Maunakea Spectroscopic Explorer

The Maunakea Spectroscopic Explorer:

Conceptual design and recent updates

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mse.cfht.hawaii.edu

Maunakea Spectroscopic Explorer

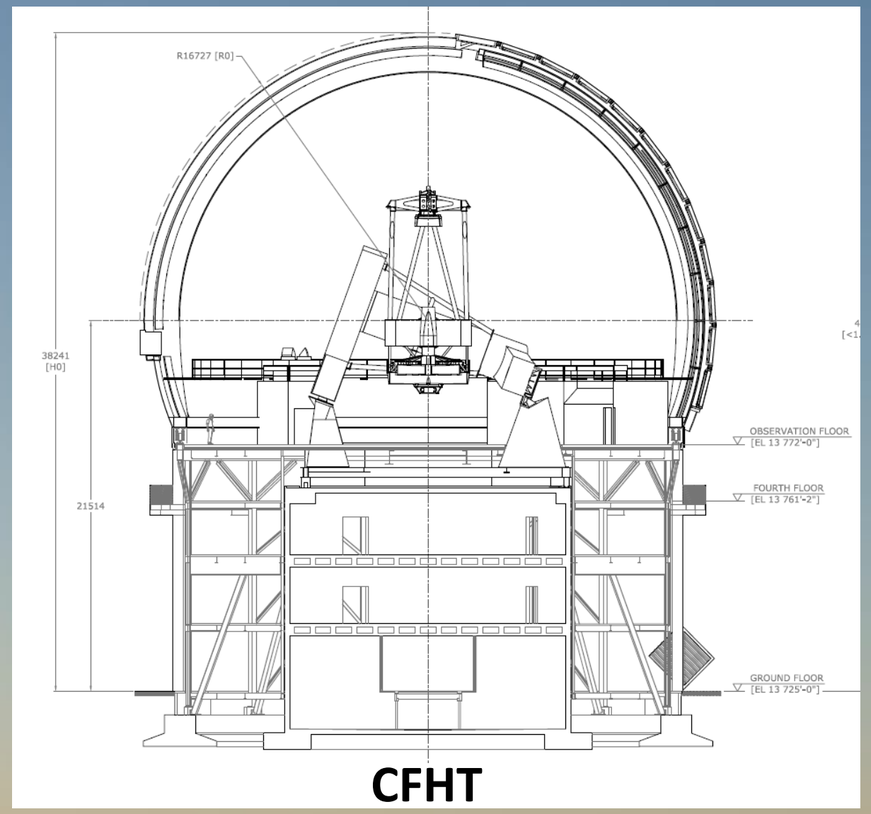
Facility transformation


CFHT

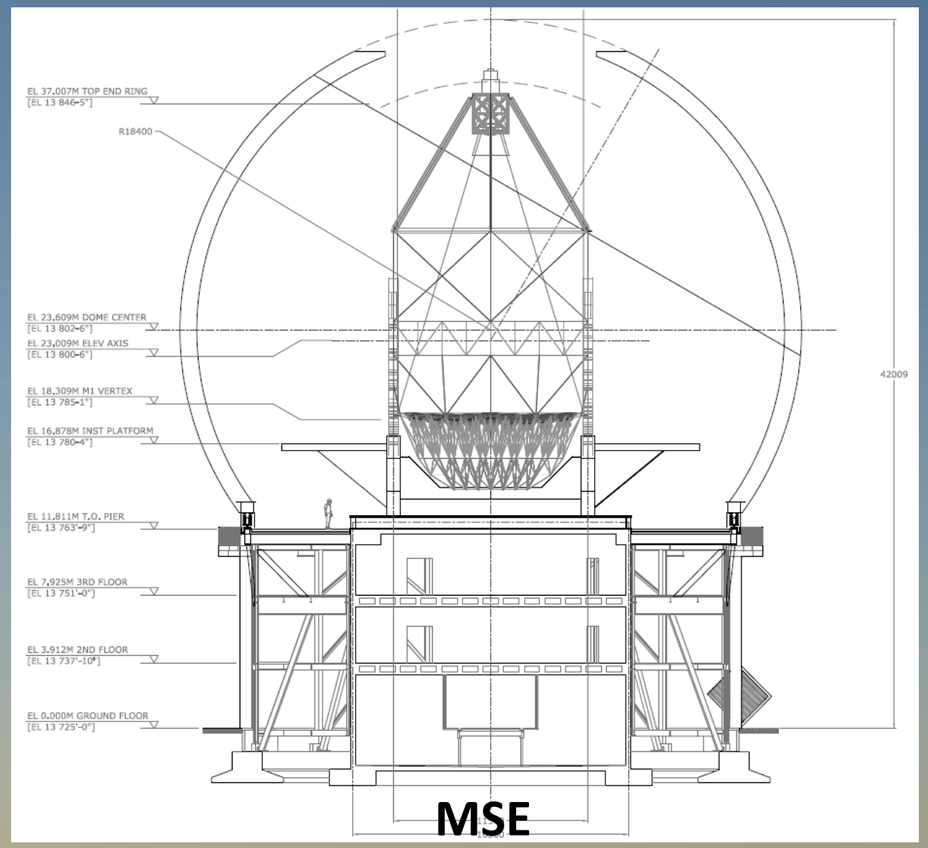
- Canada-France-Hawaii Telescope has a 40 year history of scientific and outreach leadership on Maunakea
- Out of environmental and cultural respect, a strong desire to preserve the external appearance of CFHT after MSE completion
  - MSE will reuse the CFHT summit building without additional ground disturbances
  - Limiting size increase of the new facility building and enclosure to 10%

