

National Aeronautics and
Space Administration



EXPLORE SCIENCE

NAC Science Committee

Dr. Ellen Williams, Chair

August 10, 2022

NAC Science Committee Members

- **Dr. Ellen Williams, Chair, University of Maryland**
- **Dr. Michael Liemohn, University of Michigan; Chair, Heliophysics Advisory Cmte (HPAC)**
- **Dr. Serina Diniega, Jet Propulsion Laboratory; Acting Chair, Planetary Science Advisory Cmte (PAC)**
- **Dr. Charles “Chick” E. Woodward, University of Minnesota; Chair, Astrophysics Advisory Cmte (APAC)**
- **Dr. Sara Tucker, Ball Aerospace & Technologies Corp.; Chair, Earth Science Advisory Cmte (ESAC)**
- **Dr. Noël Bakhtian, Berkeley National Laboratory**
- **Dr. Vinton Cerf, Google**
- **Dr. Linda M. Godwin, University of Missouri**
- **Dr. Willie E. May, Morgan State University**
- **Mr. Marc Weiser, RPM Ventures**
- **Incoming Chair of new Biological and Physical Sciences Advisory Committee (BPAC) joining soon**



SMD Updates & Highlights

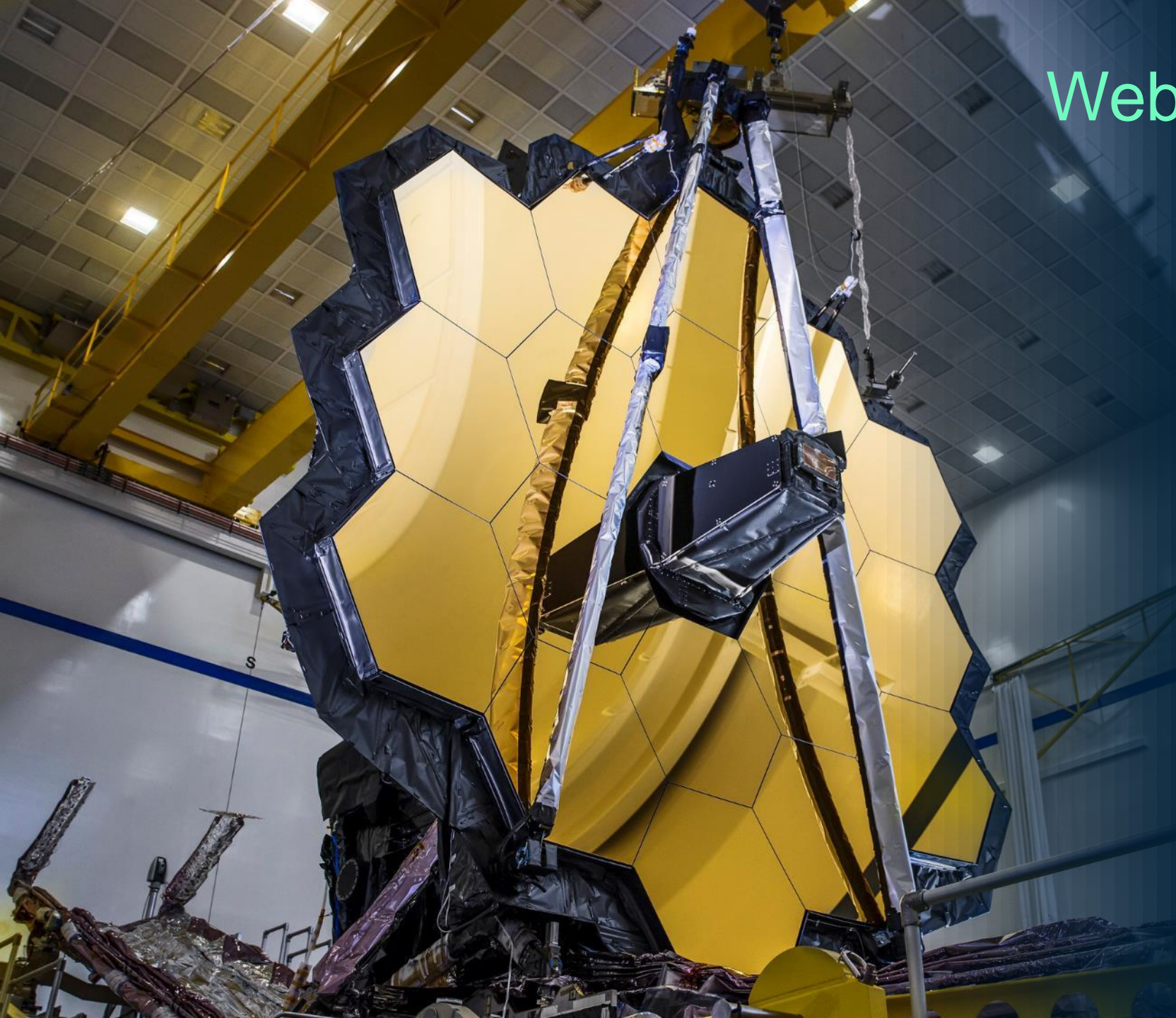


Webb Space Telescope

The Webb Space Telescope released its first full-color images and spectroscopic data during a televised broadcast at 10:30 a.m. EDT (14:30 UTC) on Tuesday, July 12, 2022.

The first wave of full-color scientific images and spectra the observatory included these science operations listed targets:

- Carina Nebula
- WASP-96 b (spectrum)
- Southern Ring Nebula
- Stephan's Quintet
- SMACS 0723.



