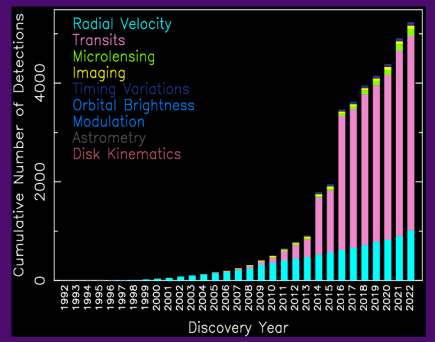
Updates from the NASA Exoplanet Science Institute (NExScI)

David R. Ciardi
NExScI Chief Scientist
On Behalf of the NExScI Team
ExoPAG-29 06 Jan 2024

Sagan Program & Community Support

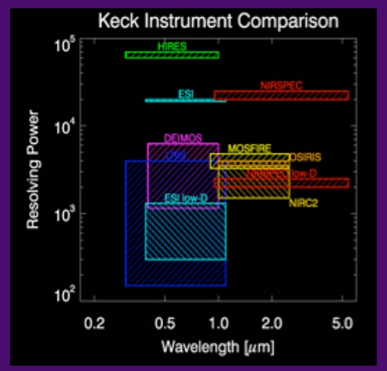
NHFP
NASA Hubble Fellowship Program

Exoplanet Archive and ExoFOP

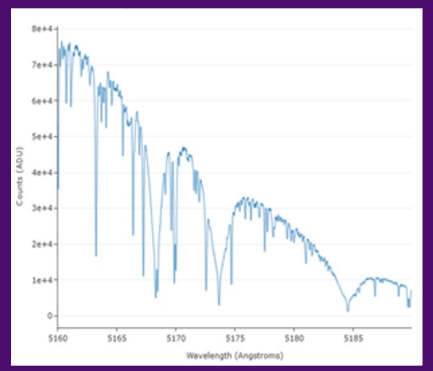


Long Term Archives

Keck Operations and Archive (KOA)



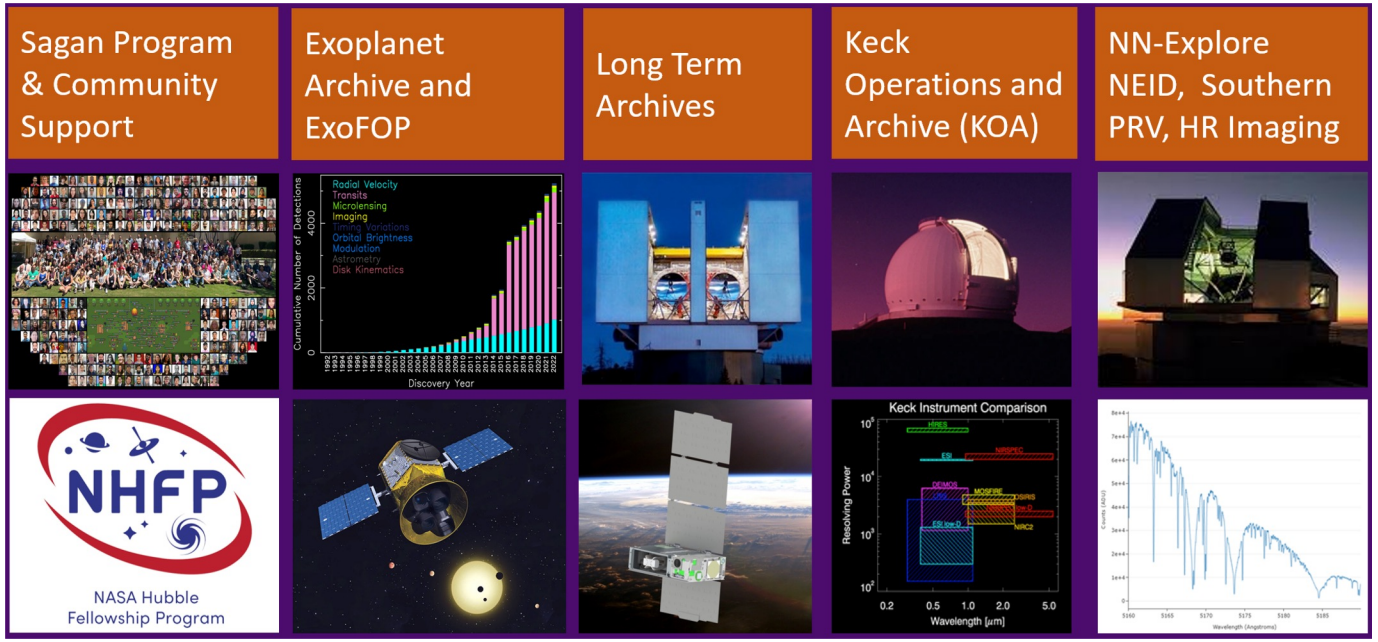
NN-Explore NEID, Southern PRV, HR Imaging