Maunakea Spectroscopic Explorer

Facility transformation



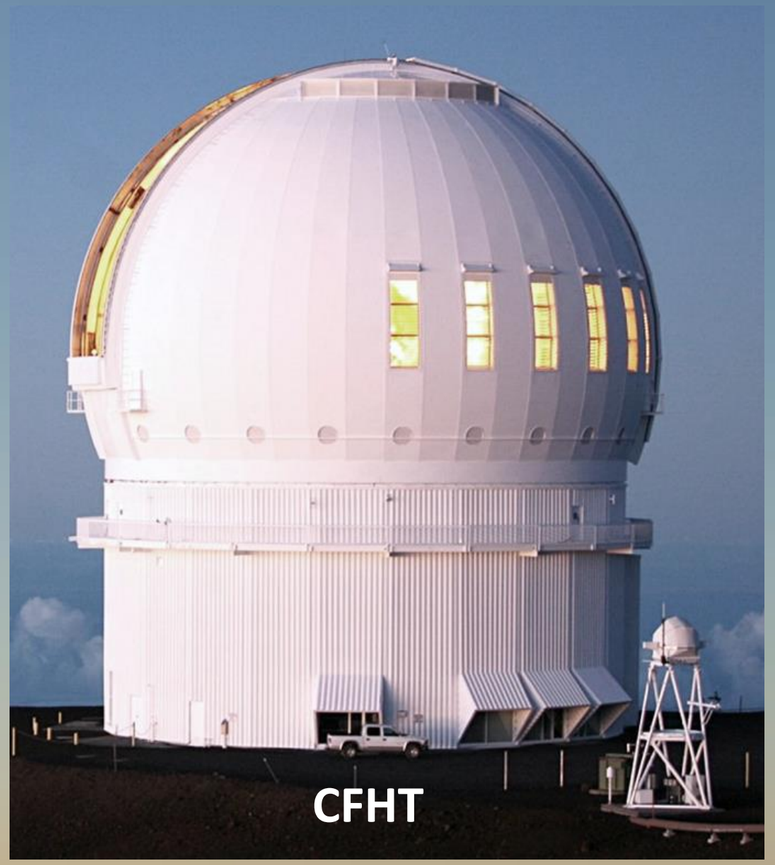
CFHT



MSE

Maunakea Spectroscopic Explorer

Facility transformation

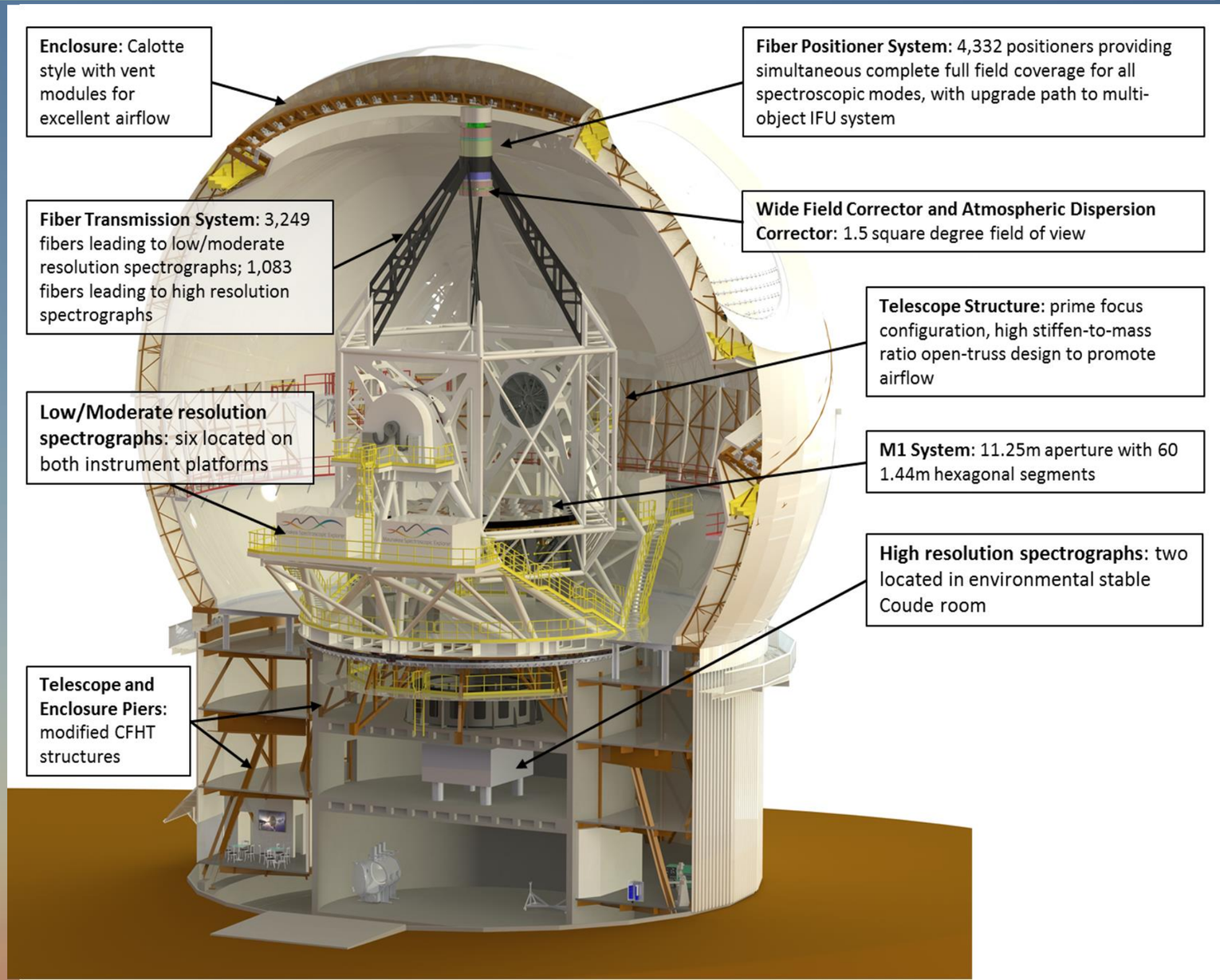


Maunakea Spectroscopic Explorer

MSE Conceptual Design 2018

- 11.25m diameter telescope
- 1.5 square degree field of view
- 4,332 fiber positioner feeds two sets of spectrographs
  - Low/moderate resolution:
    - R=λ/Δλ~3,000 or R~6,000
    - UV to H band
    - 3249 fibers
  - High resolution:
    - R~30,000
    - 3 optical wavelength windows
    - 1083 fibers

