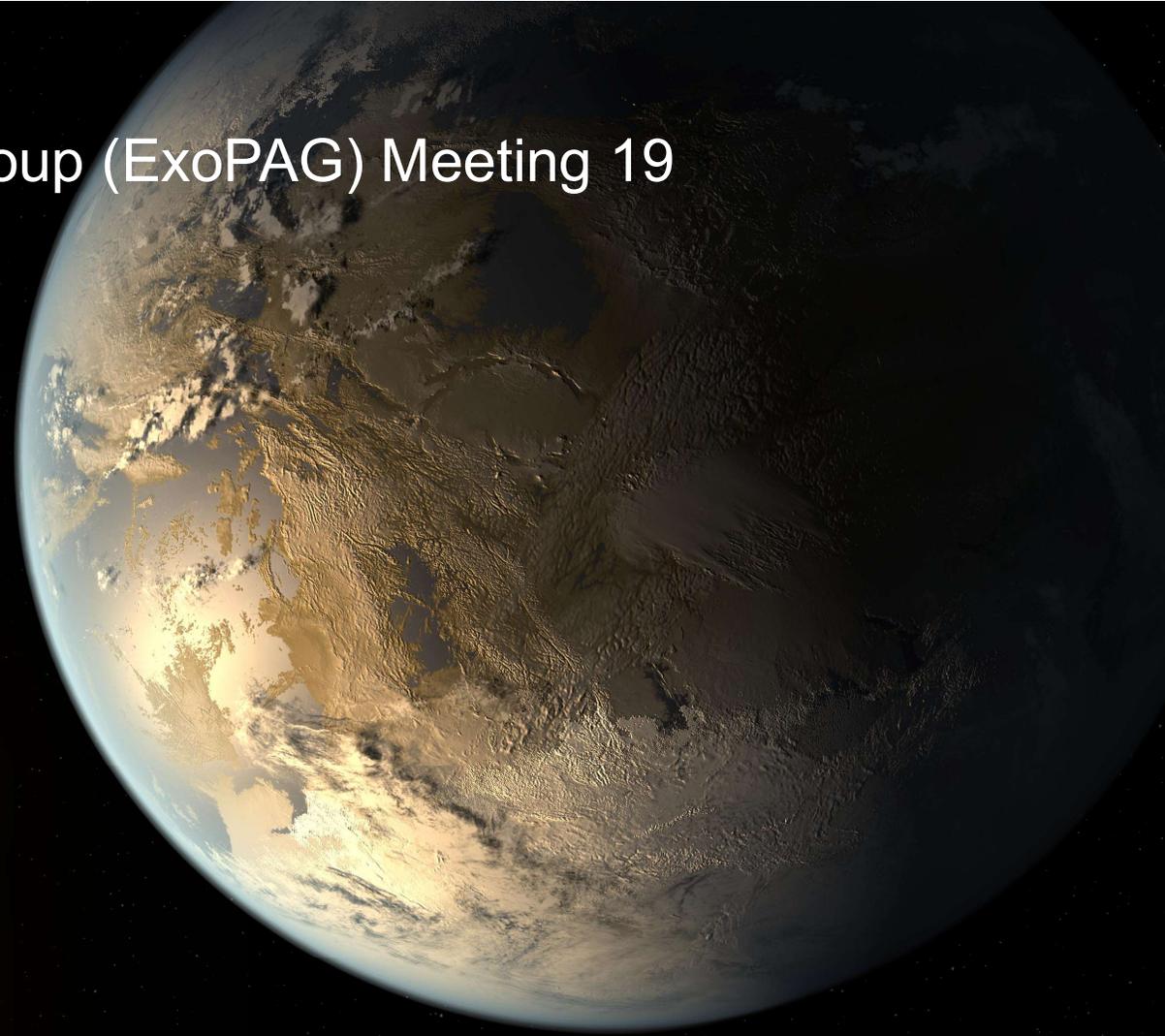


Exoplanet Program Analysis Group (ExoPAG) Meeting 19
Seattle, WA, January 5-6, 2019
Welcome.