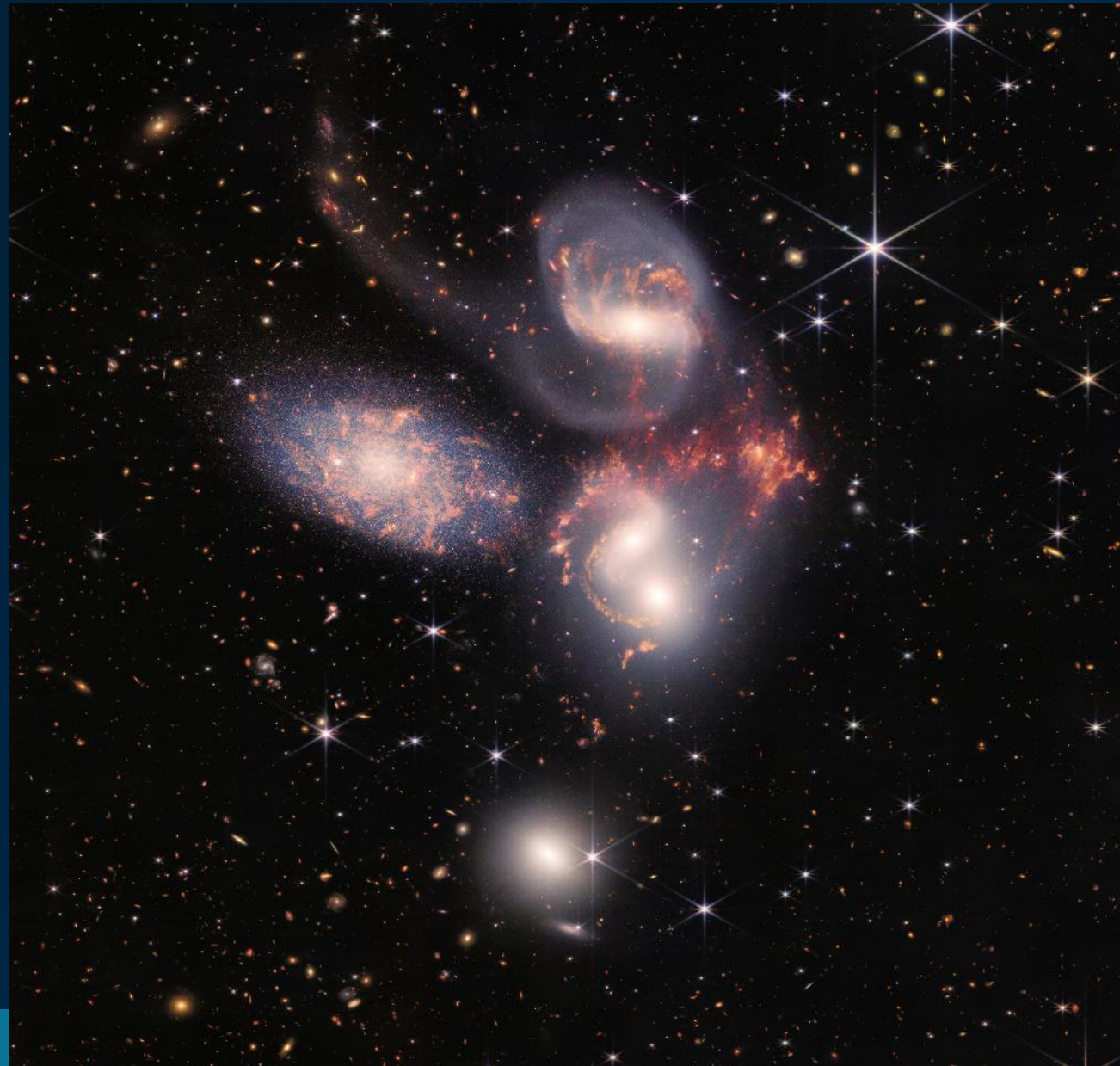


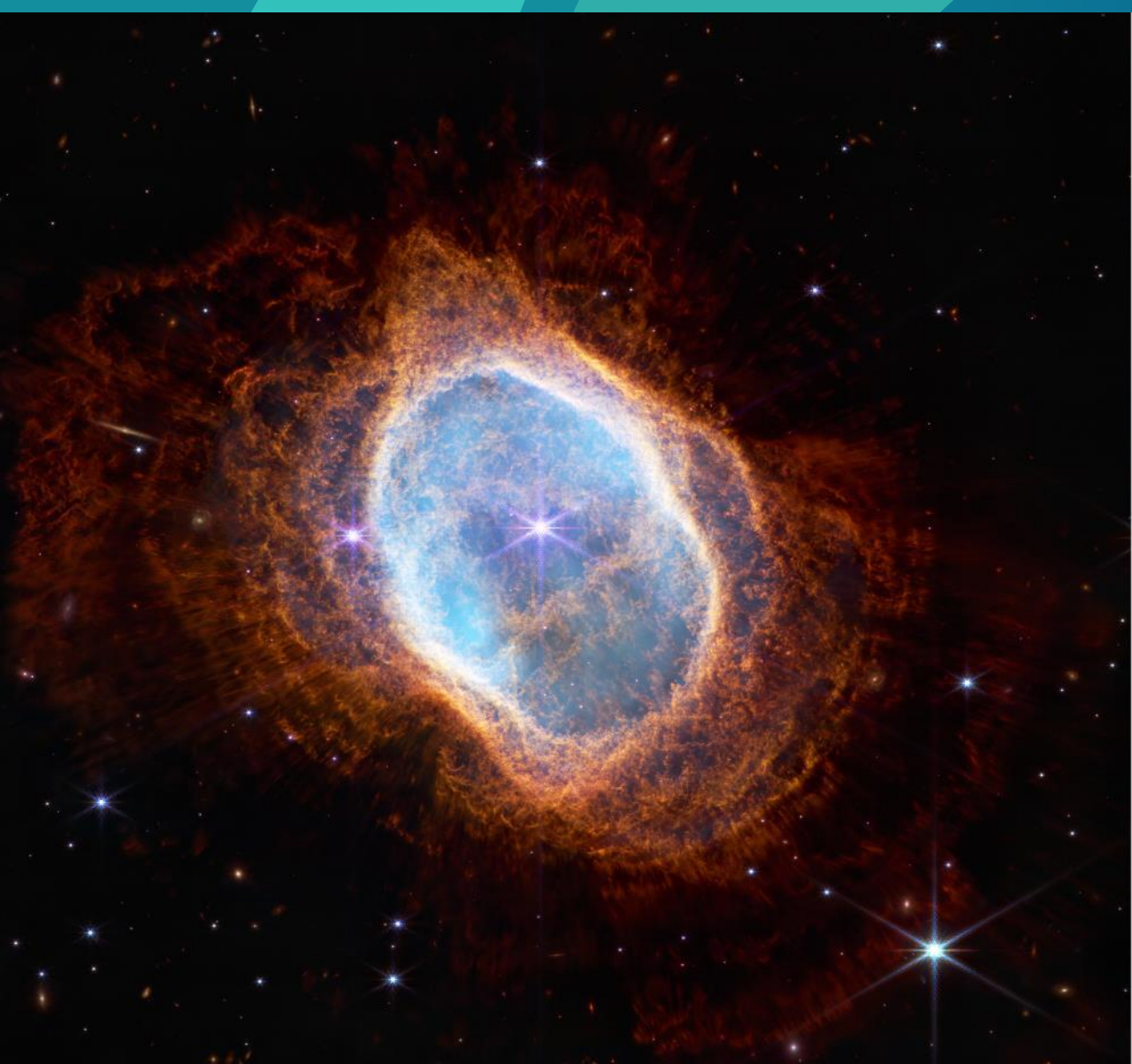
The Cosmic Cliffs: a young, star-forming region called NGC 3324 in the Carina Nebula