Completely dedicated survey facility



Maunakea Spectroscopic Explorer

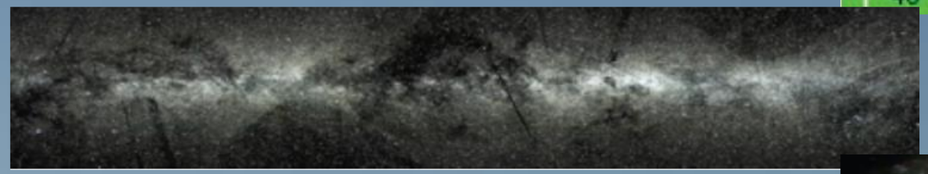
Science Working Groups

Exoplanets and stellar astrophysics

Maria Bergemann, MPIA Heidelberg; Daniel Huber, UH

Chemical nucleosynthesis

Charli Sakari, San Francisco State; Ricardo Schiavon, Liverpool JMU

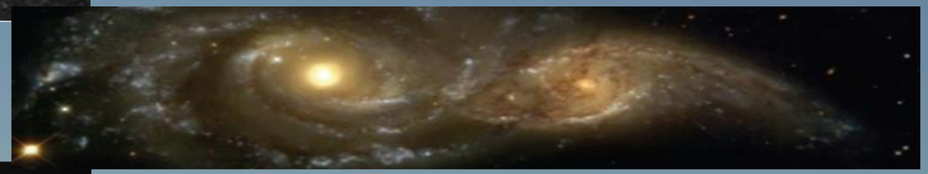


Milky Way and resolved stellar populations

Sarah Martell, UNSW; Xiaoting Fu, Kavli IAA at Peking University

Galaxy formation and evolution

Sean McGee, University of Birmingham; Aaron Robotham, UWA

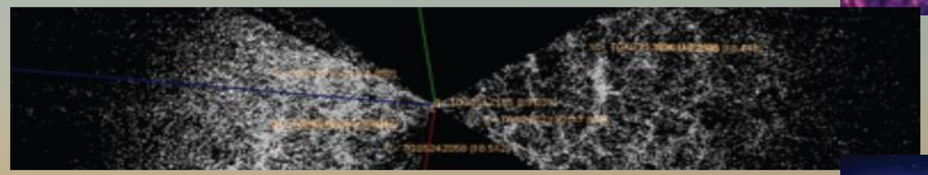


AGN and supermassive black holes

Yue Shen, University of Illinois; Manda Banerji, IfA Cambridge

Astrophysical tests of dark matter

Ting Li, Carnegie Observatories; Manoj Kaplinghat, UC Irvine



Cosmology

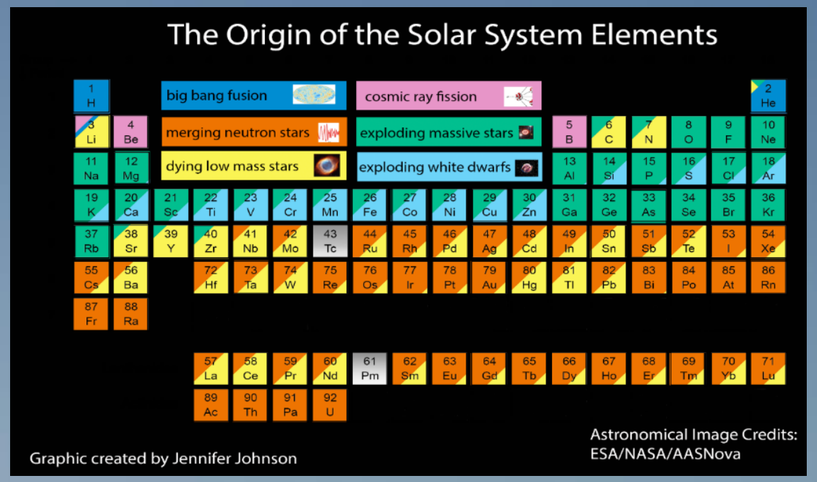
Will Percival, University of Waterloo; Christophe Yeche, CEA

Time domain astronomy and transients

Suvi Gezari, STScI; Chien-Hsiu Lee, NOAO/NOIRLab

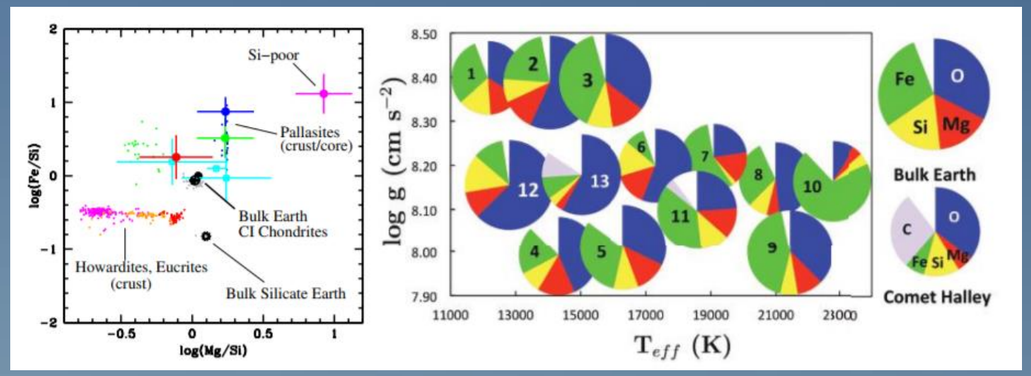
Maunakea Spectroscopic Explorer

Massive scientific capabilities



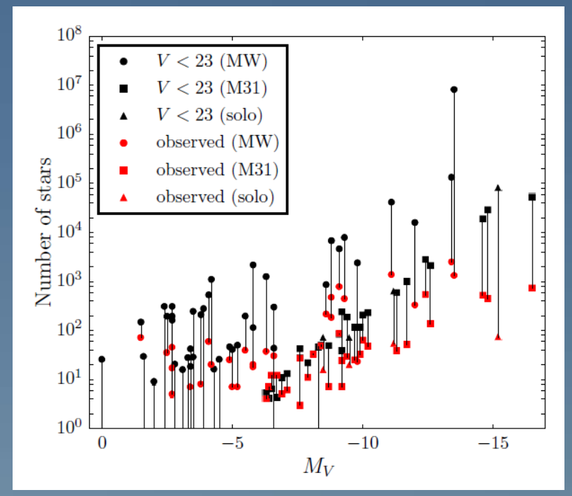
Origin of the elements

Chemical Nucleosynthesis: Yong, Thirupathi, et al.