Victoria Meadows (UW, ExoPAG Chair)



Credit: NASA

The Exoplanet Program Analysis Group

- ExoPAG

- ExoPAG EC

- APAC

- NASA APD

- ExEP

- NExSci

- ExoTAC

The ExoPAG:

- Serves as a community-based group for soliciting and coordinating community analysis and input for Exoplanet Exploration objectives
- Provides findings of analyses to the NASA Astrophysics Division Director, that are also made publicly available to the community.
- Enables direct regular communication between NASA and the community, and within the community, through open meetings, e-mail announcements and other mechanisms.
- Helps coordinate the community in providing input for Astro2020.
- Organizes and runs Study Analysis Groups and Science Interest Groups

Gary will be finishing these topics in the next talk!

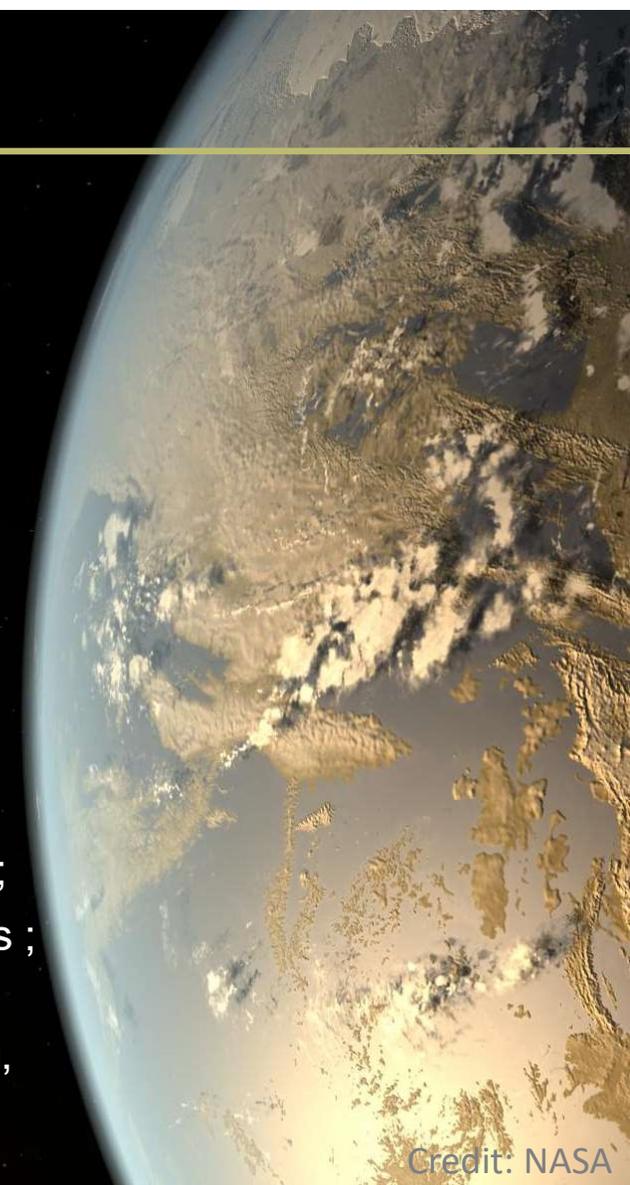
There are many opportunities for input

Via ExoPAG you can provide community input into the Exoplanet Exploration Program and NASA regarding exoplanet exploration.