NExScI
ipac
ExEP
NASA EXOPLANET EXPLORATION PROGRAM
JPL
Caltech
NASA

NExScI: NASA's ExEP Science Center

- Support the scientific community in their use of NASA missions to explore questions about the formation and evolution of planetary systems
- NExScI is the community-focused science center of NASA's Exoplanet Program
- Located on Caltech campus as part of IPAC



Fully Hybrid Sagan Summer Workshop

Sagan Program & Community Support

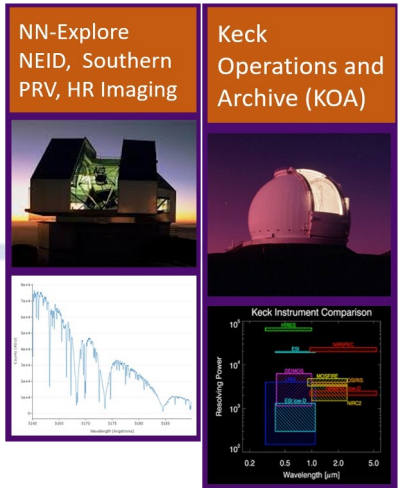
NHFP
NASA Hubble Fellowship Program

Advances in Direct Imaging: From Young Jupiters to Habitable Earths

- 2024 July 22 – 26
- Scientific motivation, hardware and software fundamentals emphasizing advances in high contrast imaging of exoplanets
- On Caltech Campus and Zoom
- Hands-on data and software exercises
- Attendee posters and pops
- In-person and virtual “lunch” with the speakers

- Registration opens mid-February 2024
- https://nexsci.caltech.edu/workshop/2024/

