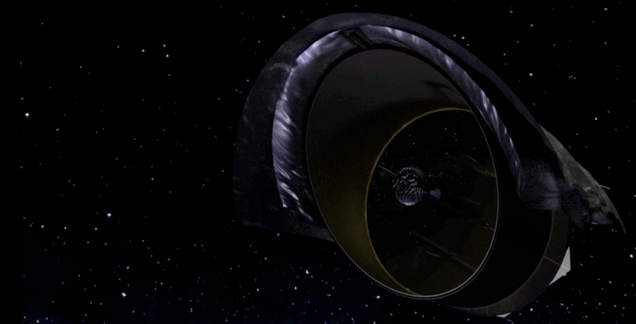
Mission Concept Studies for the 2020 Decadal Survey

ORIGINS
Space Telescope



Hardware Contribution to the Origins Space Telescope (*Origins*)

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http://origins.ipac.caltech.edu

ORIGINS
Space Telescope

How does the universe work?

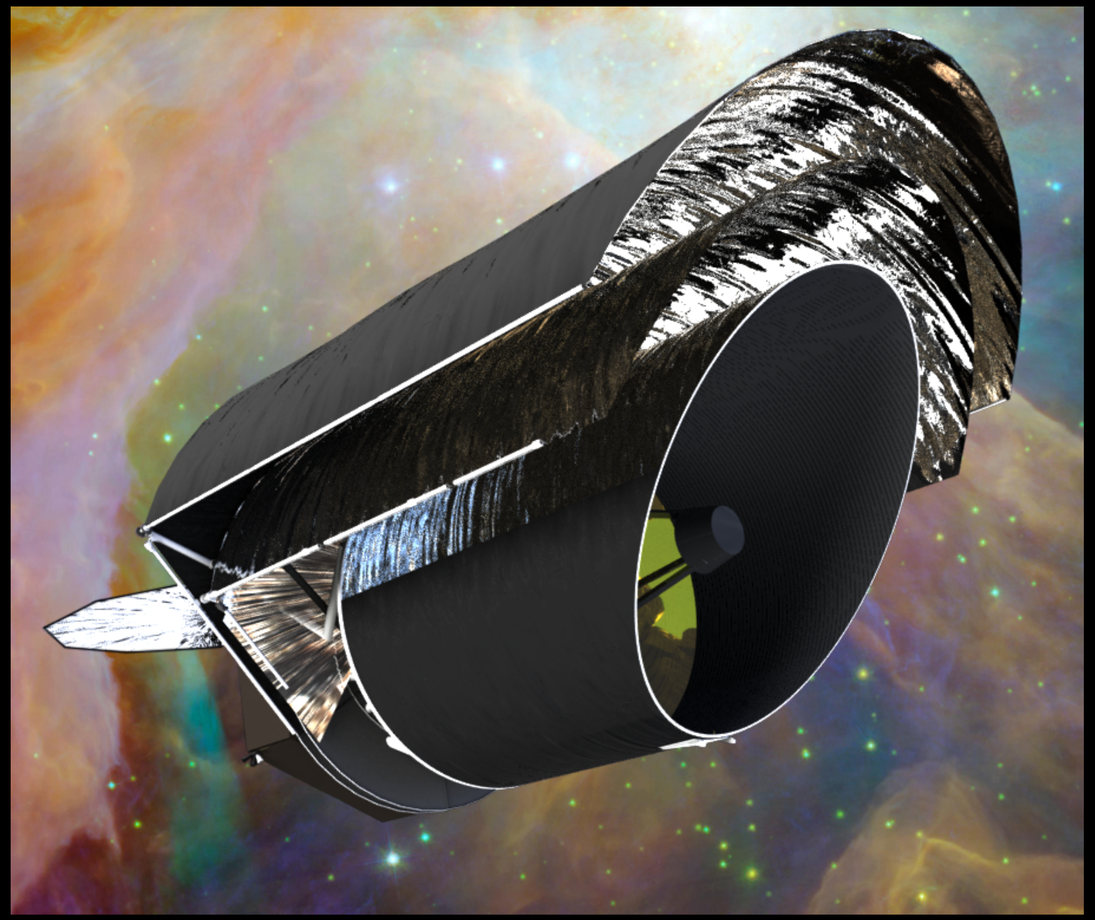
How did we get here?

