concept. Instrument study could serve as basis for a future ESA contribution to LUVOIR

## Take-aways from this session

The science must justify the time and expense.

- For the first time in human history, we can obtain a meaningful answer to the most compelling scientific question: "Are we alone?"
- There are important science programs that demand a sensitive UV telescope in space; this capability will be lost when the Hubble mission ends.

Final STDT report will be delivered to NASA on 23 August.



COSMIC ORIGINS  
&  
THE ULTRA-FAINT  
UNIVERSE



EXOTIC WORLDS

THE SEARCH  
FOR LIFE



OUR DYNAMIC  
SOLAR SYSTEM