Community Observing Resources



Community access to observing resources for exoplanets and more

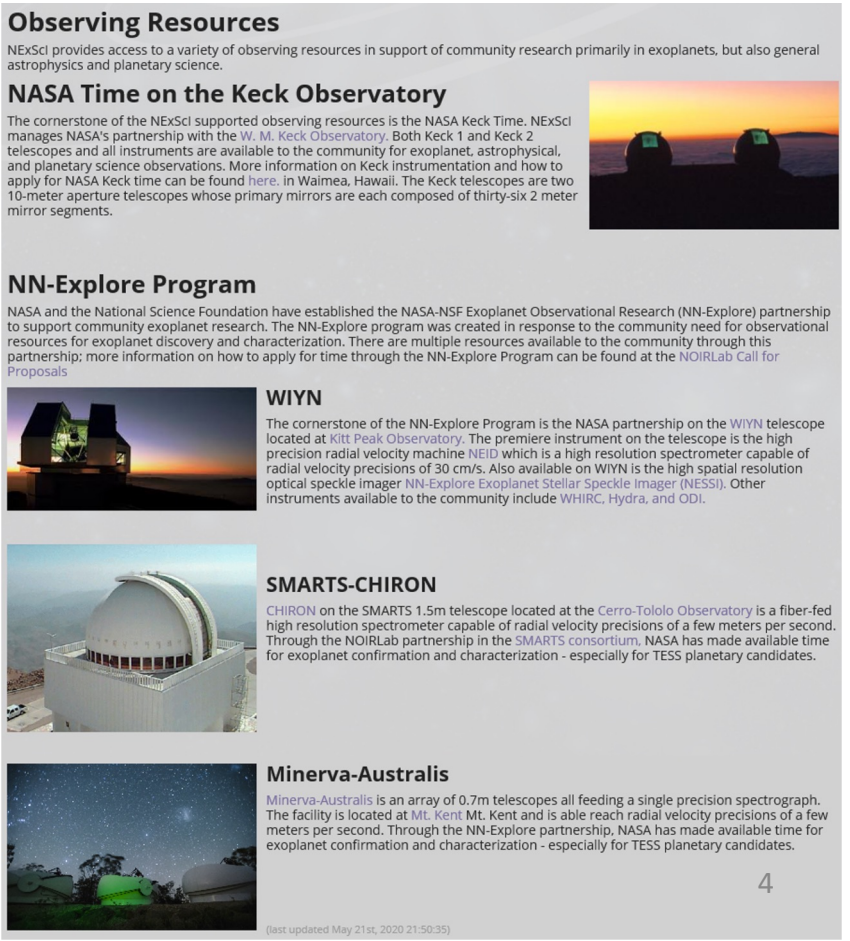
Keck

- Supports strategic programs from all areas of astrophysics and solar system
- All instruments, both telescopes

NN-Explore

- WIYN
  - NEID (PRV and daily solar data); https://neid.ipac.caltech.edu/
  - NESSI (HRI); WHIRC (NIR imaging/time series); HYRDRA (MOS)
- Southern Hemisphere PRV
  - *[SMARTS-CHIRON (stellar spectra, ~10 m/s)]*
  - Minerva-Australis (4x0.7m; ~10 m/s)
- Gemini-North/South
  - ‘Alopeke (North) and Zorro (South)
  - High resolution imaging speckle cameras

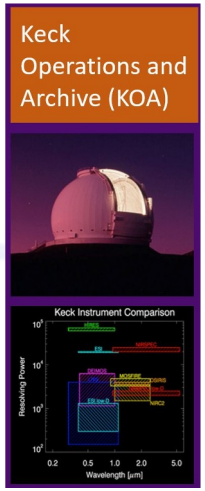
https://nexsci.caltech.edu/tools/obs_res.shtml