Webb's First Deep Field

Stephan's Quintet, a visual grouping of five galaxies.

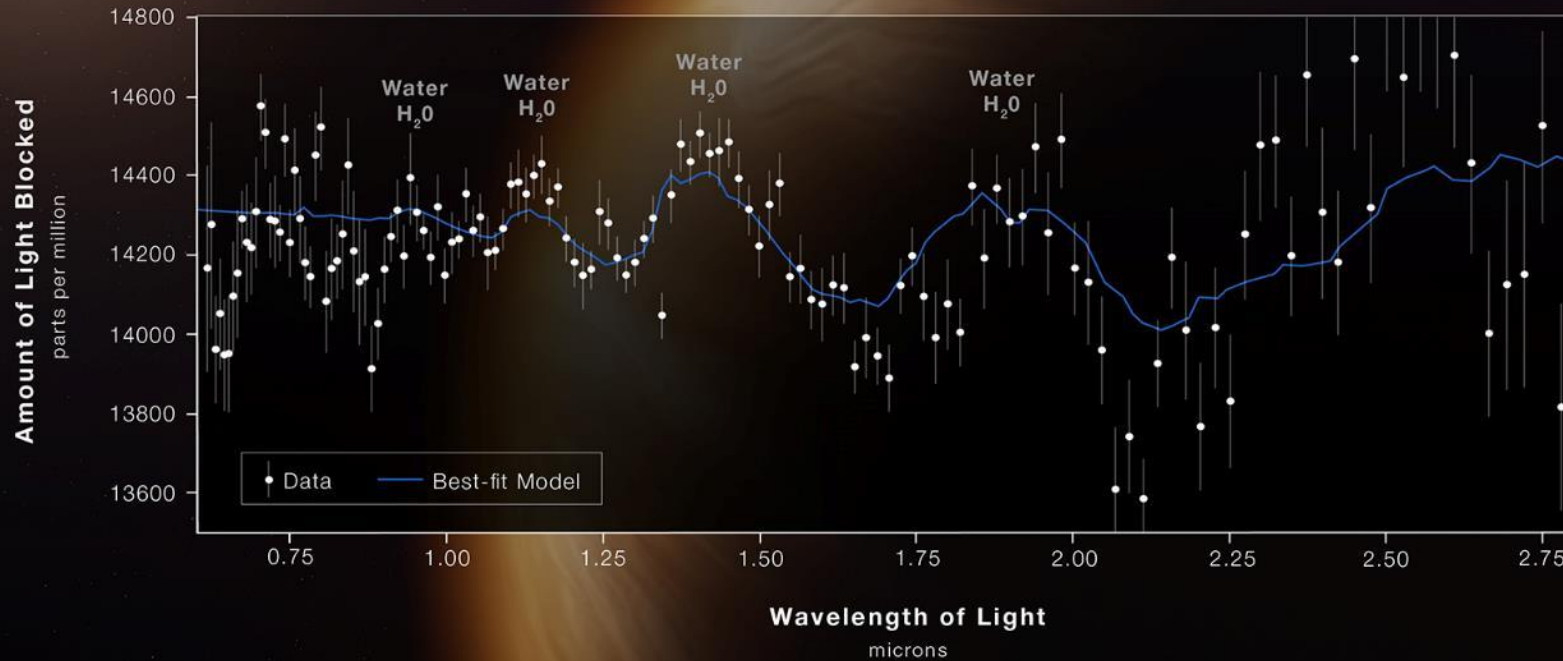




Southern Ring Nebula

ATMOSPHERE COMPOSITION

NIRISS | Single-Object Slitless Spectroscopy



JWST has captured the distinct signature of water, along with evidence for clouds and haze, in the atmosphere surrounding a hot, puffy gas giant planet orbiting a distant Sun-like star