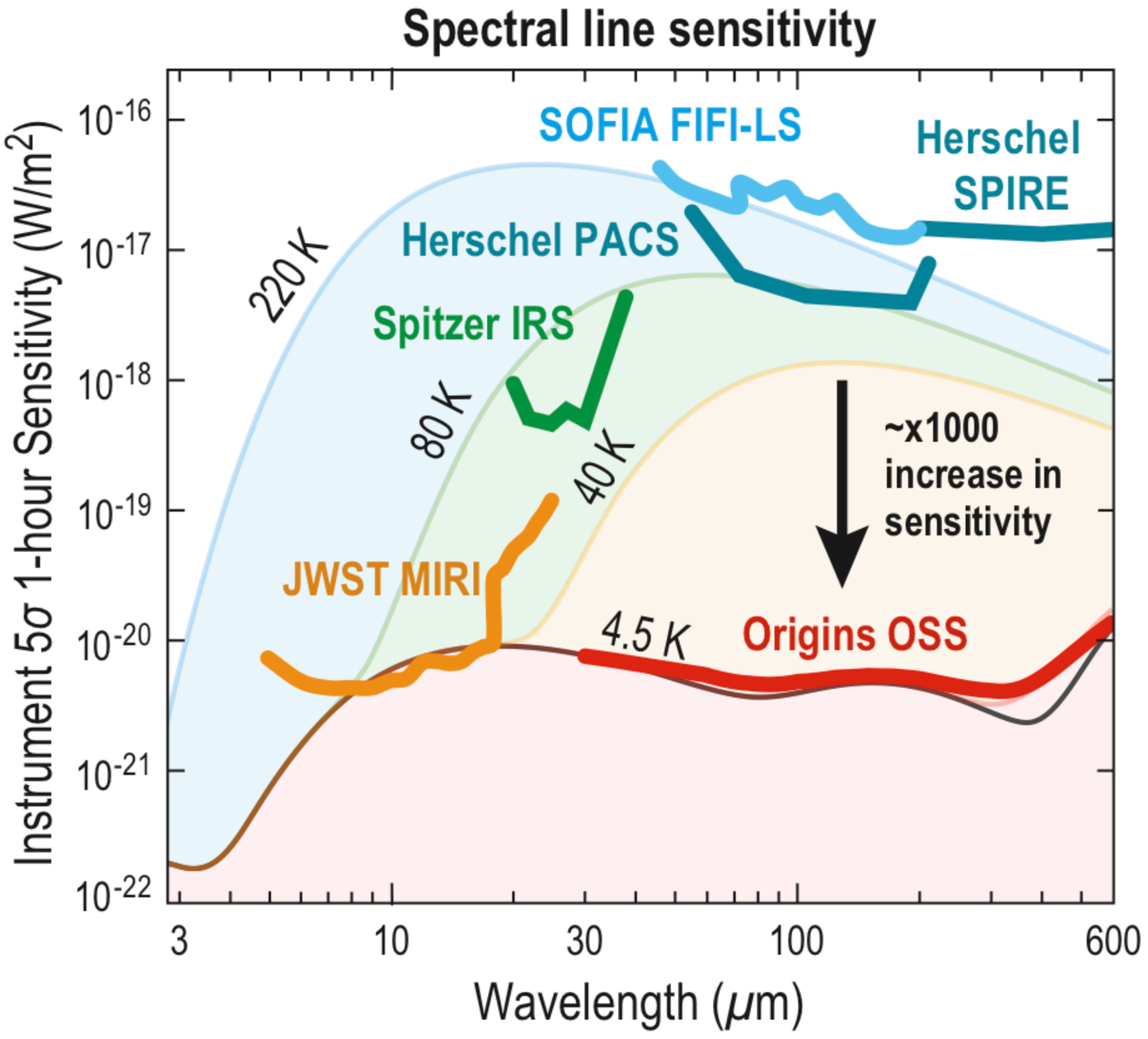
Are we alone?