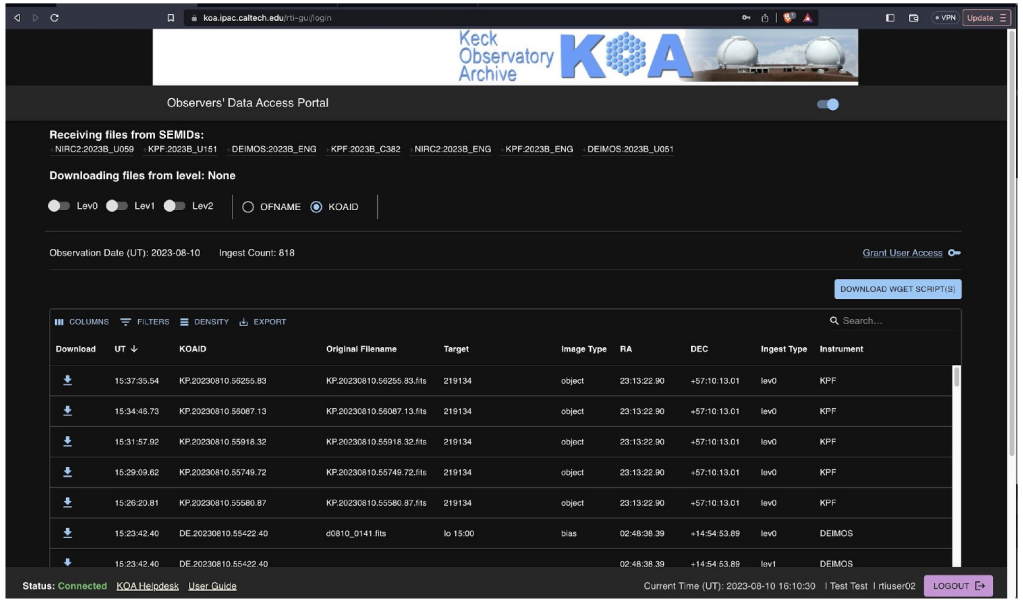
NASA Keck Time

- 2024B Proposals Due to NExScI March 14
  - Supports all astrophysics and planetary science
  - 2024A GO oversubscription rate: ~4.7:1
  - 5 Keck Strategic Mission Support programs selected
  - KPF available for community proposals
  - DAPR compliant evaluations
  - https://nexsci.caltech.edu/missions/KSA/
- Joint JWST-NASA Keck Proposal Opportunity in Cycle 3
  - Up to 10-15 nights could be allocated by JWST TAC (2024B and 2025A)
  - Data from both observatories are required to meet the science goals
  - https://nexsci.caltech.edu/missions/KeckSolicitation/jwst-keck.shtml

Keck Observatory Archive (KOA)



- Raw data ingested in near real time (usually within 1 minute of acquisition) for all instruments including KPF, KCWI/KCRM and NIRC2 upgrade
- Quick look reduced data ingested for 6 instruments, and science grade reduced data for three instruments.
- Guider images now ingested for all active instruments.
- Web-based Observers Data Access Portal (ODAP) enables observers to manage data while observing is in active use.
- New tool will notify NASA users 6 weeks before their period of exclusive access expires so that they can request an extension, subject to approval by the NASA Selection Official
- User Group met on December 6.