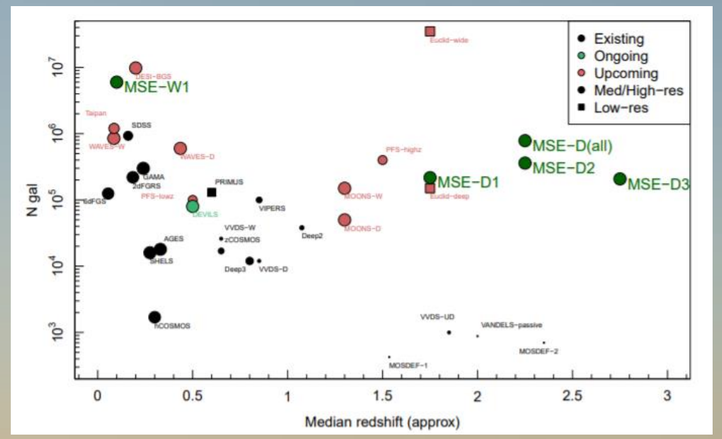
Exoplanet composition

Stars and Exoplanets: Bergemann, Huber, et al.



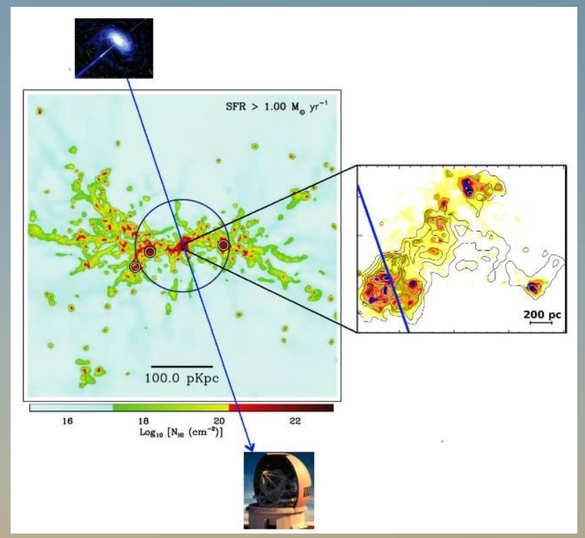
Hundreds of UFD galaxies

Dark matter: Li, Kaplinghat, et al.



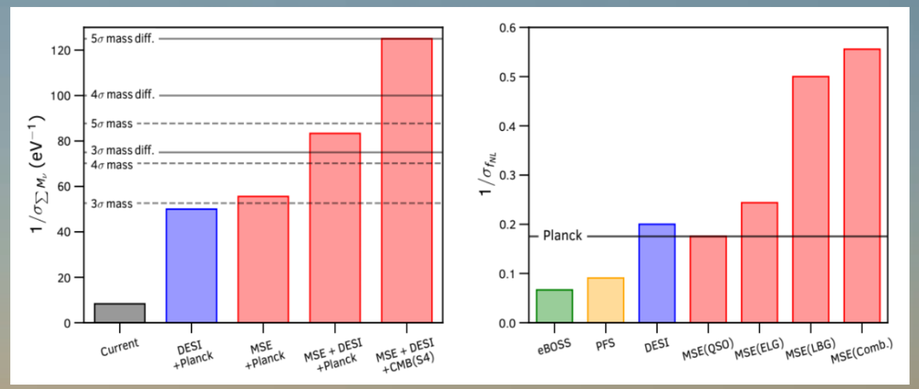
Extragalactic surveys

Galaxy formation/evolution: Tran, Robotham, et al.