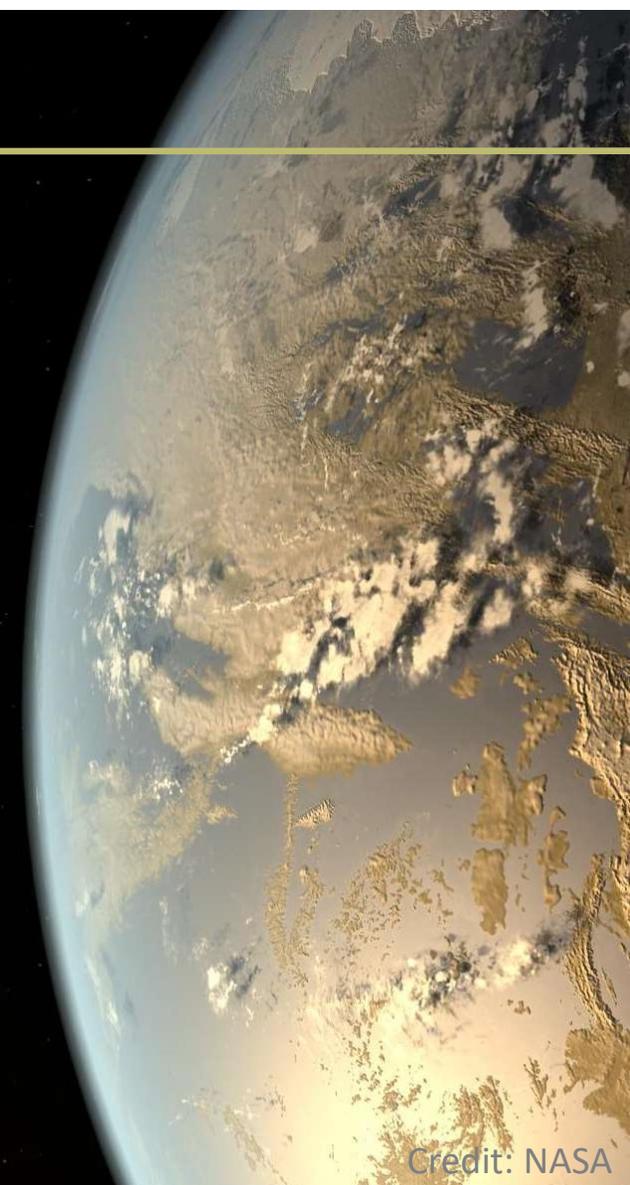
Particular areas and activities include:

1. Articulating and prioritizing the key scientific drivers for Exoplanet Exploration research
2. Evaluating the expected capabilities of potential ExEP missions for achieving the science goals of the Program
3. Evaluating ExEP goals, objectives, investigations and required measurements on the basis of the widest possible community outreach;
4. Articulating and prioritizing focus areas for needed mission technologies ; and
5. Providing findings on related activities such as ground-based observing, theory and modeling programs, laboratory astrophysics, suborbital investigations, data archiving and community engagement.

Credit: NASA



This is your ExoPAG



The full ExoPAG consists of *all members of the community who participate in ExoPAG activities*

You, the community are the members of ExoPAG.

If you want to contribute, there are several mechanisms to do this:

- Participate in our meetings
 - And you are doing this...thank you!
- Science Interest Groups (SIGs)
 - Open ended discussions on topics of interest to the community
- Study Analysis Groups (SAGs)
 - Focused, short-term activity

Any community member can lead a SIG or SAG! Pick a topic, generate your own idea, contact the ExoPAG EC.

Join the ExoPAG announcements list at :
<https://exoplanets.nasa.gov/exep/exopag/>

Credit: NASA

ExoPAG Executive Committee

ExoPAG activities and meetings are organized through an Executive Committee

- ExoPAG
 - Victoria Meadows (Chair) University of Washington
 - Tom Barclay Goddard Space Flight Center
 - Jessie Christiansen NExSci/Caltech
 - Rebecca Jensen-Clem UC-Berkeley
 - Tiffany Glassman Northrup Grumman Aerospace
 - Eliza Kempton University of Maryland
 - Dimitri Mawet Caltech
 - Michael Meyer University of Michigan
 - Tyler Robinson Northern Arizona University
 - Chris Stark Space Telescope Science Institute
 - Johanna Teske Carnegie DTM
 - Alan Boss (Past Chair) Carnegie Institution of Washington
 - Martin Still (Ex officio) NASA
- APAC
- NASA APD
- ExEP
- NExSci
- ExoTAC

Selected by NASA for 3-year terms. Calls for membership every year!