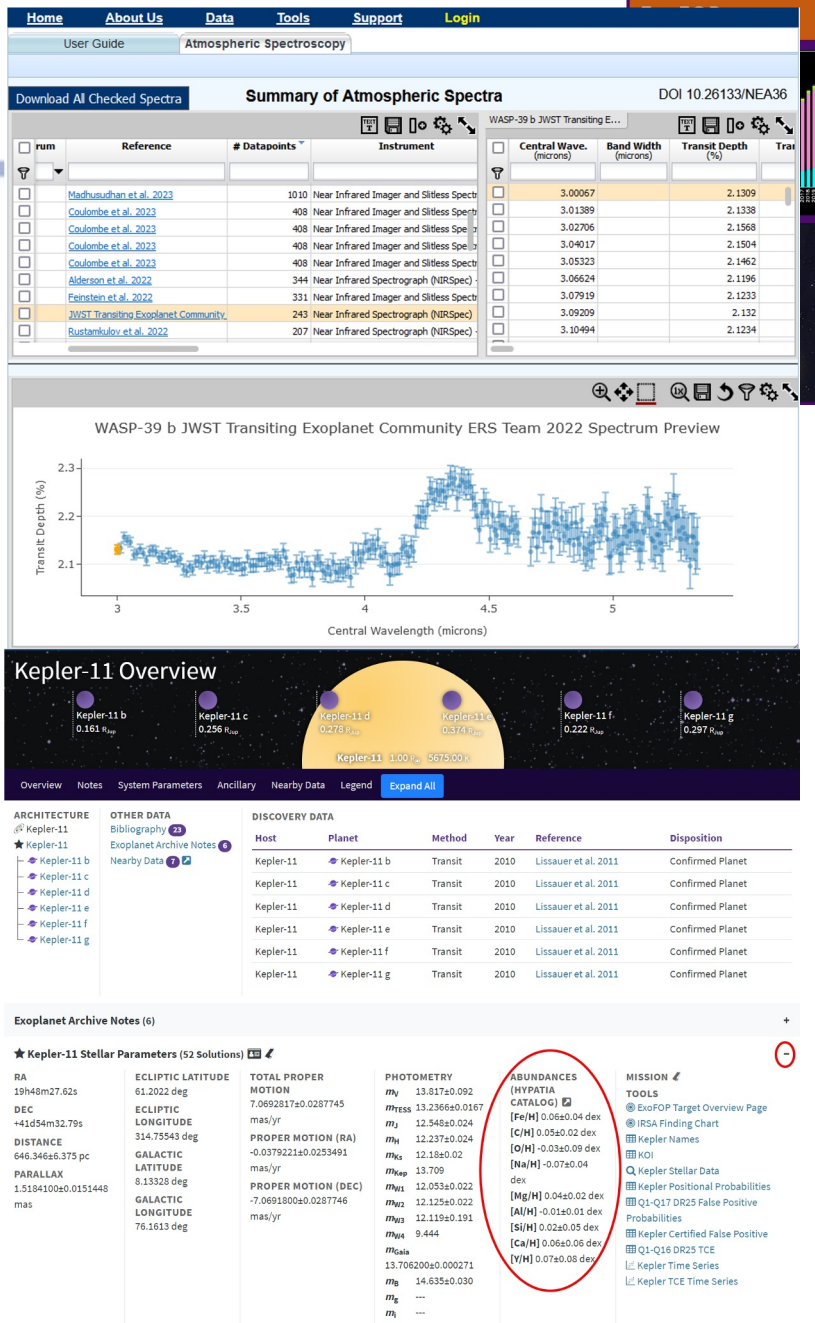


https://koa.ipac.caltech.edu

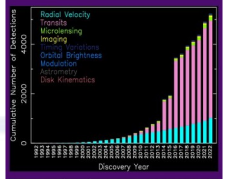
NASA Exoplanet Archive

- 5566 Exoplanets
  - 331 new planets in 2023
  - 1407 planetary solutions added or updated in 2022
- Atmospheric Spectroscopy Table & Visualizer
- System Overviews Include Hypatia Abundances
- Transiting Planets Table
- ExEP Habitable Worlds Observatory Precursor Target List
- New Contributed Datasets
  - Microlensing Observations in Astrophysics (MOA) microlensing survey – 2.4 million light curves
  - 20pc Census – every object within 20pc
  - INARA Synthetic Spectra – 3.1 million rocky worlds spectra

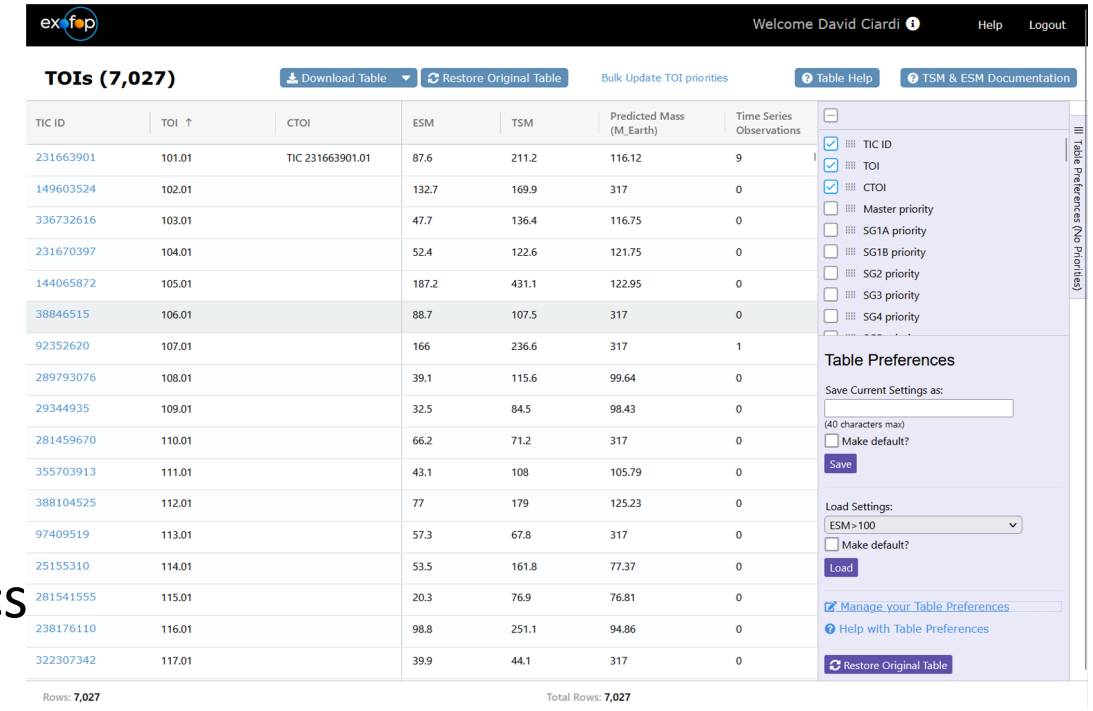
https://exoplanetarchive.ipac.caltech.edu