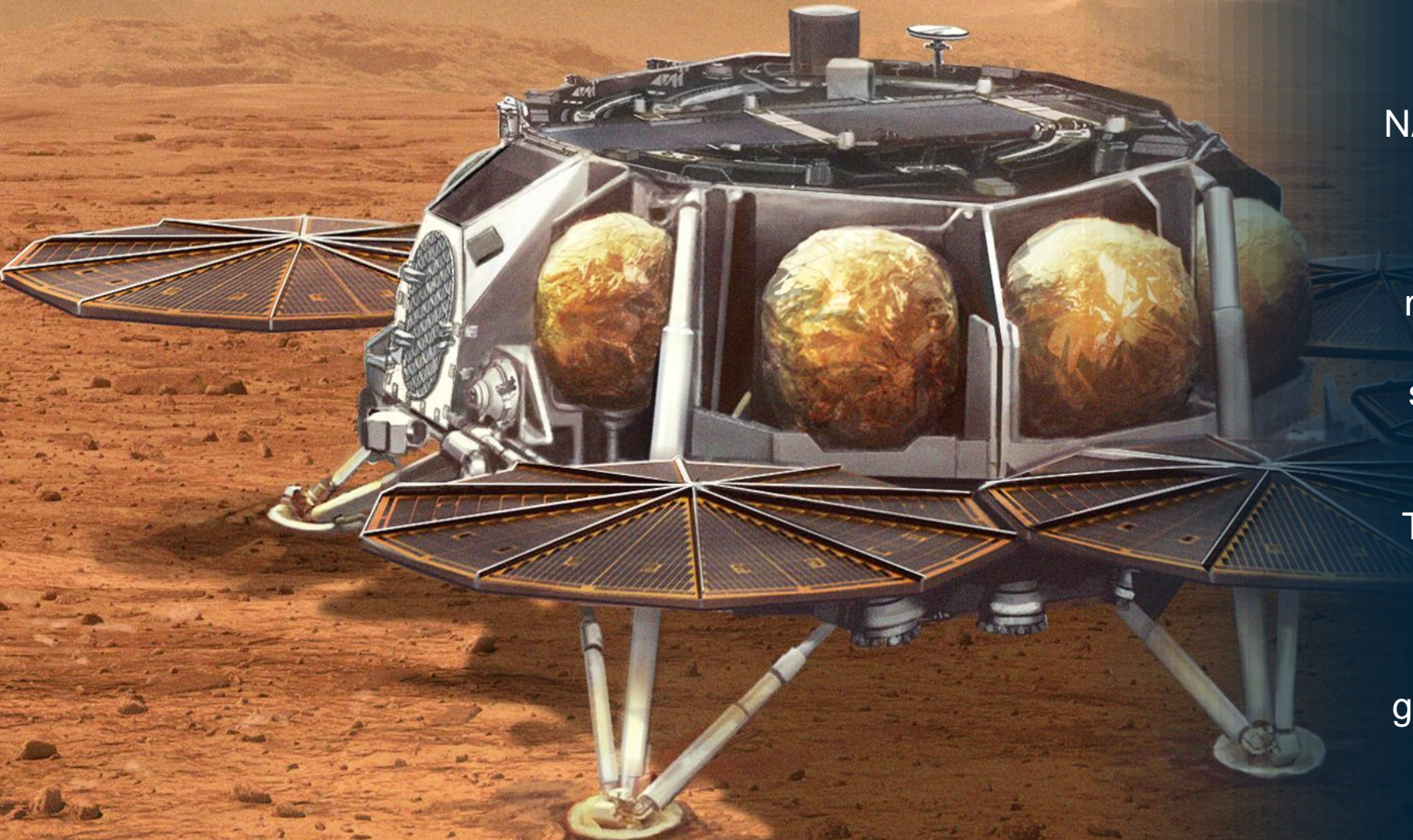
New Image:
The Cartwheel Galaxy,
located about 500
million light-years away
in the Sculptor
constellation.



