



Hybrid Space-Ground Observatories: Revolutionizing the Search for Earth-like Exoplanets

**October 20-24, 2025
Overview Schedule**

**Monday, October 20, 2025
Chen 100 Lecture Hall, Chen Neuroscience Research Building - Caltech**

Short Course: Hybrid Space-Ground Observatories: Revolutionizing the Search for Earth-Like Exoplanets

| Time | Event | Speaker |
|--|--|--|
| 8:15 - 8:45 | Coffee and Refreshments | |
| 8:45 - 9:00 | Logistics / Introduction | Harriet Brettle |
| 9:00 - 9:30 | Hybrid Space-Ground Observatories | John Mather NASA Goddard Space Flight Center |
| 9:30 - 10:00 | Exoplanet Science and Discoveries | Sara Seager Massachusetts Institute of |
| 10:00 - 10:30 | Starshade | Stuart Shaklan Jet Propulsion Laboratory |
| 10:30 - 11:00 | Break | |
| 11:00 - 11:30 | Seeing Clearly - Observing Through Earth's Atmosphere | Ahmed Soliman Jet Propulsion Laboratory |
| 11:30 - 12:00 | Extremely Large Telescopes - AO and Extreme AO | Markus Kasper European Southern Observatory |
| 12:00 - 12:30 | Orbital Dynamics | Eliad Peretz NASA Goddard Space Flight Center |
| 12:30 - 1:30 | Short Course Ends: Informal Lunch is provided Chen Breezeway | |
| Invitation-Only Study Program Begins Keck Center - Think Tank, Room 155 | | |
| 1:30 - 1:45 | Walk to Keck Center, pick up badge and welcome packet, find seat in the Think Tank | |
| 1:45 - 2:30 | Study Program Logistics and Introduction to KISS | Harriet Brettle |
| 2:30 - 3:00 | Participant Introductions | Harriet Brettle |
| 3:00 - 3:30 | Study vision and goals for the study program | Team Leads |
| 3:30 - 4:00 | Break | |
| 4:00 - 5:00 | Finalize study vision and goals via plenary discussion | Team Leads |
| 5:00 - 5:30 | Ongoing Work - NIAC Study Briefing x 3 | John Mather, Eliad Peretz, Christine Gregg, Jonathan Sauder, Shannon Brown |
| 5:30 - 6:00 | Pack up and walk to dinner | All |
| 6:00 | Group Dinner at local Pasadena Restaurant | |

Tuesday, October 21, 2025 - Keck Center - Think Tank, Room 155:

| Time | Event | Speaker |
|---------------|--|-----------------------------------|
| 8:00 - 8:30 | Institute Opens - FREE THINK TIME | |
| 8:30 - 9:00 | Coffee and Refreshments at Keck Center | |
| 9:00 - 9:15 | Logistics and Team Lead Goals for the Day | Harriet Brettle and Team Leads |
| 9:15 - 10:00 | Plenary Discussion - think outside the box! | Guest speaker - Joel Sercel |
| 10:00 - 10:30 | Lightning Talks (<i>Precursor Engineering</i>) 1- Inflatable Structures 2- JPL-Stanford long-standing efforts on Starshade | Jon Arenberg Manan Arya |
| 10:30 - 11:00 | Break | |
| 11:00 - 11:15 | Introduction to Breakout Groups and Topics | Harriet Brettle |
| 11:15 - 12:30 | Breakout Session 1: Breakout Group 1A - Science Goals and Concerns (and in context to other missions Breakout Group 1B - Technical goals and risks Breakout Group 1C - Programmatic avenues and concerns (O'meara, Mather) | Groups |
| 12:30 - 2:00 | Group Picture and Lunch at Athenaeum | |
| 2:00 - 2:45 | Report outs from breakout groups (10 mins each) | Groups |
| 2:45 - 3:15 | Lightning Talks (<i>Precursor missions</i>) 1- Landolt 2- Orbits | Peter Plavchan William Sanchez |
| 3:15 - 3:30 | Plenary Discussion and Q&A | All |
| 3:30 - 4:00 | Break | |
| 4:00 - 5:30 | Breakout Session 2: Breakout Group 2A - Science specs for hybrid observatories, habitable orbits, observable exoearths, exoplanets characterization, ..etc Breakout Group 2B - Building and launching a 100 m starshade: on-orbit build, inflatable, and Overall feasibility Breakout Group 2C - Design Reference Mission (fuel, sequence, targets); On-orbit servicing; Breakout Group 2D - Observation through Earth Atmosphere, AO atmospheric turbulence with a starshade; other hybrid combinations, combining coronagraphs and starshades | Groups |
| 5:30 - 7:30 | POSTER-ish SESSION and Informal dinner at the Keck Center (dinner starts at 6:30 pm) | |

