



Working with Neil Gehrels on WFIRST

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Outline

- Memories as Neil
- WFIRST as a Dark Energy mission
- WFIRST as an Exoplanet mission
- WFIRST as a General Astrophysics mission



WFIRST
WIDE-FIELD INFRARED SURVEY TELESCOPE
DARK ENERGY • EXOPLANETS • ASTROPHYSICS

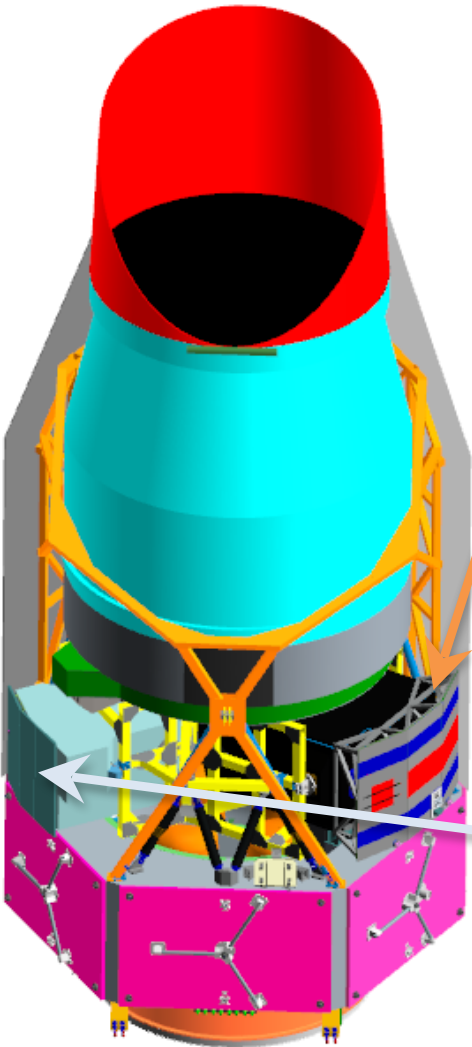
WFIRST Instruments

Wide Field Instrument

- *Imaging & spectroscopy over 1000s of sq. deg.*
- *Monitoring of SN and microlensing fields*
- Near infrared bandpass
- Field of view 100 x HST and JWST
- 18 H4RG detectors (288 Mpixels)

Coronagraph

- *Image and spectra of exoplanets from super-Earths to giants*
- *Images of debris disks*
- Visible bandpass
- Contrast of 10^{-9} or better
- Exoplanet images from 0.1 to 1.0 arcsec

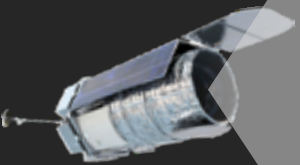


Hubble - A Spectacular Start



The Hubble Ultra Deep Field
seeing the Universe, 10,000
galaxies at a time

WFIRST - Hubble X 100



A WFIRST Deep Field
A New Window on the Universe - **1,000,000** galaxies at a time