Mars Sample Return (MSR)

NASA and ESA have established a new group of researchers, called the Mars Sample Return Campaign Science Group, to maximize the scientific potential of Mars rock and sediment samples that would be returned to Earth for in-depth analysis.

The 16 researchers will function as a science resource for the campaign's project teams as well as for related Earth-based ground projects, such as sample recovery and curation.



Earth Surface Mineral Dust Source Investigation (EMIT)

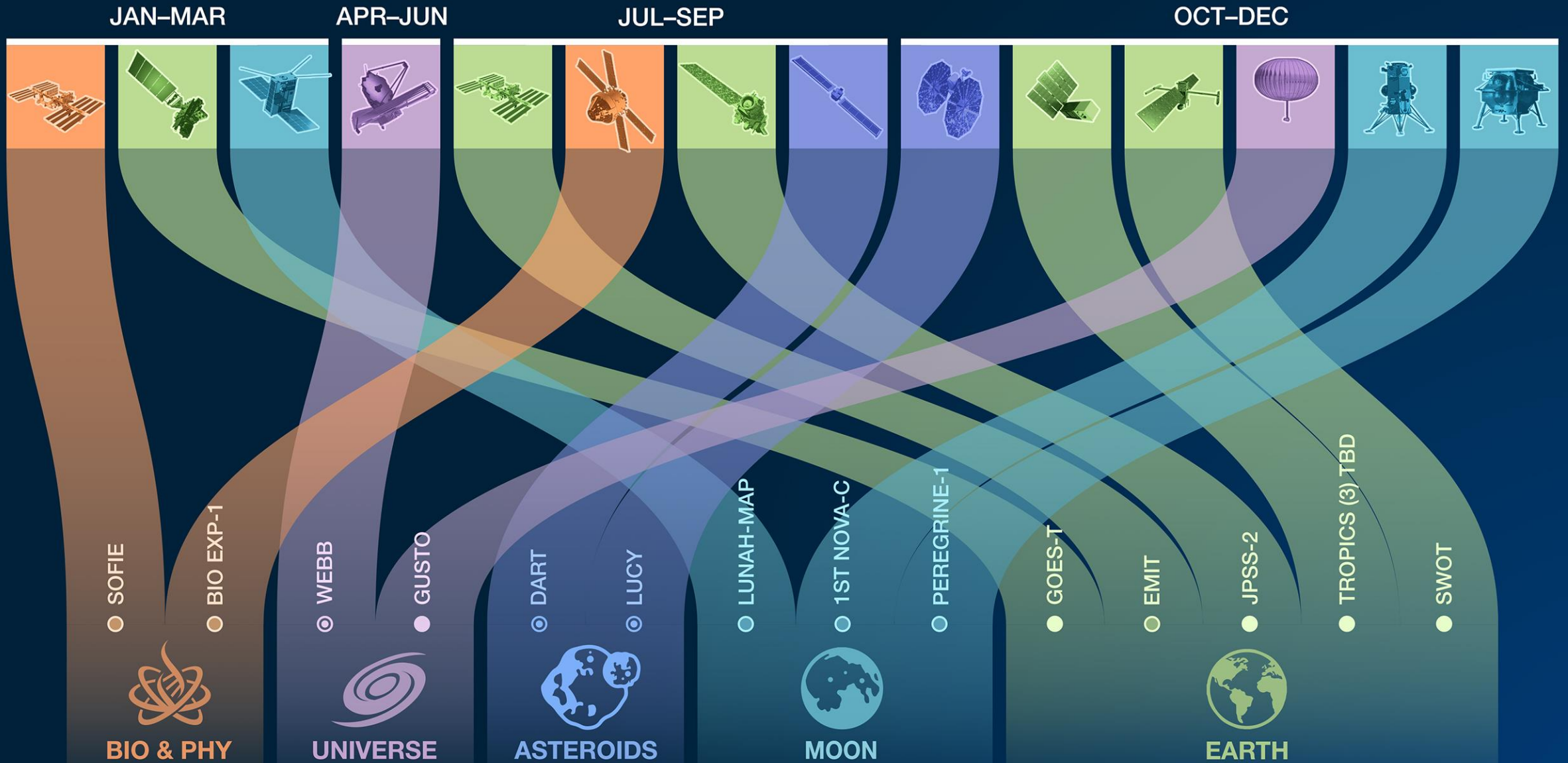
NASA and SpaceX launched the agency's next investigation to monitor climate change to the International Space Station on July 14, 8:44 p.m. EDT.