Deadline for receipt of nominations for this year is January 18, 2019.

Credit: NASA

2018 Status of ExoPAG SAGs and SIGs

| Year | SAG or SIG | Title | Lead |
|------|------------|--|----------------------|
| 2018 | SAG 16 | Exoplanet Biosignatures (closed) | Domagal-Goldman |
| 2018 | SAG 17 | Community Resources Needed for K2 and TESS Planetary Candidate Confirmation (closed) | Ciardi & Pepper |
| -- | SAG 19 | Exoplanet imaging signal detection theory and rigorous contrast metrics (active - closeout expected in 2019) | Mawet & Jensen-Clem |
| -- | SIG 2 | Exoplanet Demographics (Initiated) | Christiansen & Meyer |
| -- | SAG 20 | Impact of JWST Delay on Exoplanet Science (Initiated) | Teske & Deming |

- Closeout of SAG16 (Biosignatures) and SAG 17 (K2/TESS Follow-up)
- Initiation of SIG2 on Exoplanet Demographics
- Initiation of SAG 20 on the Community Impact of the JWST Delay
- SAG reports are publicly available on the ExoPAG website.
- Previous SAG leads were encouraged to summarize final reports as 5-page white papers.
- SAG Reports for SAGs 10, 11 and 15 summarized and submitted to the NAS Exoplanets Committee. SAG 16 publications summarized and submitted to the NAS Astrobiology Committee.

ExoPAG Activities 2018

- Held ExoPAG17 meeting at AAS in National Harbor, MD, on January 6-7, 2018 (100 attendees)
 - New format with mini-science symposium on JWST transmission.
- Held ExoPAG18 in Boston, July 29th, in conjunction with the Cool Stars 20 conference (160 attendees)
 - Mini-science symposium on M dwarf/planet interactions
 - Showcase for relevant CubeSat missions.
- Planning for this meeting.
- ExoPAG recommendation for student support to ExoPAG meetings adopted. New program initiated and supported by ExEP, with applications for student travel to ExoPAG meetings available on the ExoPAG website. Implemented for ExoPAG18 and 19.
- EC feedback provided on the ExEP draft Science Plan and Science Gap List.



PLANET HOP FROM
TRAPPIST-1
Credit: NASA
VOTED BEST "STUDY ABROAD" DESTINATION

ExoPAG Activities 2018

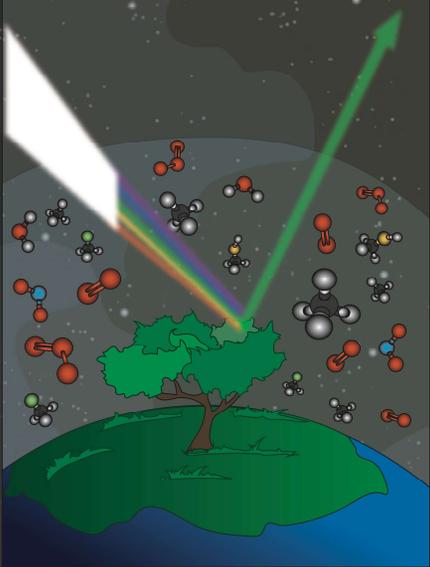
- Led a community letter (co-signed by 55) to the JWST Users Committee (JSTUC), making the case for large multi-cycle legacy proposals to support community-led proposals.
- Hosted spreadsheet for exoplanet community to self-organize on NAS Exoplanets white papers (38 papers listed and almost all requesting community participation).
- Community data challenge for ground-based direct detection for SAG 19
 - Goal is the fair comparison of algorithms for post-processing high-contrast imaging sequences.
- PAG leadership obtained formal guidance that the PAGs may serve their communities by coordinating the writing of white papers and other input for Astro2020.
- Google spreadsheet for community coordination of Astro2020 Decadal White Papers available on the ExoPAG website @ <https://exoplanets.nasa.gov/exep/exopag/2020-decadal-and-large-mission-studies/>
- EC and community participation in the Great Observatories cross-PAG SAG
- Working with Planetary AGs (VExAG, OPAG) to develop joint activities.