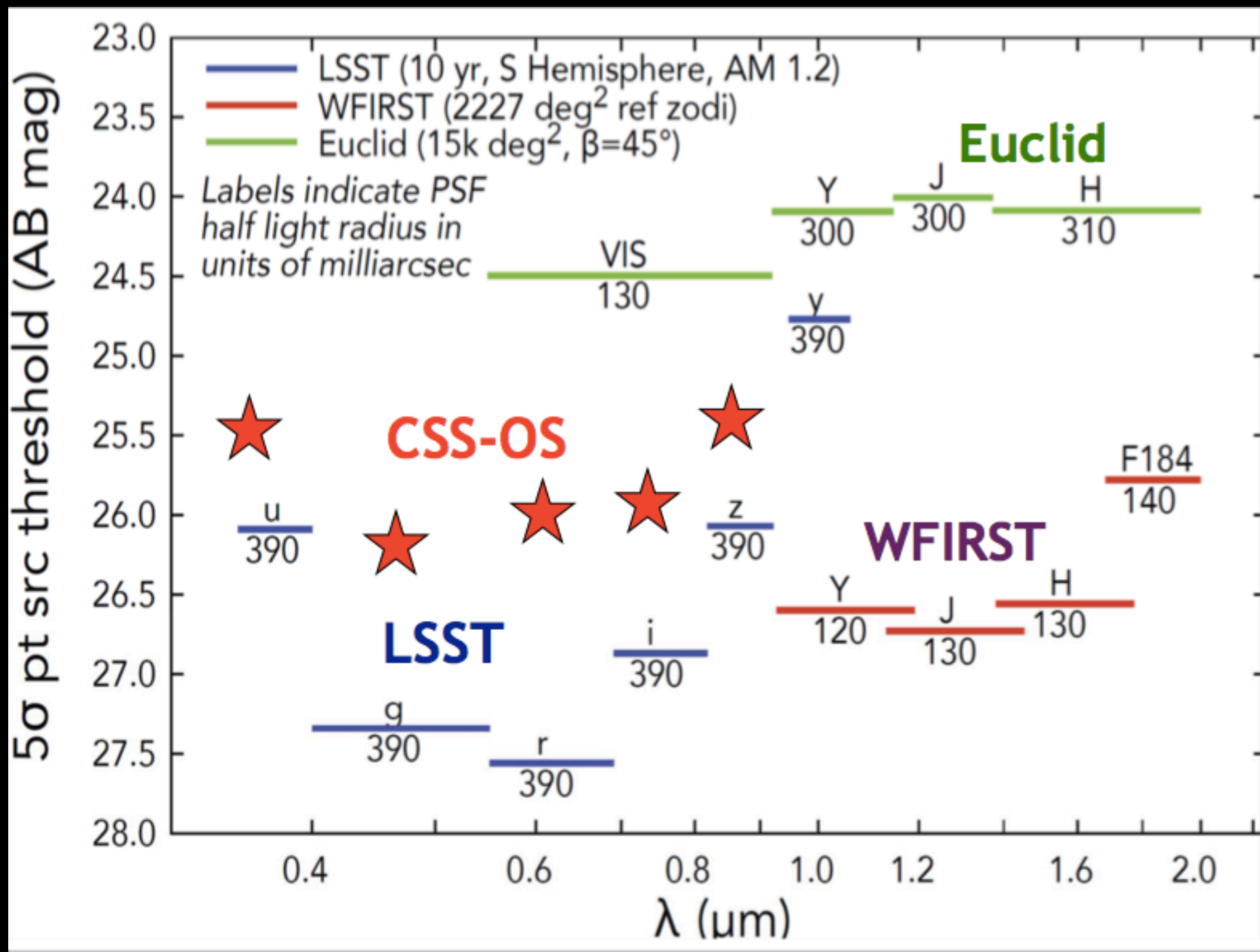


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WFIRST FSWG

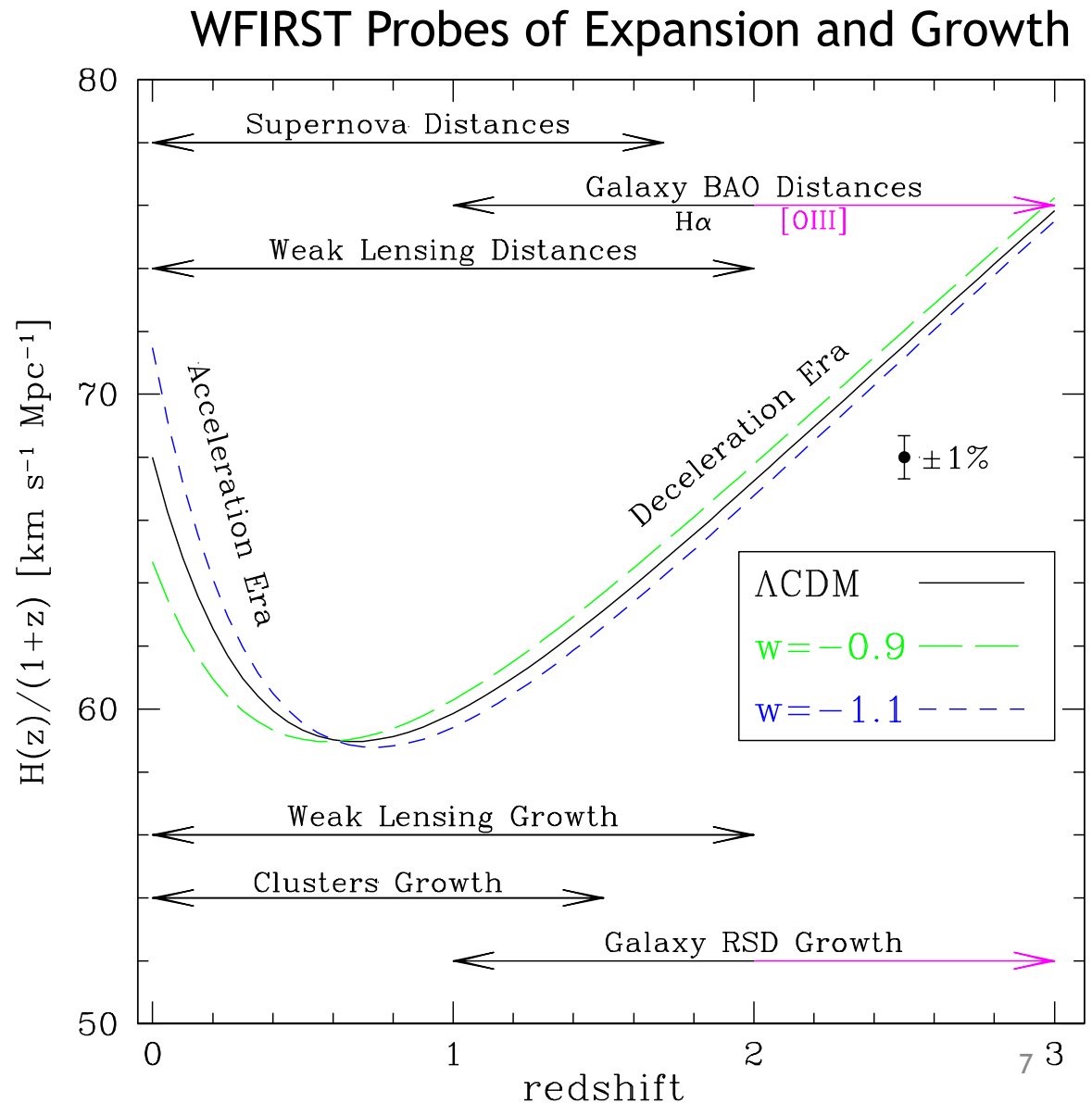
Name	Affiliation	Role
Jeff Kruk, Chair	NASA/GSFC	Project Scientist
David Spergel, Deputy Chair	Princeton University	WFI Adjutant Scientist
Jeremy Kasdin, Deputy Chair	Princeton University	CGI Adjutant Scientist
Dominic Benford, <i>ex officio</i>	NASA/HQ	Program Scientist
Dave Bennett	UMBC & GSFC	Microlensing
Ken Carpenter, <i>ex officio</i>		
Roc Cutri, <i>ex officio</i>		
Olivier Doré		
Ryan Foley		
Scott Gaudi		
Chris Hirata		
Jason Kalirai		Science
Jeff Kruk, <i>ex officio</i>	NASA/GSFC	Project science
Nikole Lewis	STScI	Coronagraph
Bruce MacIntosh	Stanford	Coronagraph
Roeland van der Marel, <i>ex officio</i>	STScI	Science center
S. Perlmutter	UC Berkeley	Supernova Cosmology
James Rhoads	Arizona State	GI/GO – Cosmic Dawn
Jason Rhodes, <i>ex officio</i>	NASA/IPI	Project science





- WFIRST combines all techniques to determine the nature of Dark Energy.
- Only observatory doing such comprehensive observations
- High precision measurements will be optimally combined for the best measurement