EMIT will be the first instrument to use NASA-invented imaging spectroscopy technology to comprehensively measure the mineral composition of the Earth's arid land dust source regions.



2022 MISSION TIMELINE

● LAUNCH ○ DELIVERY ◎ MILESTONE



PSYCHE

NASA announced Friday, June 24, the Psyche asteroid mission, the agency's first mission designed to study a metal-rich asteroid, will not make its planned 2022 launch attempt.

Due to the late delivery of the spacecraft's flight software and testing equipment, NASA does not have sufficient time to complete the testing needed ahead of its remaining launch period this year, which ends on Oct. 11.





Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites (TRACERS)

NASA's Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites mission, or TRACERS mission, has passed a critical mission review on March 31, 2022. The mission now moves into its next phase, Phase C, advancing towards its target launch readiness date of July 27, 2024.

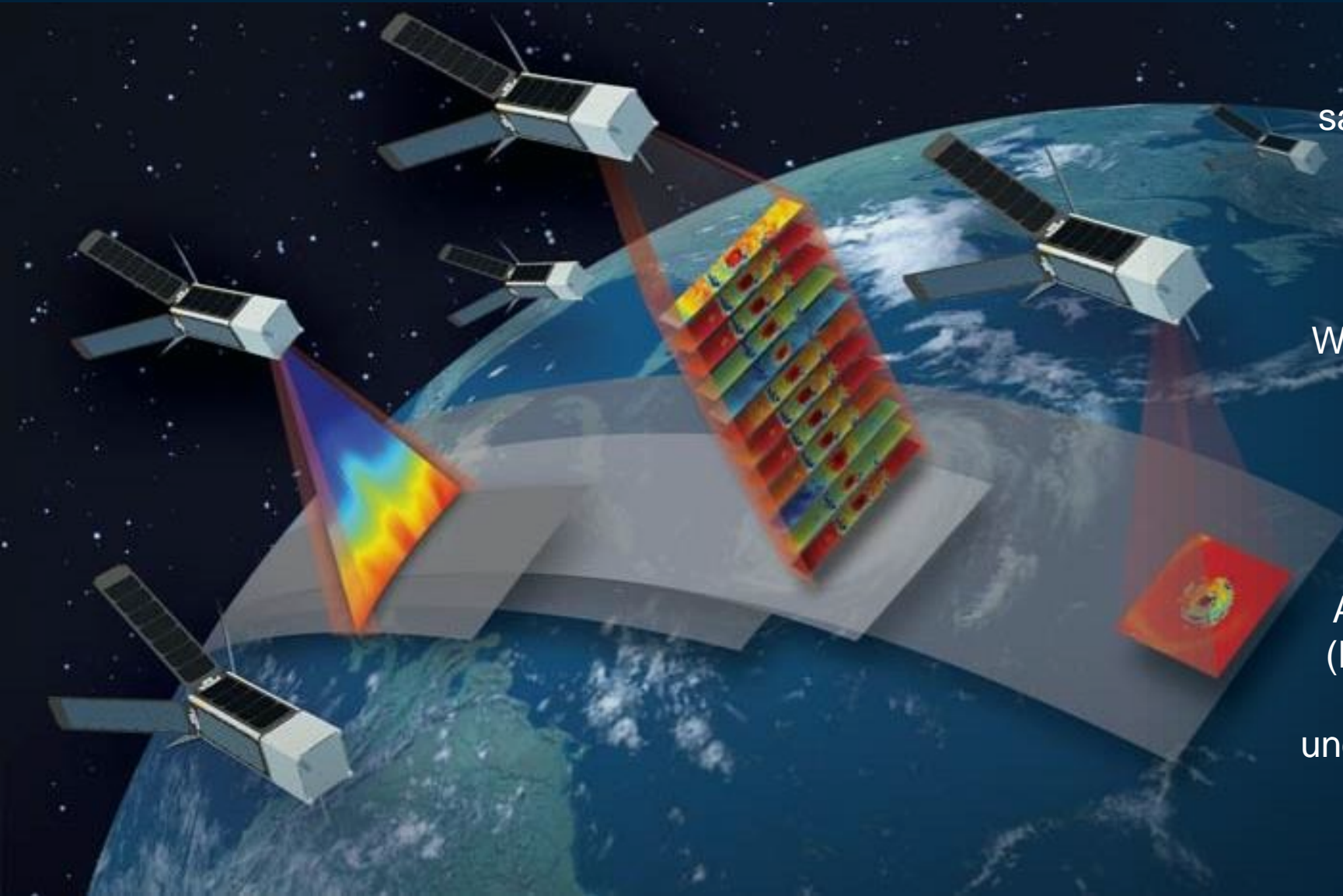
TRACERS began phase B in May 2020--2 months into the COVID shutdown. There were inefficiencies due to remote work, including very limited travel to establish and collaborate with teams.