Credit: NASA

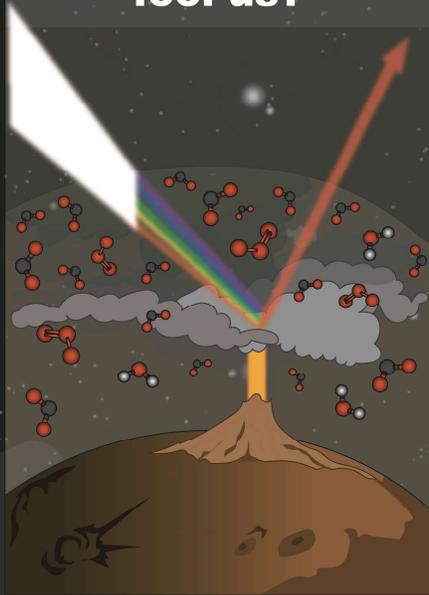
ExoPAG 2018 Activities – SAG 16 Highlight

SAG16 Exoplanet Biosignatures – Led by Domagal-Goldman (GSFC), Kiang (GISS), Parenteau (Ames) – Organized an in-person/virtual workshop in 2016 with extremely broad community participation to address fundamental scientific questions that will enhance the science return from NASA exoplanet characterization missions.

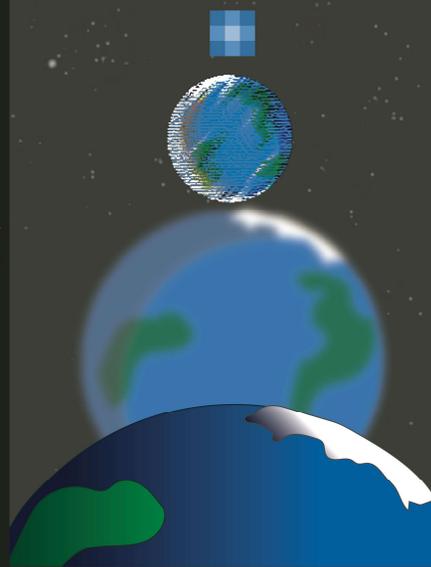
What does life **produce**?



Can a dead planet **fool us**?



How do we interpret **limited data**?



How do we **quantify** our **certainties**?



ExoPAG 2018 Activities – SAG 16 Highlight

- As a direct outcome of the 2016 workshop, six community-led review papers on Exoplanet Biosignatures were published this year in a special issue of *Astrobiology*.
 - Executive Summary (also the SAG16 Report: Kiang et al. 2018)
 - A Review of Remotely Detectable Signs of Life (Schwieterman et al. 2018)
 - Understanding Oxygen as a Biosignature in the Context of Its Environment (Meadows et al. 2018)
 - A Framework for Their Assessment (Catling et al. 2018)
 - Future Directions (Walker et al. 2018)
 - Observational Prospects (Fujii et al. 2018)

Many of the themes developed in these papers were emphasized in the NAS Exoplanets and Astrobiology Strategy Reports.