Weinberg & SDT 2015



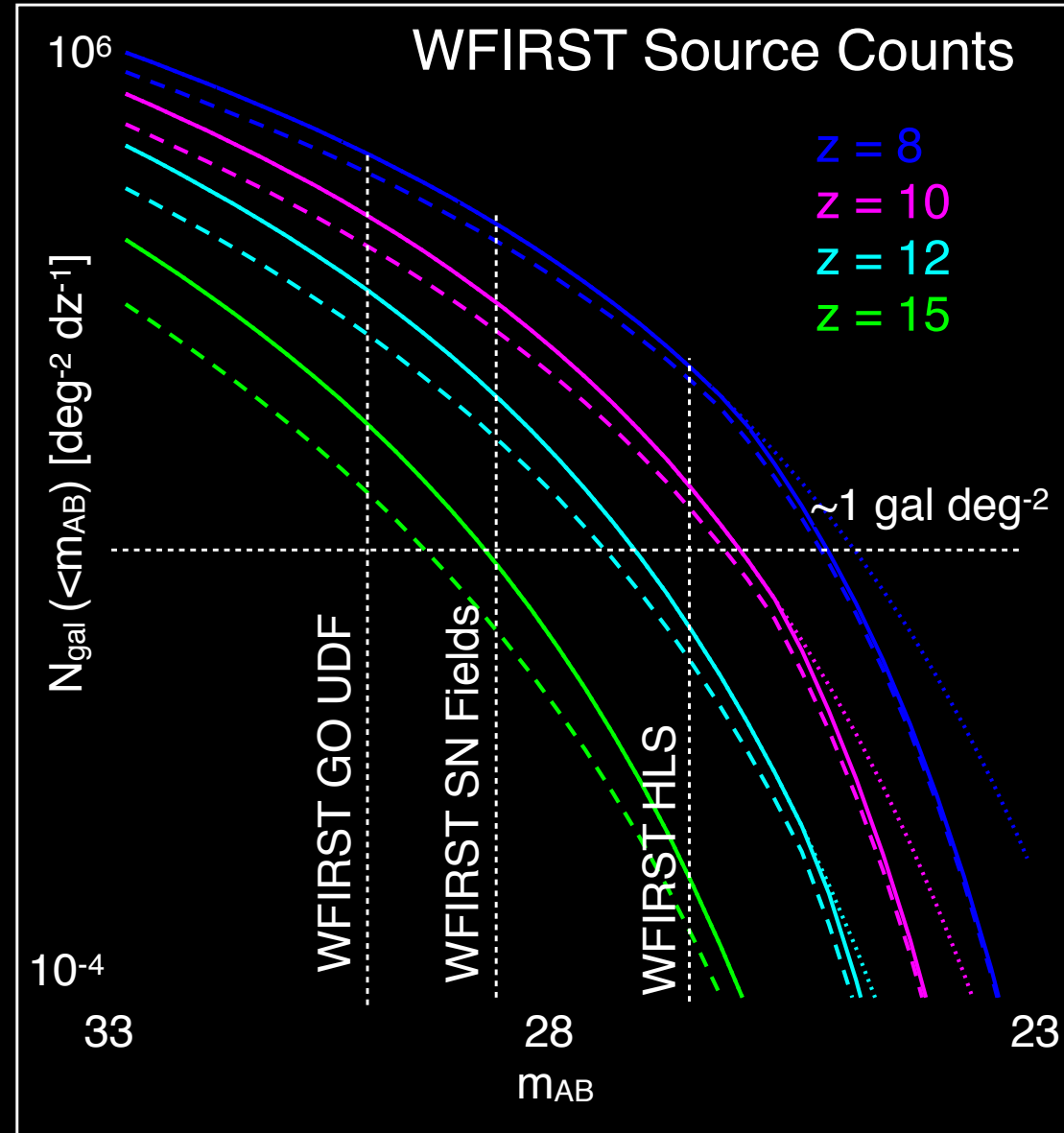
WFIRST Ultra Deep Survey Design and Sources

Example WFIRST Ultra Deep Survey design:

Area $\sim 0.28 \text{ deg}^2$ (single field)
Z,Y,J,H,F184 $\sim 29.5\text{-}30 \text{ AB}$

A WFIRST Ultra Deep survey would discover:

- $N \gtrsim 10^4$ galaxies at $z \gtrsim 8$
- $N \gtrsim 10^3$ galaxies at $z \gtrsim 10$
- $N \gtrsim 10^2$ galaxies at $z \gtrsim 12$
- $N \sim 10\text{s}$ galaxies at $z \gtrsim 15$





