From Recommendation to Reality

Decadal → GOMAP → CSIT → Mission Architecture

Community Science and Instrument Team

How national science priorities
become engineering decisions

Evgenya Shkolnik, CSIT co-chair

What the CSIT Does

Translate science → requirements

Translate community science priorities into Driving Science Cases that inform HWO mission-level requirements.

Coordinate community → design

Coordinate across PAGs, SIGs, and partners to ensure continued broad community participation and that science priorities are reflected in HWO design.

Evaluate trades → instruments

Help evaluate instrument concepts and technology maturity to define a scientifically optimized core instrument suite for the Mission Concept Review.

Advocate science → stakeholders

Serve as ambassadors for the community, articulating the scientific value of HWO across stakeholder groups.

HWO's Community Science & Instrument Teams (CSIT)

National Aeronautics and Space Administration

International ex-officio

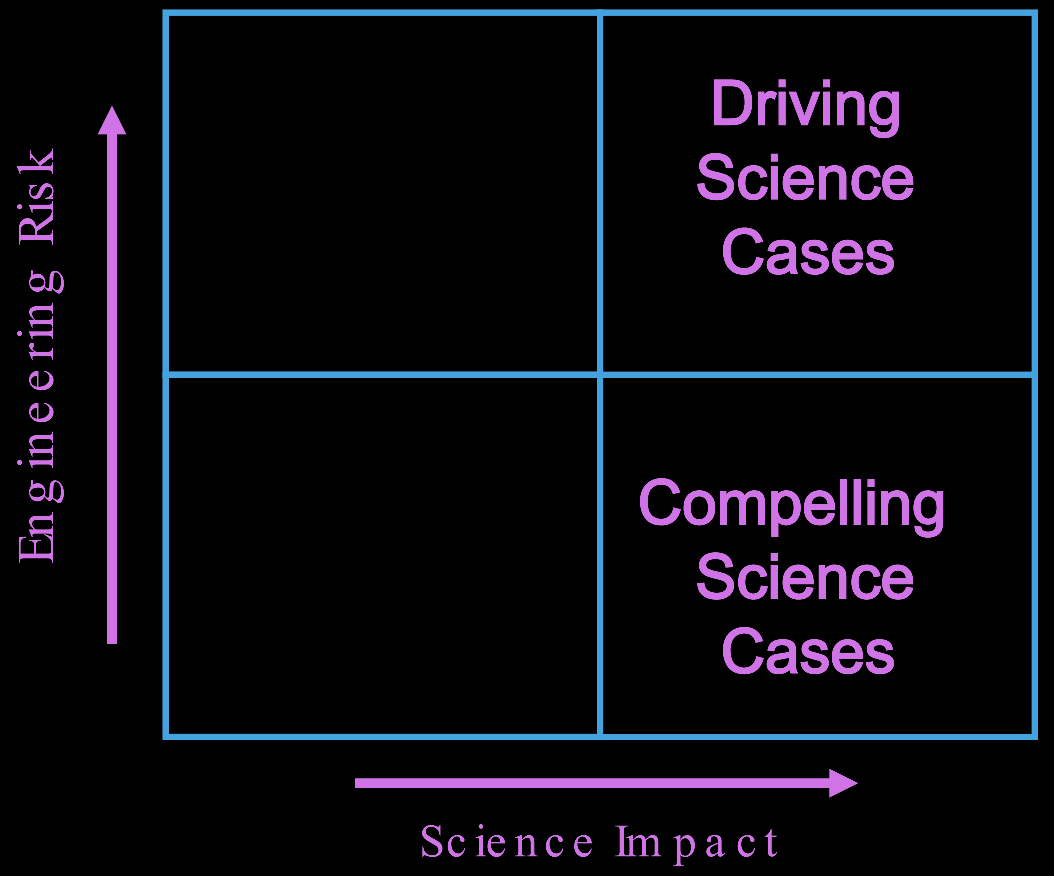
Exoplanets & Habitability ◉ Solar System ◉ Stars & Stellar Environments ◉ Galaxies & Cosmic Ecosystems ◉ Extreme Astrophysics & Transients ◉ Instrumentation & Analysis