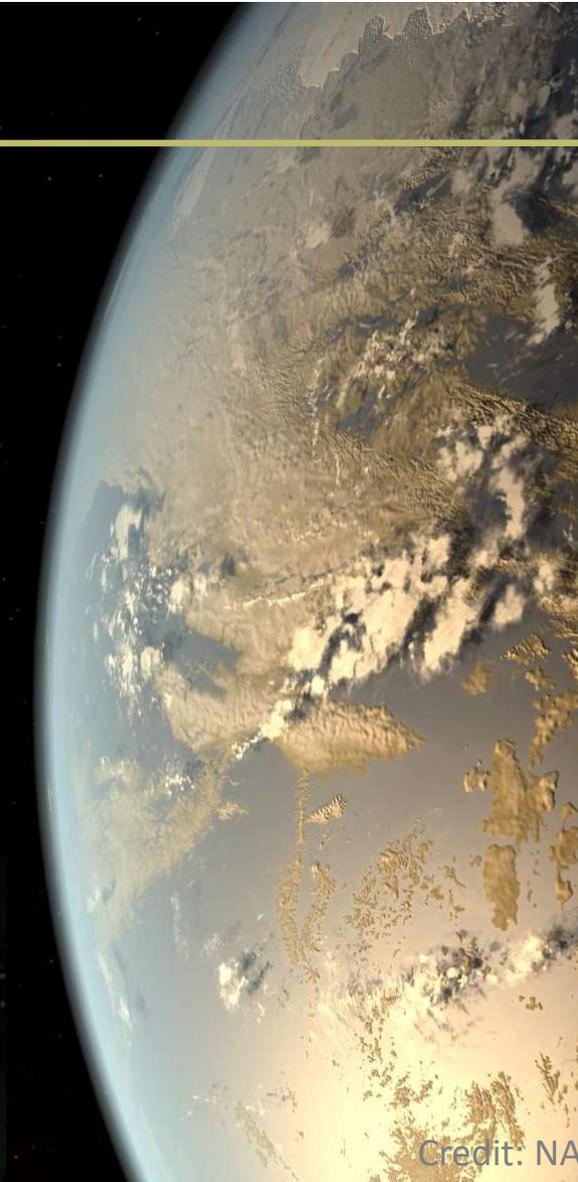
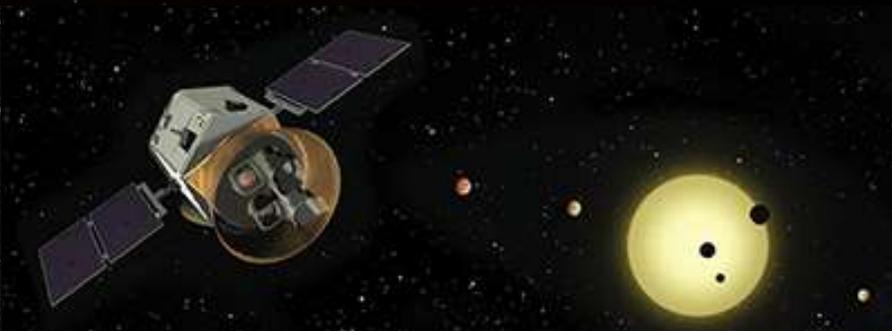
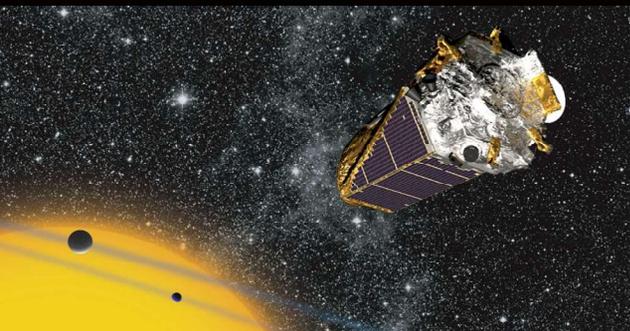
ExoPAG 2018 Activities – SAG 17 Highlight

SAG 17: Community Resources Needed for K2/TESS Planetary Candidate Confirmation (Led by David Ciardi (NExSci/Caltech), Josh Pepper (Lehigh), Knicole Colon (NASA GSFC), Stephen Kane (UC Riverside)).