Complete the Census of Exoplanets - Microlensing

WFIRST complements Kepler, TESS, Plato

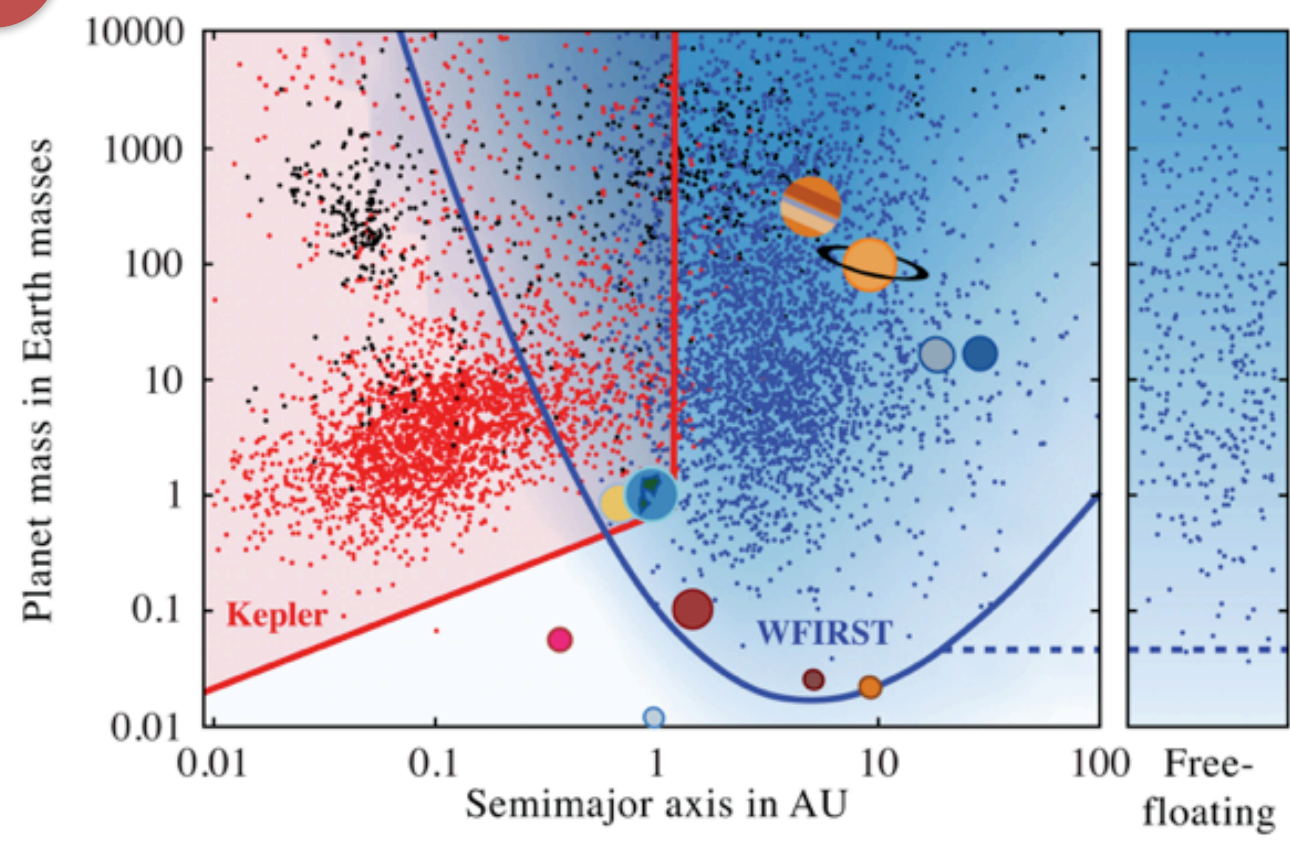


Kepler, TESS

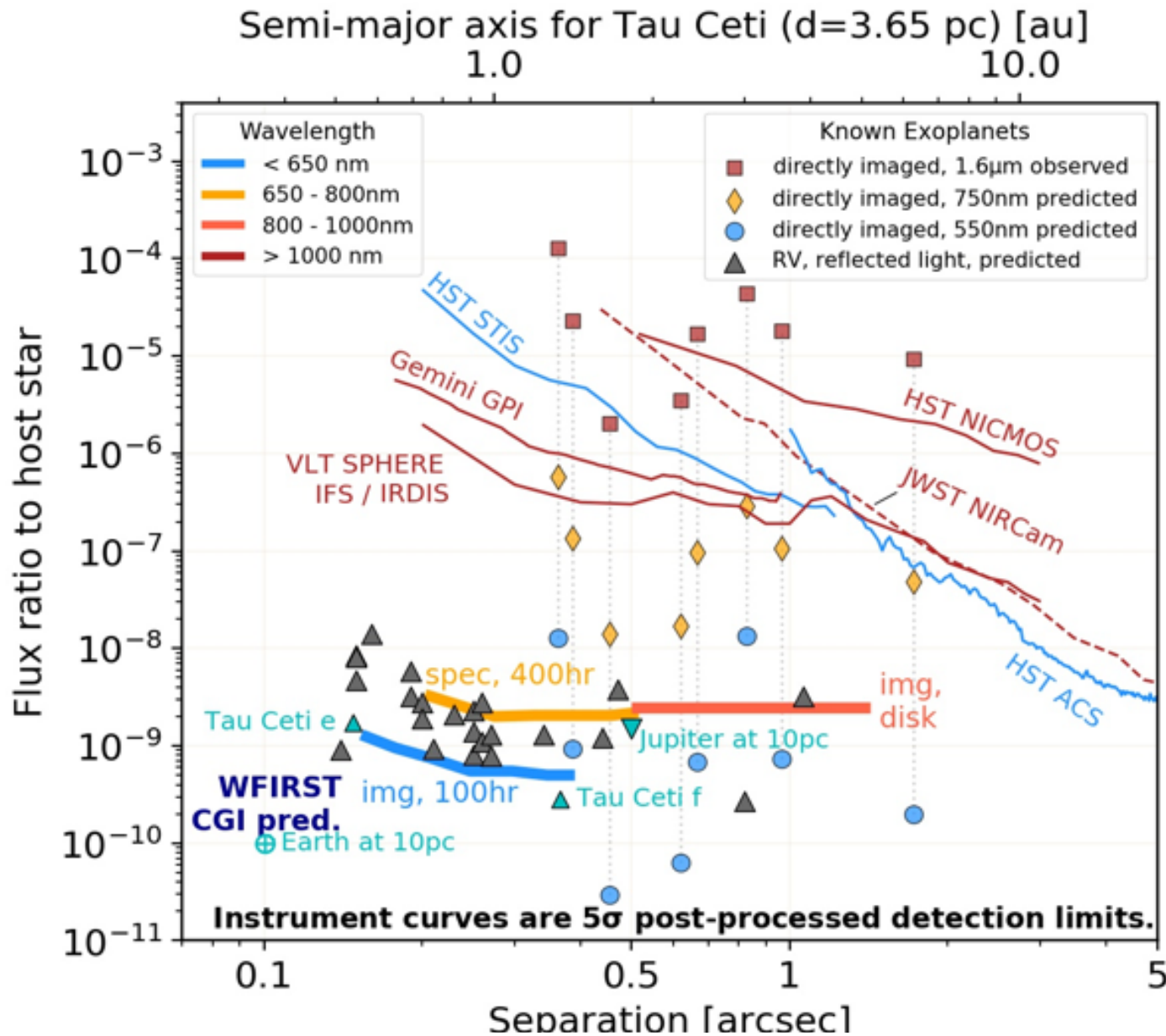


WFIRST

- 2600 planets
- 370 Earth mass & less
- 100's free-floaters