Quasar absorption spectroscopy

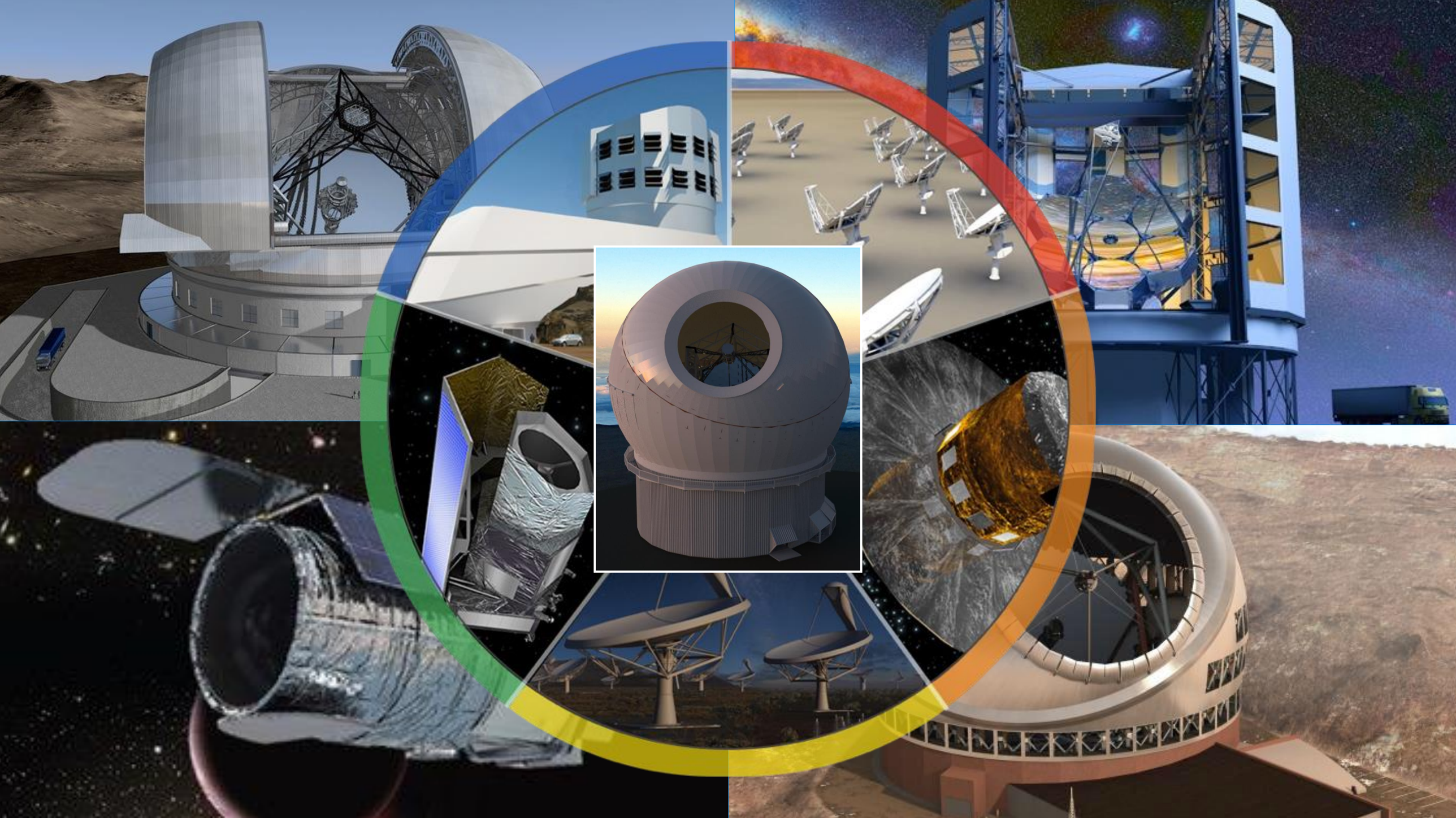
AGN and SMBHs: Shen, Ellison, et al.



Non-Gaussianity and the neutrino mass

Cosmology: Yeche, Percival, et al.