ExoFOP



- Enables sharing of observations, data, and information on exoplanets and their host stars for all (~2 billion) stars in the TESS Input Catalog
- TESS Candidates: 7027 TOIs, 3280 cTOIs
- Community Uploads
  - 932000 Files
  - 68000 Recorded Observations
  - 31000 Recorded Notes
  - 6900 Recorded Nearby Stellar companions
- Added predicted planetary masses and Transmission/Emission Spectroscopy metrics
- Functionality Coming-Soon
  - Upload Planet Parameters for any target not just transiting planets
  - User Preferences for Customizable (and save-able) table views
  - Mission Target Lists (part of SAG22 response)



https://exofop.ipac.caltech.edu

SAG22 Report: Main Recommendations

- Community-led report on the need for an archive dedicated to the characterization of stars from which the HWO targets be prioritized selected
- SAG report through the ExoPAG and presented as “analysis” to the Exoplanet Program and, by extension, NExScI as the ExEP science center
- (Final Report on SAG22 ? Hinkle talk this afternoon)

SAG22 Report: Main Recommendations

- Need for a centralized repository of curated, detailed stellar and planetary system data for a relatively small collection of nearby FGKM stars.
- Some key stellar information necessary for target selection, prioritization, and/or characterization is poorly constrained, sparse, or non-existent particularly for time-dependent quantities
  - Uniform, good-quality stellar parameters (e.g., radius, mass, teff, lum)
  - Elemental abundances beyond Fe
  - Stellar activity measurements – particularly time-dependent
  - Well quantified uncertainties on all parameters
- Community work needed for new observations and assessment of published and archival data

SAG22 Report: ExEP Response

- NExScI's ExoFOP can be adapted to meet some of the SAG22 recommendations
- *NExScI convened community tiger team working group to prioritize work on ExoFOP in support of SAG22*
  - *23 May 2023*
  - *Panel Members: T. Henry, J. Winters, N. Hinkel, N. Tuchow, K. Cunha, E. Mamajek, J. Burt, Sam Quinn*
- NExScI scientists participating in HWO START and associated working groups to understand needs of HWO, the START and the community

SAG22 Report: Planned ExoFOP Changes

- HWO Target Lists
  - Enable multiple versions (e.g., ExEP's, Tuchow et al.)
  - Improved handling of stellar and planetary parameters
    - Work with START WGs and community
    - Connect to other services (NASA/NOIRLab archives, Hypatia (already connected at Archive, Starchive)
    - Adding user uploads for:
      - Multiple abundances
      - Fluxes/magnitudes
      - Additional activity indicators
      - Exozodical properties
    - Relevant Gaia (DR3/4) properties
- Enable lists for other missions (e.g., EPRV, JWST, Ariel)
- Enable community generated lists
- Improve API access to content to enable community extraction and use of content
- Statistics (min/max/ave) for parameters with multiple values
- Plotting and visualization
- Work currently underway – 2024 releases include
  - Dedicated target lists
  - Ability for community to share multiple abundances, additional fluxes/magnitudes, and additional activity indicators