Discovery of new phenomena

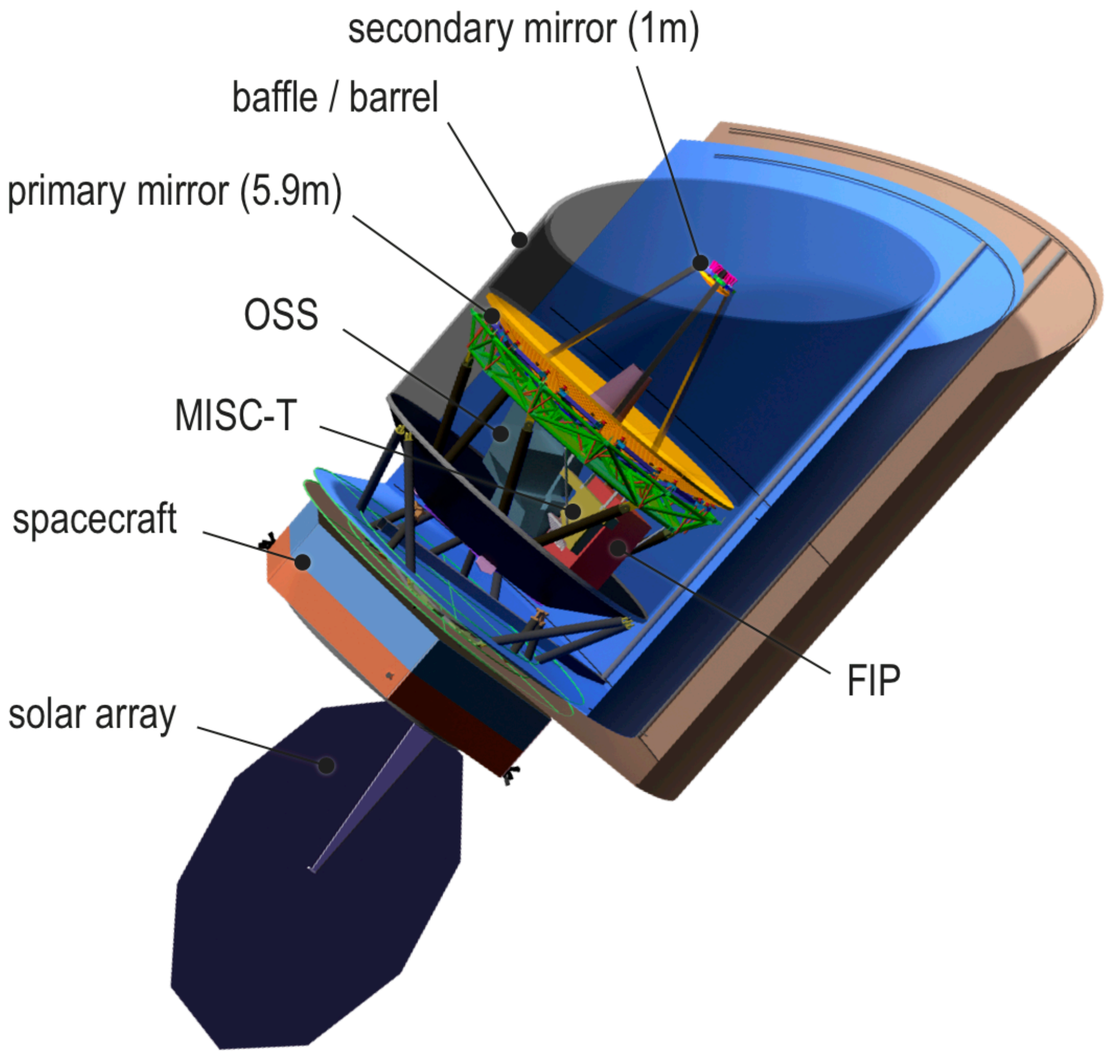
ORIGINS
Space Telescope

- ★ x1000 more sensitive than anything before
- ★ 5.9m aperture non-deployed cold aperture (4.5K)
- ★ Low-risk development, testing, and deployment
- ★ 3 orders of magnitude in wavelength coverage: 2.8-588 μm




Spectral line sensitivity
Instrument 5σ 1-hour Sensitivity (W/m²)
10-16
10-17
10-18
10-19
10-20
10-21
10-22
3
10
30
100
600
Wavelength (μm)
SOFIA FIFI-LS
Herschel SPIRE
Herschel PACS
220 K
Spitzer IRS
80 K
40 K
~x1000 increase in sensitivity
JWST MIRI
4.5 K
Origins OSS

ORIGINS Space Telescope



Origins: Spitzer-like minimal deployable design

wavelength coverage: 2.8-588 µm

Telescope:

- diameter: 5.9 m
- area: 25 m^2 (=JWST area)
- diffraction-limit: 30 µm
- temperature: 4.5 K

Cooling: long life cryro-coolers

Agile Observatory for surveys: 60” per second

Launch Vehicle:

Large, SLS Block 1, Space-X BFR

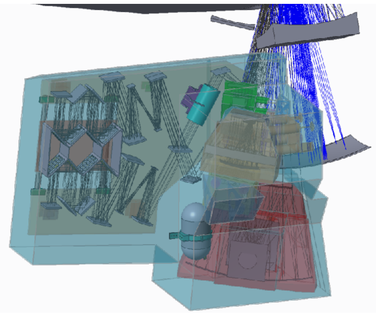
Mission: 10 year propellant, serviceable

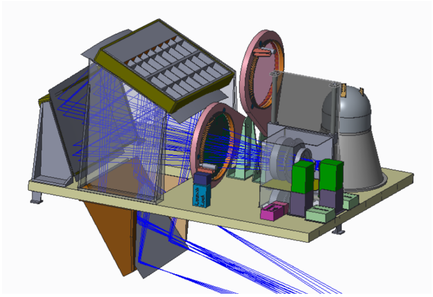
Orbit: Sun-Earth L2

Three Instruments

OSS: Origins Survey Spectrometer

-25-588 µm R~300, survey mapping
-25-588 µm R~43,000, spectral surveys
-100-200 µm R~325,000, kinematics



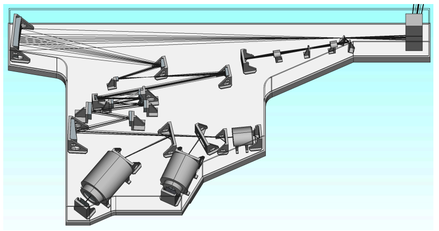


FIP: Far-infrared Imager Polarimeter

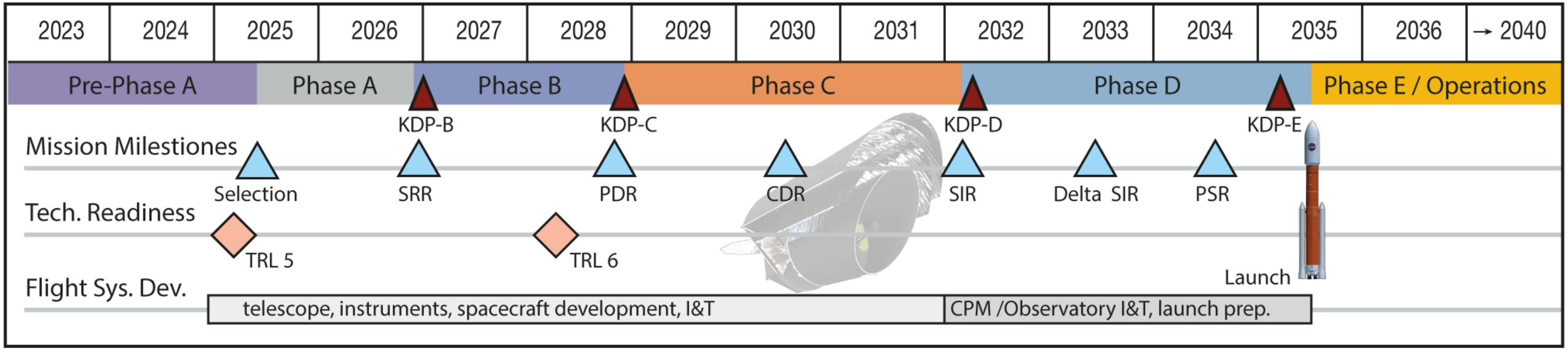
- 50 or 250 µm, Large area survey mapping
- 50 or 250 µm, polarimetry