MSE Detailed Science Case MSE Science Team 2019; arXiv: 1904.04907

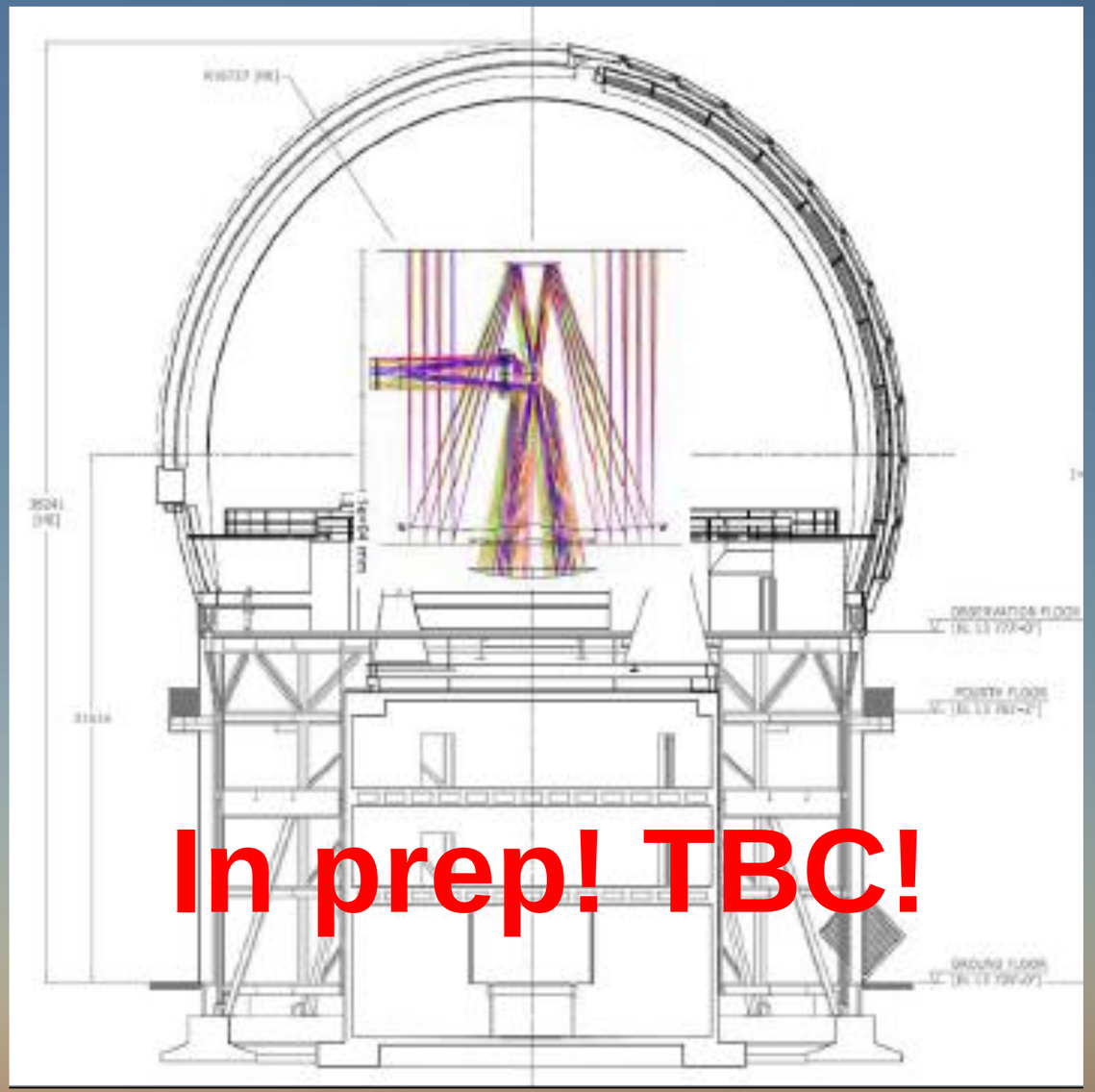


Maunakea Spectroscopic Explorer

MSE's new Quad Mirror concept

- ~~11.25m~~ **14m** diameter telescope
- 1.5 square degree field of view
- ~~4,332~~ **~21,000** fiber positioner feeds two sets of spectrographs
  - Low/moderate resolution:
    - R=λ/Δλ~3,000 or R~6,000
    - UV to ~~H~~ **K** band
    - **~5x 3249** fibers
  - High resolution:
    - R~30,000
    - 3 optical wavelength windows
    - **~5x 1083** fibers

- Nasmyth mounting allows shorter fibers, therefore higher sensitivity
- Fold mirror could enable adaptive optics
- ~~Completely dedicated survey facility~~ New design enables instrument changes
- Also, recent spectrograph design updates (regardless of telescope design)



Credit: Sam Barden, MSE Systems Engineer

Red font=significant update to design

Maunakea Spectroscopic Explorer

About the MSE Project

The mission of the Maunakea Spectroscopic Explorer Project is to realize a dedicated facility that enables a diverse suite of large-scale spectroscopic surveys of millions of astrophysical objects at a range of wavelengths, spectral resolutions, redshifts, and spatial scales.

The MSE Project is hosted by the Canada-France-Hawaii Telescope Corporation, and supported by contributing organizations in Canada, France, Hawaii, Australia, China, India, South Korea, Texas, the UK, and the US. The MSE collaboration recognizes the cultural importance of the Maunakea summit to a broad cross-section of the Native Hawaiian community, and is committed to equity, diversity and inclusion.

Statements of MSE's mission, cultural respect, and equity, diversity and inclusion are available on https://mse.cfht.hawaii.edu.