Science Drives Mission Design

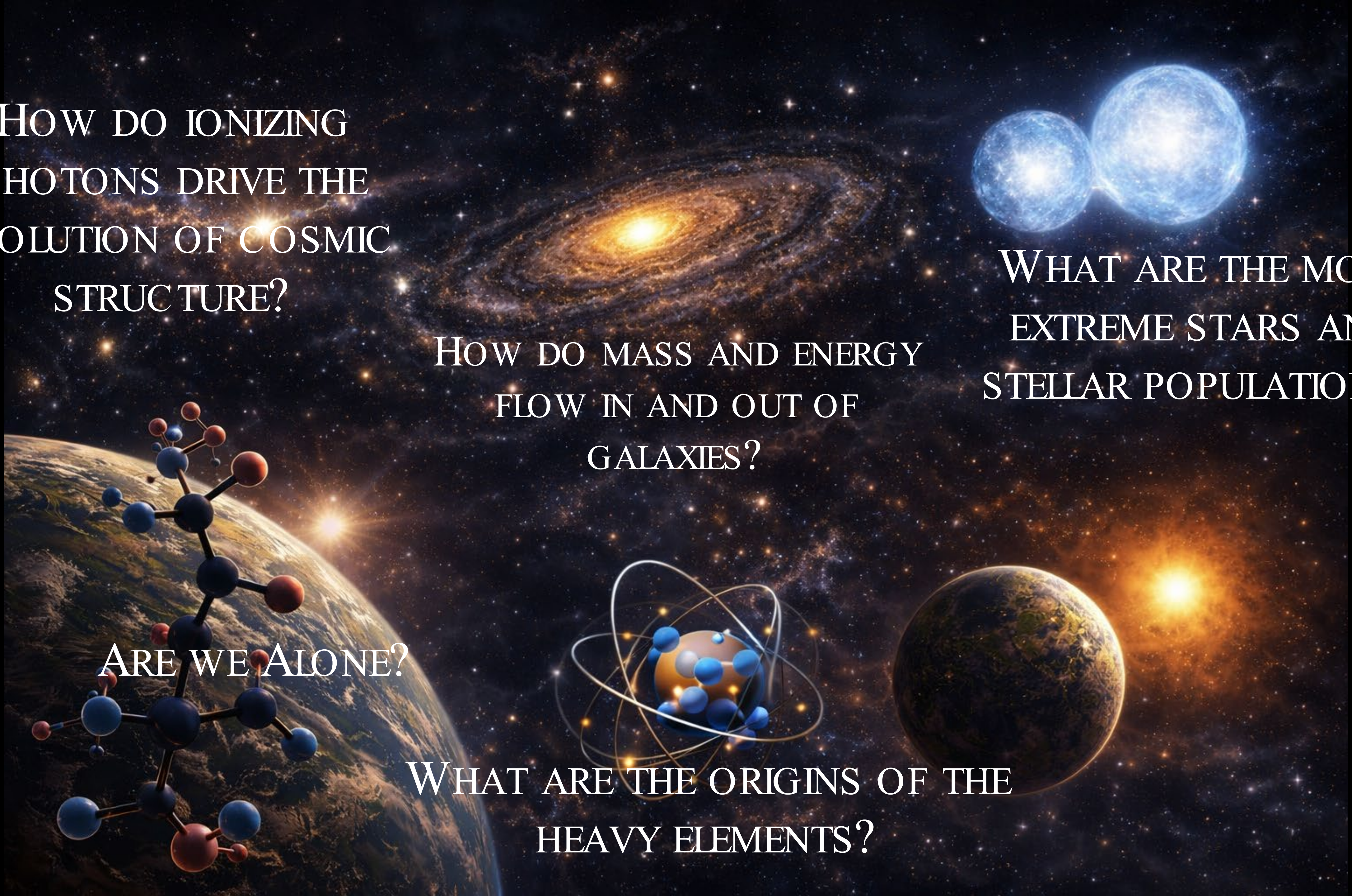
The CSIT reviewed all community Science Case Development Documents **(SCDD)** to identify potential:

1) Driving Science Cases (DSC) that inform draft Level 1 science requirements (baseline and threshold) by mapping science objectives to capabilities.