MISC-T: Mid-Infrared Spectrometer **Camera Transit**

-Ultra-Stable Transit Spectroscopy
-2.8-20 µm R~50-295

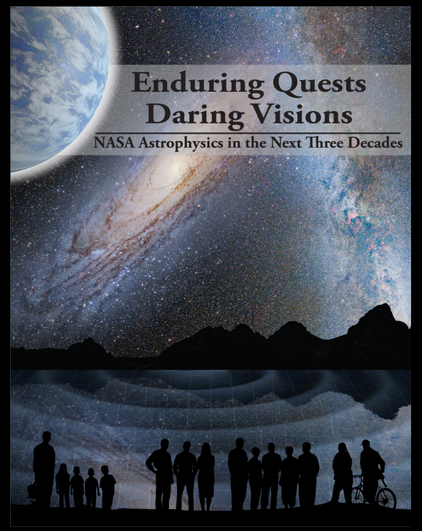


Origins Mission Development Timeline

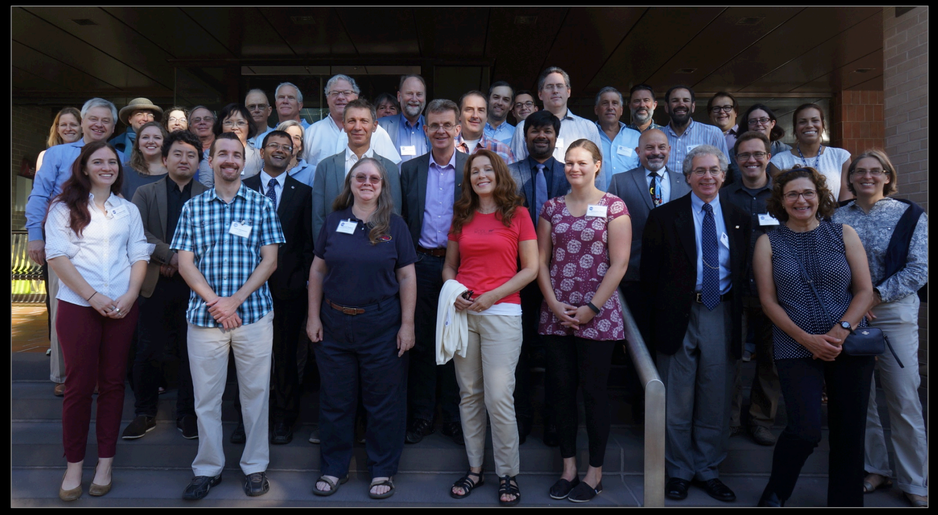


ORIGINS Space Telescope

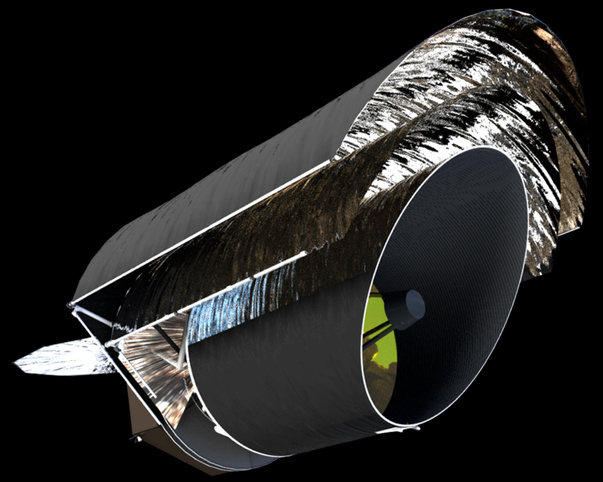
From the community, by the community, for the community.



Through the Astrophysics Roadmap, the community expressed interest in a “Far-IR Surveyor” mission.



The OST Science and Technology Definition Team has worked with >100 scientists and engineers around the world to design the mission that people want.



Guest Observers will use OST to answer mission-driving science questions and make unexpected, transformative discoveries.