| Wednesday, October 22, 2025 - Keck Center - Think Tank, Room 155 | | |
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| 8:00 - 8:30 | Institute Opens - FREE THINK TIME | |
| 8:30 - 9:00 | Coffee and Refreshments at Keck Center | |
| 9:00 - 9:15 | Logistics and Team Lead Goals for the Day | Harriet Brettle and Team Leads |
| 9:15 - 10:00 | Report Outs from Breakout Groups (10 mins each) | Groups |
| 10:00 - 11:00 | Plenary Session - Approaches to Address Engineering and Scientific Challenges in Implementing Hybrid Observatories | Team Leads |
| 11:00 - 11:30 | Break | |
| 11:30 - 12:00 | Lightning Talks (<i>Precursor science</i>) | Rhonda Morgan Dimitri Mawet Dmitry Savransky |
| 12:00 - 12:15 | Group Pulse: "Where we are at" & "What are we missing" | All |
| 12:15 - 12:30 | Selection of Breakout Groups | |
| 12:30 - 2:00 | Lunch at the Keck Center | |
| 2:00 - 3:30 | Breakout Session 3: Breakout Group 3A - Precursor Science: finding and characterizing targets Breakout Group 3B - Precursor Engineering: what precedes HOEE Starshade and AO Breakout Group 3C - Preparing capabilities at ground-based telescopes | Groups |
| 3:30 - 3:45 | Quick Break | |
| 3:45 - 4:15 | Plenary Session - Workshop Findings and Report outline Review of ideas and next steps Importance of Illustrations - KISS Gallery | All |
| 4:15 - 4:30 | Pack up and move to Lecture | All |
| 4:30 - 5:00 | Lecture Reception (Chen Breezeway) | All |
| 5:00 - 6:00 | Guest Lecture - Revolutionizing Astrophysics: How Space and Ground Telescopes Can Work Together (Chen 100 Lecture Hall) | John Mather |
| 6:00 - 7:30 | Dinner on your own | |

| Thursday, October 23, 2025 - Keck Center - Think Tank, Room 155 | | |
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| 8:00 - 8:30 | Institute Opens - FREE THINK TIME | |
| 8:30 - 9:00 | Coffee and Refreshments at Keck Center | |
| 9:00 - 9:15 | Logistics and Team Lead Goals for the Day | Harriet Brettle and Team Leads |
| 9:15 - 9:45 | Report outs from breakout groups (10 mins each) | All |
| 9:45 - 10:30 | Plenary Group Discussion: Path Forward for Collaboration, Discussion on future projects | Speaker by Team leads (Given the taken notes during the study week and pre-workshop activities) |
| 10:30 - 11:00 | Break | |
| 11:00 - 11:30 | KISS Outputs - Final Report and Stakeholders | Harriet Brettle |
| 11:30 - 12:30 | Breakout Groups - Report Drafting | All |
| 12:30 - 2:00 | Lunch on your own | |
| 2:00 - 2:30 | FREE THINK TIME (individual, or self organizing small groups) | All |
| 2:30 - 3:15 | Report outs from breakout groups (15 mins each) | Groups |
| 3:15 - 3:30 | Plenary Discussion, Selection of Breakout Groups | All |
| 3:30 - 4:00 | Break | |
| 4:00 - 5:30 | Break Out Session 4: 4A: State-of-the-art large deployables 4B: Advocacy for HOEE incl. international collaboration 4C: Testing a 100 m starshade (incl. facilities) | Groups |
| 5:30 - 6:00 | Walk over to the Athenaeum | All |
| 6:00 | Closing Dinner at the Athenaeum | |

Friday, October 24, 2025 - Keck Center - Think Tank, Room 155

| Time | Event | Speaker |
|---------------|--|--------------------------------|
| 8:00 - 8:30 | Institute Opens - FREE THINK TIME | |
| 8:30 - 9:00 | Coffee and Refreshments at Keck Center | |
| 9:00 - 9:15 | Logistics and Team Lead Goals for the Day | Harriet Brettle and Team Leads |
| 9:15 - 10:00 | Breakout Groups Report Out | All |
| 10:00 - 10:30 | Open Discussion of Breakout Group Recommendations and Path Forward | All |
| 10:30 - 11:00 | Break | |
| 11:00 - 12:30 | Open Discussion of Final Report and Path Forward | All |
| 12:30 - 2:00 | Lunch | |
| 2:00 - 4:30 | Informal Workshop Small Group - Report Drafting Time | All |
| 4:30 - 5:00 | Workshop Closeout | Harriet Brettle |
| 5:00 | Institute Closes | |