Exoplanet & Disk Direct Imaging

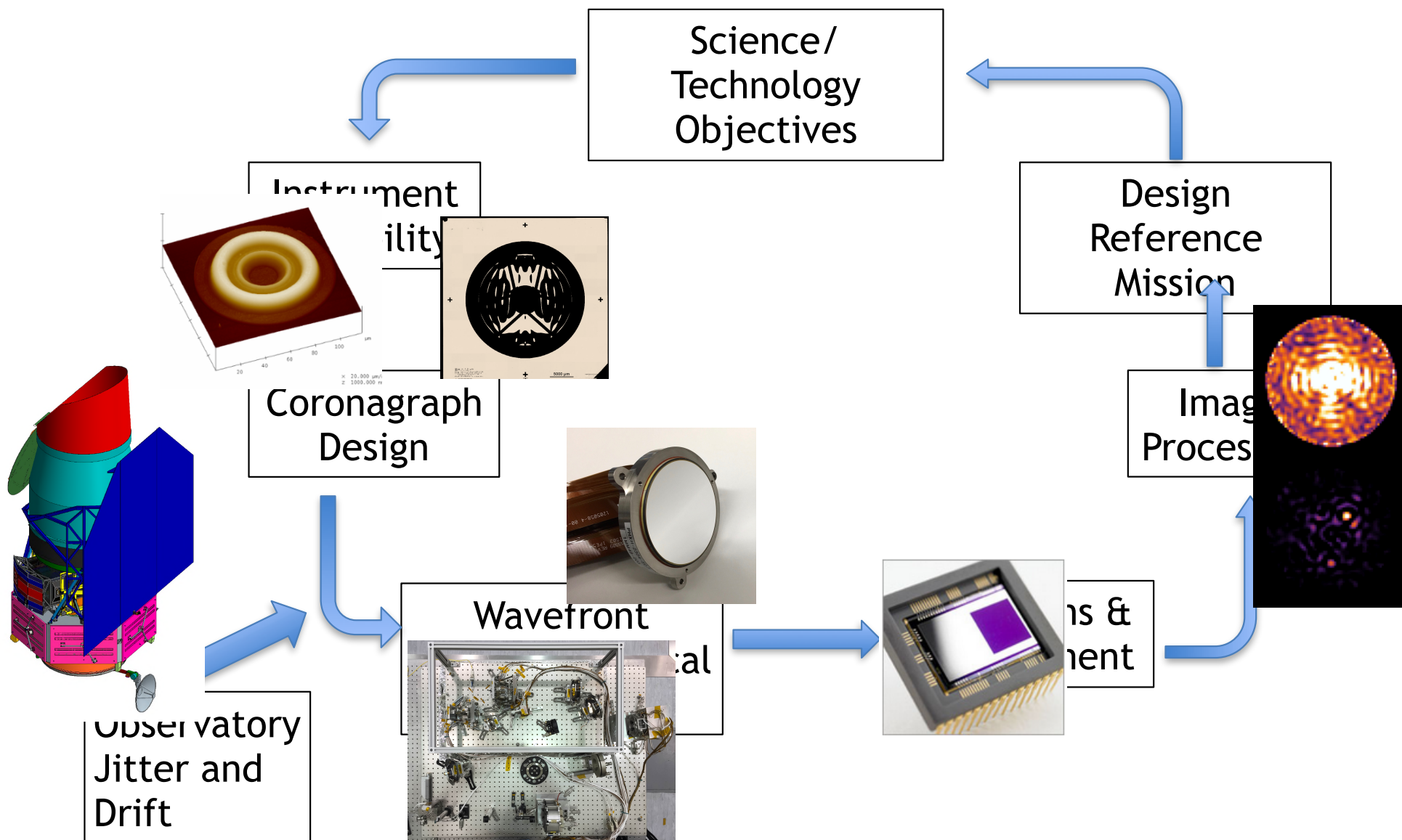




Realizing a Coronagraph Mission

WFIRST

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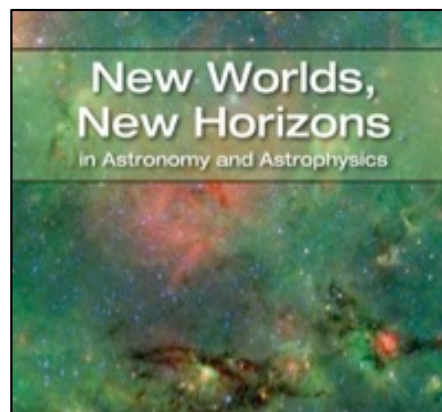


Hits 5/6 NASA Strategic Goals

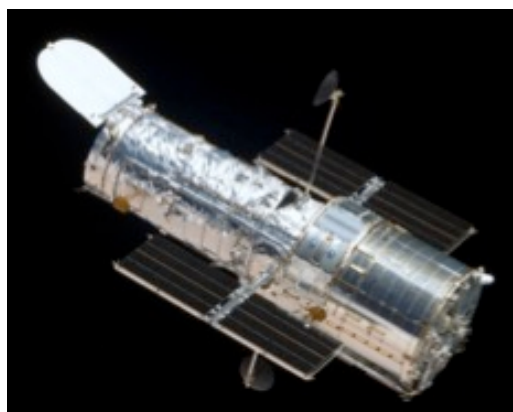
Addresses all 3 APS performance goals

#1 Priority of Astro Decadal Survey

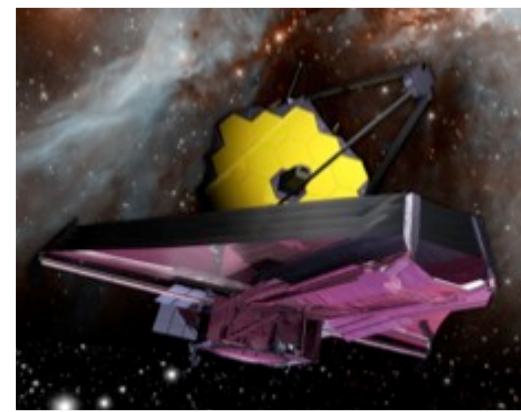
Brings the Universe to STEM education



Foundation for discovering Earth-like planets



Hubble's clarity over 10% of the sky



Complements and enhances JWST science