1) Compelling Science Cases (CSC) needed for explorations of trade space and Design Reference Missions (DRMs)



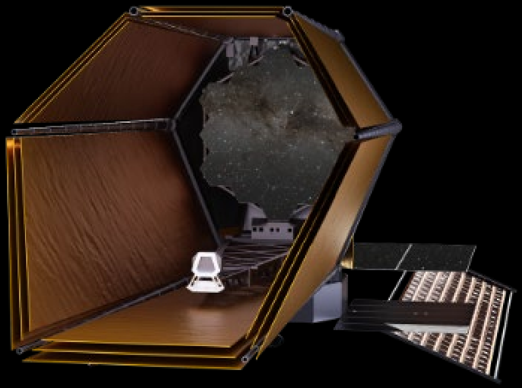

HWO's First Driving Science Questions
Recommended by the CSIT

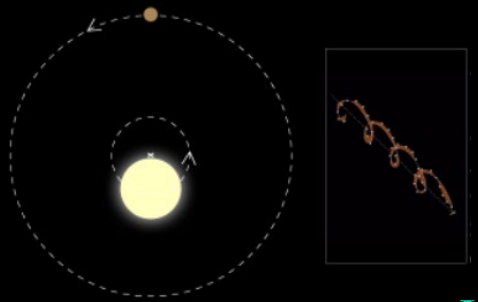

How do ionizing photons drive the evolution of cosmic structure?
How do mass and energy flow in and out of galaxies?
What are the most extreme stars and stellar populations?
Are we Alone?
What are the origins of the heavy elements?

Preliminary Observatory Goals Flowing from the First Driving Science Cases

Telescope

Diameter	~8 m
Bandpass	~97– 1700 nm





High-Resolution Imager

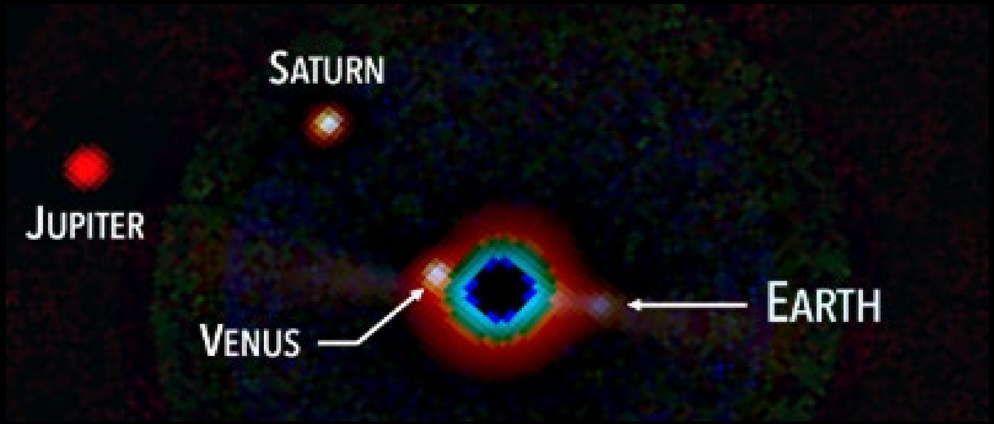
Vis and NIR imaging & High-precision astrometry

Bandpass	~400– 1200 nm
Field-of-View	~3' x 4'
Astrometry Precision	~0.3 μas per epoch

Coronagraph

High-contrast imaging and imaging spectroscopy

Bandpass	~200- 1700 nm
Final Planet-Star Flux Ratio	~10^{-10}
IWA	~50 mas
R ($\lambda/\Delta\lambda$)	NUV: ~7 ; Vis: ~140 ; NIR: ~70

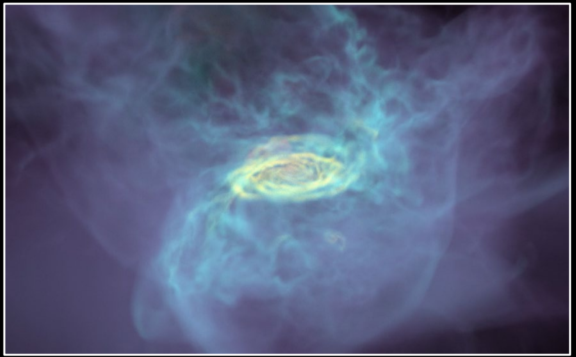


PRELIMINARY OBSERVATORY GOALS FLOWING FROM THE FIRST DRIVING SCIENCE CASES

Multi-Object Spectrograph (MOS)

FUV and NUV spectroscopy and FUV imaging

Bandpass	~97 – 380 nm
Field-of-View	~3‘× 3′
Angular Res.	~0.05″
R (λ/Δλ)	~500 ~40,000 ~100,000 (point-source)



Integral Field Unit (IFU)

FUV and NUV spectroscopy and imaging

Bandpass	~100 – 400 nm
Field-of-View	~3″× 3’’
Angular Res.	~0.02″
R (λ/Δλ)	~4,000

Other candidate instruments will also be considered.

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Science and technology co-evolve

designs are iterated over time

and decisions are informed by maturity