

SAG 16/NExSS Biosignatures Workshop Update

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SAG 16/NExSS Biosigs Science Organizing Committee

SAG 16 Goals

- To assess the current state of the field with respect to the detection of life on exoplanets.
- Note there is a focus on life detection (not habitability assessment) and a focus on exoplanets (not Mars nor icy worlds).
- The end-goal is to review the biosignatures currently in the literature, come up with a consensus for biosignature assessment, and a framework for the consideration of future biosignatures.

Methods/Schedule

- We are breaking this activity into three parts, centered around a workshop that will be held July 27-29:
 1. Pre-workshop meetings that will review the existing suite of exoplanet biosignatures.
 2. A workshop-without-walls, open to the community, in which we discuss biosignature frameworks and how to assess exoplanet biosignatures.
 3. Post-workshop activities in which we will draft, edit, and obtain community feedback on our report(s).

Pre-Workshop Meetings Topics

- These will be designed to review the existing literature
- We will host meetings on three topics:
 1. A review of DesMarais et al., 2002.
This is a great review of the “standard” thinking on biosignatures.
 2. The work done on novel biosignatures since 2002.
This includes both new signatures and the new considerations we need to make for those signatures (*e.g.*, false positives).
 3. The changes since 2002 on detection techniques and missions (HabEx/LUVOIR/FIRS(?)/ELTs vs. TPF-C/TPF-I/Darwin).
- Main product from pre-workshop meetings will be a table of biosignatures with their properties (observables, sources, false positives, contextual information, etc.)

Pre-Workshop Meeting Logistics

- To facilitate global attendance, we will host two meetings on each of the above topics – Mondays at 1 PM ET and Thursdays at 7 PM ET.
- NOTE: Don't feel pressured to attend all six! Try to attend one of each.
- We will archive these meetings, so if you miss them you can view afterwards.
- These will be held online via Adobe Connect and a telecon line.
- Adobe Connect can be loaded at:
<https://ac.arc.nasa.gov/www-exoplanetbiosignatures/>

Sun	Monday	Tuesday	Wednesday	Thursday	Friday	Sat
JUNE						
12	13 Meeting 1-A 1700-1800 UTC	14	15	16 Meeting 1-B 2300-2400 UTC	17	18
19	20	21	22	23	24	25
26	27 Meeting 2-A 1700-1800 UTC	28	29	30 Meeting 2-B 2200-2300 UTC	July 1	2
JULY						
3	4	5	6	7	8	9
10	11 Meeting 3-A 1700-1800 UTC	12	13	14 Meeting 3-B 2300-2400 UTC	15	16
17	18	19	20	21	22	23
24	25	26	27 Seattle 1530-2400 UTC	28 Seattle 1530-2400 UTC	29 Seattle 1530-2400 UTC	30
31						

Workshop-Without-Walls (WWW)

- The WWW will be held July 27-29
- The goal will be to host interdisciplinary discussions with astronomers, geologists, biologists, heliophysicists, astrobiologists, instrumentalists, etc
- Discussions will focus on consensus for assessing biosignatures, and (presumably) the need for contextual information when assessing biosignatures
- We will also host “work sessions” to nucleate products that will be folded into our final report
- Discussions will be led from in-person meeting in Seattle, WA
- Meeting will also be accessible online, and products will be developed with collaborative tools

SAG 16/Workshop Example Products

- Table of previously proposed biosignatures and their properties
- Consensus framework for assessing biosignatures
 - Includes “types” of contextual information one would want to rule out false positives, understand “drivers” for biological productivity, etc.
 - Top-level properties of these observations – wavelength range, spectral resolution + signal-to-noise ratio
- A “case study” on how to utilize the above products by discussing observation goals for a certain biosignature (*e.g.*, O₂ or ChlA)
- Research topics and workshops that could advance biosignature science

Name	Institute	Expertise Area
Daniel Apai	Univ. of Arizona, USA	planet imaging
Gary Blackwood	JPL/ExEP, USA	mission planning design
Shawn Domagal-Goldman	NASA GSFC, USA	astrobiology, missions
Yuka Fujii	ELSI, Japan, and NASA GISS, USA	remote surface biosignatures, Super-Earths
Lee Grenfell	DLR, ESA, Germany	
Nancy Kiang	NASA GISS, USA	photosynthetic biosignatures
Adrian Lenardic	Rice Univ., USA	geophysics, mantle evolution
Nikole Lewis	STSci, USA	bridging models and instrumentation for exoplanet missions
Tim Lyons	Univ. of California, Riverside, USA	geochemistry, Earth history, systems science, geochemistry
Hilairy Hartnett	Arizona State Univ., USA	biogeochemistry, organic geochemistry, extreme environments
Bill Moore	Hampton Univ., USA	planetary interior evolution, atmospheric escape
Enric Pallé	Instituto de Astrofísica de Canarias, Spain	remote biosignatures
Niki Parenteau	SETI / NASA ARC, USA	microbiology, photosynthesis
Heike Rauer	DLR, Germany	transit missions, biosignatures context
Karl Stapelfeldt	NASA GSFC/JPL, USA	mission design
Sara Walker	Arizona State Univ., USA	physicist, information in biological systems and origin of life

- For more information and/or to sign up for our email distribution list, please visit our website:

<https://nexss.info/community/exoplanet-biosignatures-workshop>

- Email questions and concerns to:

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