Goals:

- 1) Identify needed follow-up observations for K2 and TESS
- 2) Identify resources available to the US community
- 3) Identify how archival resources can be utilized
- 4) Identify how the community and resources can be organized.

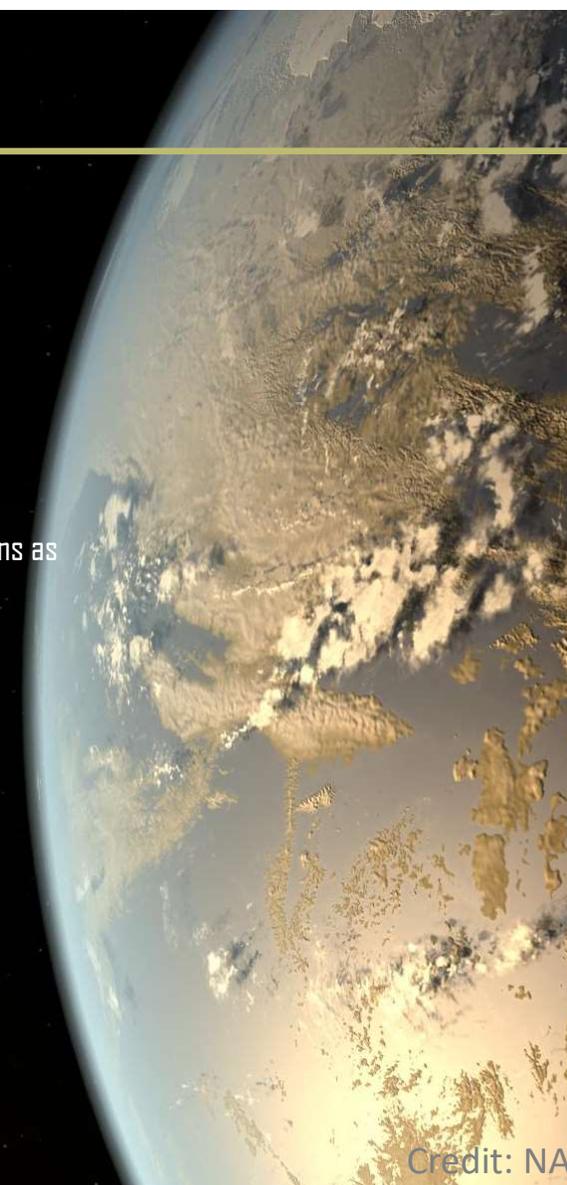
Activity: Telecons and community input at ExoPAG meetings.



Credit: NASA

ExoPAG 2018 Activities – SAG 17 Highlight

- The SAG 17 Final Report is now available on the ExoPAG website.
 - https://exoplanets.nasa.gov/internal_resources/942/
- Main conclusions of the report:
 - Ground-based observations are critical for transit mission success.
 - Without ground-based, mission scientific goals can not be met. The ground-programs are as significant to the missions as the spacecraft themselves.
 - Ground-based telescopes are needed to validate, confirm, and characterize exoplanets.
 - Needed resources include 1-10m class telescopes with wide-field imaging, high angular resolution imaging, moderate-resolution ($R \sim 3000$ or greater) and precision radial velocity spectrographs.
 - Financial resources are needed to support the necessary ground-based follow-up work of students, postdoctoral scholars, and early-career scientists.