ORIGINS Space Telescope

NASA

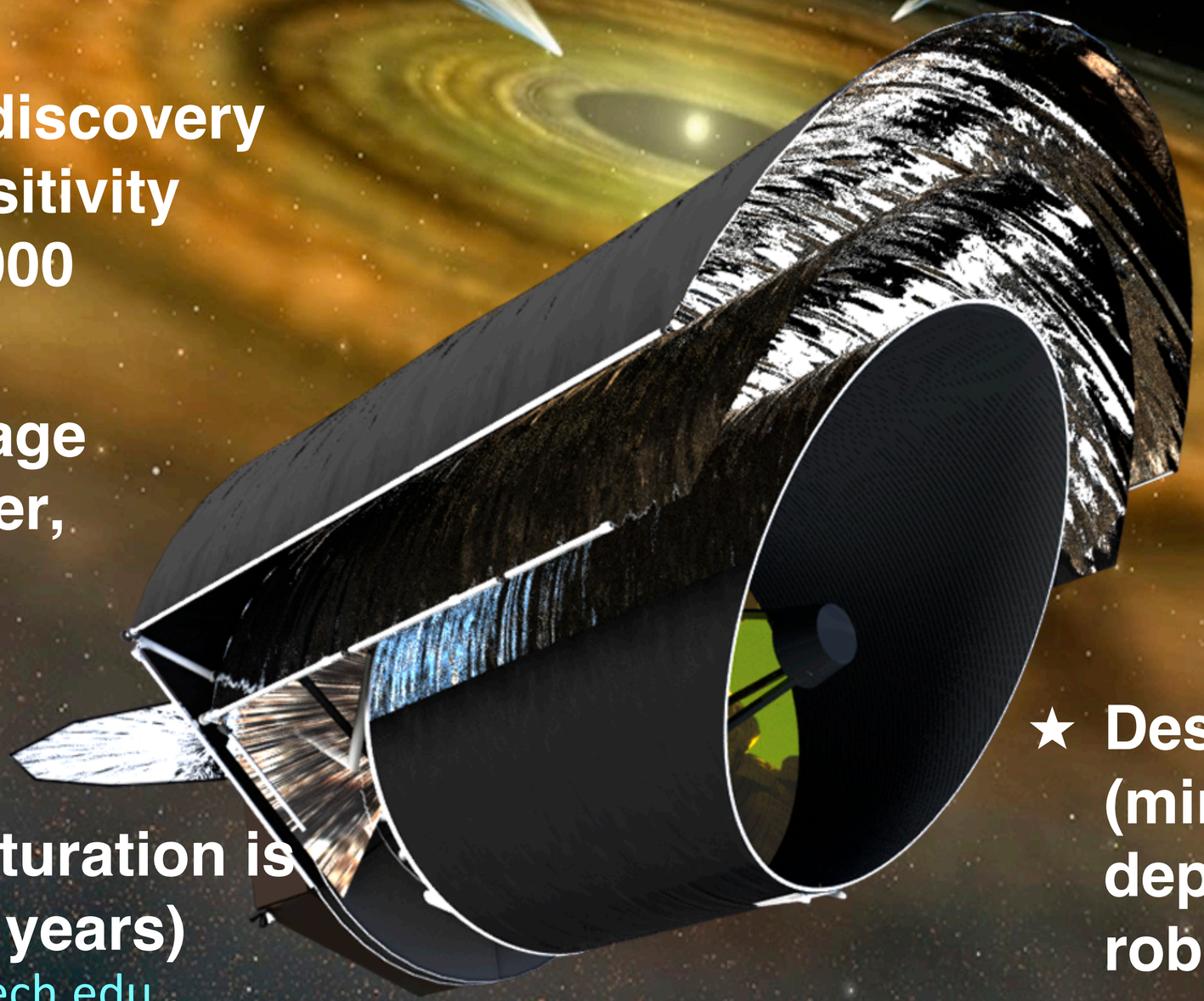
国際的な科学史上の超大型旗艦ミッション(US Decadal Mission)への参加
[e.g., Origins 5BUSD]

コミュニティへの参加：サイエンス遂行

国際的な責務分担：チーム活動
プロジェクトの細部の情報共有
技術力の成熟化、人材育成
(小型ミッションとの戦略的な役割分担を組み上げることが鍵)

Origins;
- STDT活動に2016年5月から2019年8月まで参加
- 最終検討報告書に記載されたベースライン装置の１つMISCの検討をJAXAが担当
- MISCに採用される超高安定分光装置は阪大で開発された瞳分割分光を採用
- US2020Decadal Surveyに向けて2019年8月に公開した最終検討報告書を分担執筆
- 2020年度末にDecadal Reportが出る予定

Now is the time to discover our ORIGINS



- ★ Vast scientific discovery space with sensitivity increase by x1000
- ★ Builds on technical heritage of JWST, Spitzer, and Herschel
- ★ Technology maturation is achievable (3-4 years)
- ★ Design is low-risk (minimal deployments) and robust

https://origins.ipac.caltech.edu
https://asd.gsfc.nasa.gov/firs/