Maunakea Spectroscopic Explorer

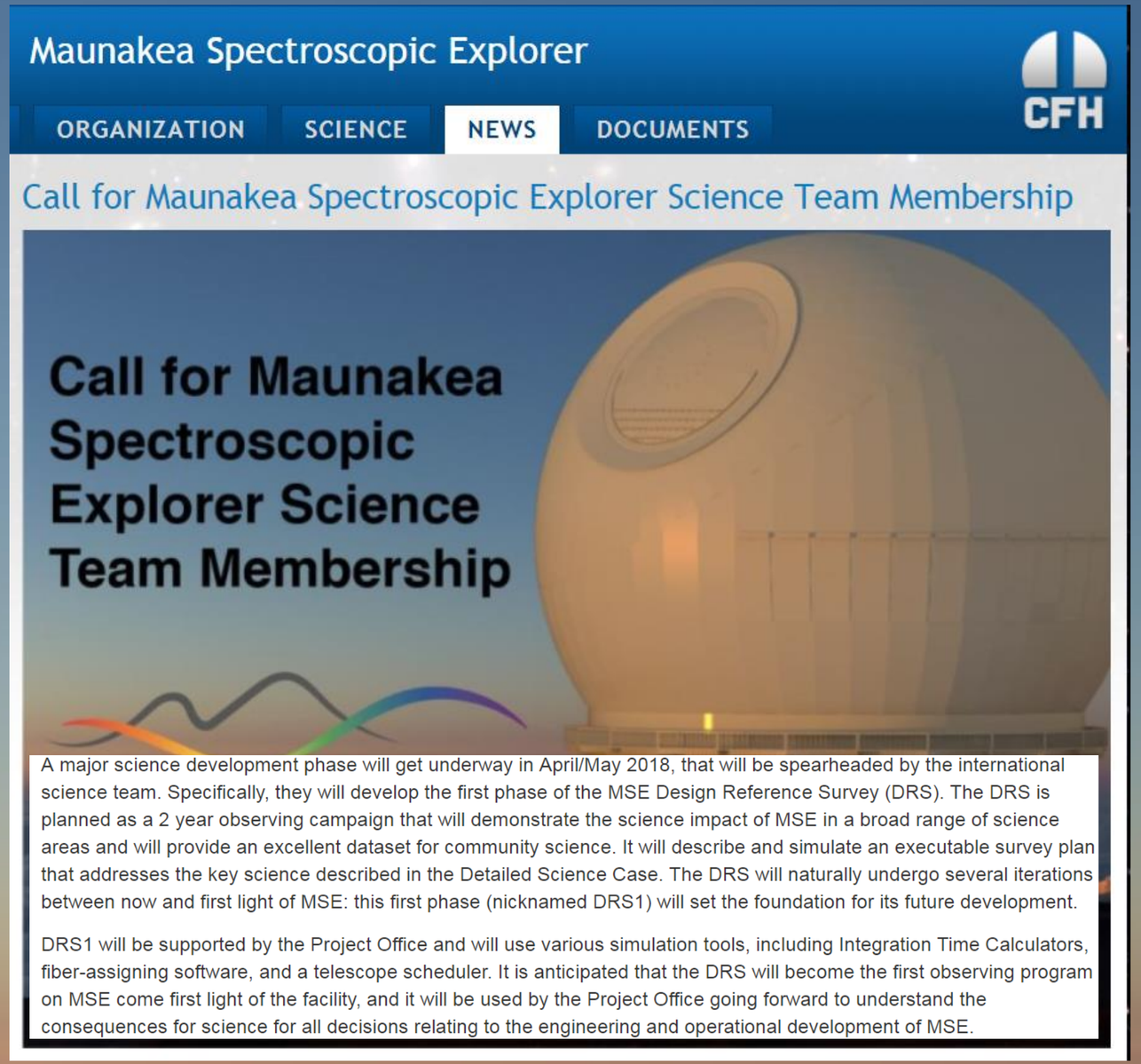
Join the Science Team!

Send an email to:

mseinfo@mse.cfht.hawaii.edu

or

marshall@mse.cfht.hawaii.edu



Maunakea Spectroscopic Explorer

Timeline to Science Operations

Science Commissioning will begin in 2032

- Based on a technically paced schedule with no constraints on resources and cash flow

The project timeline is organized in four major overlapping phases with three milestones:

- Preliminary Design Phase - 2 yrs
- Construction Phase - 6.5 yrs duration
- System-Level Assembly, Integration and Verification (AIV) Phase - 5.5 yrs
- Science Commissioning - 2 yrs