Credit: NASA

ExoPAG 19 Agenda

January 5-6, 2019 Washington State Convention Center Room 4C-2

See the ExoPAG website for remote connection info: <https://exoplanets.nasa.gov/exep/events/240/exopag-19/>

Saturday January 5, 2019

| | | | |
|------|------|---|--|
| 1:30 | 0:15 | Welcome and Introduction to ExoPAG | Vikki Meadows |
| 1:45 | 0:10 | NASA Organization Relevant to ExoPAG | Gary Blackwood |
| 1:55 | 0:25 | Exoplanet Exploration Program (ExEP) Updates | Gary Blackwood/Karl Stapelfeldt |
| 2:20 | 0:25 | Technology Update | Nick Siegler and Brendan Crill |
| 2:45 | 0:15 | Exoplanet Communications (ExoComm) Update | Anya Biferno |
| 3:00 | 0:20 | WFIRST CGI report from the SITs | John Debes (remote) |
| 3:20 | 0:20 | Laboratory Astrophysics | Jonathan Fortney (remote) |
| 3:40 | 0:15 | Break | |
| 3:55 | 0:20 | TESS update | George Ricker |
| 4:15 | 0:20 | NExSci and FOP update | David Ciardi |
| 4:35 | 0:20 | NEID update | Paul Robertson |
| 4:55 | 0:25 | SIG and SAG updates -SAG 19 -SAG 20 -SIG 2 | -Becky Jensen-Clem (5min) -Johanna Teske (5min) -Jessie Christiansen (15min) |
| 5:20 | 0:25 | Open Discussion | all |
| 5:45 | | Adjourn | |

| Sunday January 6, 2019 | | | |
|-------------------------------|------|---|-------------------------------|
| 9:00 | 0:05 | Welcome | Vikki Meadows /Tyler Robinson |
| | | <u>Nearby Planetary Systems Mini-Science Symposium</u> | |
| 9:05 | 0:30 | Detecting and Characterizing Exoplanets in Nearby Systems | Ian Crossfield |
| 9:35 | 0:15 | Precision RV for Nearby Planetary Systems | Ryan Blackman |
| 9:50 | 0:15 | Using CHIRON and the CTIO/SMARTS 1.5m for TESS Follow-Up | Leonardo Paredes |
| 10:05 | 0:15 | High Contrast Imaging and Adaptive Optics for Nearby Stars and Planetary Systems | Quinn Konopacky |
| 10:20 | 0:15 | Simulations of a Single-Mode Fiber Integral Field Spectrometer | Carl Coker |
| 10:35 | 0:15 | Break | |
| 10:50 | 0:30 | Modeling Exoplanetary Atmospheres in Nearby Exoplanetary Systems | Emily Rauscher |
| 11:20 | 0:15 | Modeling Super-Earth Atmospheres in Preparation for Upcoming Extremely Large Telescopes | Maggie Thompson |
| 11:35 | 0:15 | RECONS and Gaia Astrometric Discoveries with Considerations for JWST | Eliot Halley Vrijmoet |
| 11:50 | 0:15 | Disks in Nearby Planetary Systems with JWST and ALMA | Meredith MacGregor |
| 12:05 | 0:15 | Detecting Nearby Transiting Exoplanets | Chelsea Huang |
| 12:20 | 1:25 | Lunch | |

| | | | |
|-------|------|--|----------------------|
| 12:20 | 1:25 | Lunch | |
| 13:45 | | <u>Exoplanet Community Inputs to the Decadal Survey</u> | |
| 1:45 | 0:30 | Starshade Rendezvous Probe Mission Study | Andrew Romero-Wolf |
| 2:15 | 0:30 | Earthfinder RV Probe Mission Study | Peter Plavchan |
| 2:45 | 0:10 | Introduction to Decadal Survey White Paper Discussion | Vikki Meadows and EC |
| 2:55 | 0:50 | Open Mic for Short Summary of White Papers in Progress | Audience |
| 3:45 | 0:15 | Wrap up | Vikki Meadows |
| 4:00 | | Adjourn | |

If you have a Decadal White Paper concept you would like to share with your colleagues, you can send a single slide to Jennifer Gregory (jgregory@jpl.nasa.gov) to be shown in the open mic session, or just be prepared to stand up and talk about your idea for a minute!