

# Keck Institute for Space Studies

## List of Study Programs

### **2020 - 2021 Programs:**

1. [COVID-19: Identifying Unique Opportunities for Earth System Science](#)
2. [Next Generation Planetary Geodesy](#)
3. [The Next-Generation Ground-Based Planetary Radar](#)
4. [Venus In-Situ Sample Capture Mission](#)
5. [Revolutionizing Access to the Martian Surface](#)
6. [Non-Nuclear Exploration of the Solar System](#)
7. [Real Time Detection and Tracking of Fires that Matter](#)

### **2019 Programs:**

1. [Beyond Interstellar: Extracting Science from Black Hole Images](#)
2. [Nebulae: Deep-Space Computing Clouds](#)
3. [Sensing Forest Water Dynamics from Space: Towards Predicting the Earth System Response to Droughts](#)
4. [Data-Driven Approaches to Searches for the Technosignatures of Advanced Civilizations](#)
5. [Caltech Space Challenge \(Student-Led Program, Co-Sponsored\)](#)

### **2018 Programs:**

1. [MarsX: Mars Subsurface Exploration](#)
2. [Unlocking a New Era in Biodiversity Science: Linking Integrated Space Based and In-Situ Observations](#)
3. [Tidal Heating – Lessons from Io and the Jovian System](#)
4. [Large Constellations and Formations for Exploring Interstellar Objects and Long-Period Comets](#)

## **2017 Programs:**

1. [Accessing the Subsurface Oceans of Icy Worlds](#)
2. [Cryogenic Comet Sample Return – Compelling New Science vs. Technological Challenges](#)
3. [Designing Future CMB Experiments](#)
4. [Next-Generation Approach for Detecting Climate-Carbon Feedbacks: Space-Based Integration of Carbonyl Sulfide \(OCS\), CO<sub>2</sub>, and SIF](#)
5. [The Architecture of LISA Science Analysis: Imagining the Future](#)
6. [Unlocking the Climate Record Stored within Mars' Polar Layered Deposits](#)
7. [Caltech Space Challenge 2017 \(Student-Led Program\)](#)

## **2016 Programs:**

1. [Addressing the Mars ISRU Challenge: Production of Oxygen and Fuel from CO<sub>2</sub> Using Sunlight](#)
2. [Exoplanet Imaging and Characterization: Coherent Differential Imaging and Signal Detection Statistics](#)
3. [Optical Communication on SmallSats – Enabling the Next-Era in Space Science](#)
4. [Space Science Opportunities Augmented by Exploration Telepresence](#)

## **2015 Programs:**

1. [Don't Follow \(Just\) the Water: Does Life Occur in Non-Aqueous Media?](#)
2. [Exploring New Multi-Instrument Approaches to Observing Terrestrial Ecosystems and the Carbon Cycle From Space](#)
3. [Methane on Mars](#)
4. [Optical Frequency Combs for Space Applications](#)
5. [Three Dimensional \(3D\) Additive Construction for Space using In-Situ Resources](#)
6. [Caltech Space Challenge 2015 \(Student-Led Program\)](#)

## **2014 Programs:**

1. [Adaptive Multi-Functional Space Structures for Micro-Climate Control](#)
2. [Bridging the Gap: Observations and Theory of Star Formation Meet on Large and Small Scales](#)
3. [Gazing at the Solar System: Capturing the Evolution of Dunes, Faults, Volcanoes and Ice from Space](#)
4. [Mapping and Assaying the Near Earth Object Population Affordably on a Decadal Timescale](#)
5. [Science and Enabling Technologies to Explore the Interstellar Medium](#)
6. [Venus Seismology](#)

## **2013 Programs:**

1. [Airships: A New Horizon for Science](#)
2. [Inferring Thermal and Mechanical Properties of Celestial Bodies Regolith Using \(Simple\) Low-T](#)
3. [New Approaches to Lunar Ice Detection and Mapping](#)
4. [Planetary Magnetic Fields: Planetary Interiors and Habitability](#)
5. [Satellites to the Seafloor: Autonomous Science to Forge a Breakthrough in Quantifying the Global Ocean Carbon Budget](#)
6. [The Sleeping Giant: Measuring Ocean Ice Interactions in Antarctica](#)
7. [Caltech Space Challenge 2013 \(Student-Led Program\)](#)

## **2012 Programs:**

1. [CMB Polarization Cosmology in the Coming Decade](#)
2. [Engineering Resilient Space Systems](#)
3. [In Situ Science and Instrumentation for Primitive Bodies](#)
4. [New Methods to Measure Photosynthesis from Space](#)
5. [Quantum Communication, Sensing and Measurement in Space](#)
6. [Small Satellites: A Revolution in Space Science](#)
7. [Tools and Algorithms for Sampling in Extreme Terrain \(Student-Led Program\)](#)

## **2011 Programs:**

1. [Asteroid Return Mission Study](#)
2. [Digging Deeper: Algorithms for Computationally-Limited Searches in Astronomy](#)
3. [High Altitude Ballooning for Space and Atmospheric Observation \(Student-Led Program\)](#)
4. [Monitoring of Geoengineering Effects and their Natural and Anthropogenic Analogues](#)
5. [Next Generation UV Instrument Technologies Enabling Missions in Astrophysics, Cosmology and Planetary Sciences](#)
6. [xTerramechanics - Integrated Simulation of Planetary Surface Missions](#)
7. [Caltech Space Challenge 2011 \(Student-Led Program\)](#)

## **2010 Programs:**

1. [Future Missions to Titan: Scientific and Engineering Challenges](#)
2. [Innovative Approaches to Planetary Seismology](#)
3. [Innovative Satellite Observations to Characterize the Cloudy Boundary Layer](#)
4. [Quantifying the Sources and Sinks of Atmospheric CO<sub>2</sub>](#)
5. [The First Billion Years](#)

## **2009 Programs:**

1. [Climate Feedbacks and Future Remote Sensing Observations](#)
2. [Innovative Approaches to Exoplanet Spectra](#)
3. [Innovative Concepts in IR/Submm Astronomy from Space](#)
4. [Mission Concepts for Accessing and Sampling High-Risk Terrains on Planetary Surfaces](#)
5. [Monitoring Earth Surface Changes from Space](#)
6. [Shedding Light on the Nature of Dark Matter](#)
7. [Single Photon Counting Detectors](#)

## **2008 Programs:**

1. [Coherent Arrays for Astronomy and Remote Sensing](#)
2. [Large Space Structures](#)
3. [New Directions in Robotic Exploration of Mars](#)