TROPICS

Despite a loss of the first two of six satellites, the TROPICS constellation will still meet its science objectives with the four remaining CubeSats distributed in two orbits.

With four satellites, TROPICS will still provide improved time-resolved observations of tropical cyclones compared to traditional observing methods.

As a Federal Aviation Administration (FAA) licensed mission, the FAA and Astra will lead the investigation to understand what happened during the TROPICS-1 launch.



Unidentified Aerial Phenomena (UAP) Independent Study: Key Points

- NASA believes that the tools of scientific discovery are powerful and apply to the study of UAP
- SMD and Aeronautics Research Mission Directorate (ARMD) will appoint members from across the scientific, aeronautics, and data analytics communities
- This is an open, independent, and unclassified study. NASA will commission the team to deliver an independent report that we will subsequently publish
- The Independent Study Team will be chaired by Dr. David Spergel (President, Simons Foundation), with Dr. Dan Evans (SMD) serving as the Designated Federal Officer/Executive Secretary



Dr. David Spergel



Dr. Dan Evans

NAC Science Committee Hybrid Meeting

July 12-13

- SMD Update – Committee Report in Progress
- Discipline Advisory Committee Reports
- SCaN commercialization and impacts to SMD
 - Discussion: Balancing Efficiencies and Flexibility
- Big Data Management in SMD
 - Discussion: Open Science benefits balance
- SMD Climate Survey Update
 - Discussion: Roll out to directorate missions
- JWST First Images presentation
 - Discussion: High Risk/High Payoff balance

Joint Human Spaceflight Committee/Science Committee Hybrid Meeting

July 13

- Joint Committee report in preparation
- Moon to Mars Architecture Status Update
- Cross-directorate Science Utilization
- Artemis Science Team Formation Summaries of LSSW Highlights
- Process on Integration and Implementation of Science in Artemis
- Discussion of Planetary Decadal – Chapter on Exploration

NAC Science Committee Hybrid Meeting

May 3-4

- SMD Update
- Discipline Advisory Committee Reports
- Managing Commercial Delivery of Services -
Exploration Science Strategy and Integration Office
- SMD Inclusion, Diversity, Equity and Accessibility
- Planetary Protection Update
- James Webb Space Telescope Update
- Climate Science Update



Findings and Recommendations

SMD Mission Performance under the COVID -19 Environment

The Science Committee finds that:

- The NASA workforce has done an exceptional job executing its mission under the extraordinary challenges of the COVID-19 environment. There will be continuing challenges over the next few years in establishing the new normal balance of off-site and on-site work activity (Future of Work).
- The successful launch and deployment of the James Webb Space Telescope is a remarkable accomplishment under any conditions, and especially laudatory given the challenges of COVID-19. The demonstration of commitment and technical skill required to accomplish this mission will inspire future technologically challenging missions to succeed.

The Science Committee recommends that:

- SMD continue strategic evaluation of how Future of Work challenges following the major disruptions of COVID-19 may affect delivery of its mission in the future, and how best to leverage a hybrid future that embraces the distributed nature of the science community.

Consequences of no action on the recommendation

If this matter is not strategically addressed, one possible consequence is that gains made in increasing cognitive diversity at NASA may be lost. For instance, some women or employees from low-income families might have a less effective work environment at home due to taking on additional domestic or family-support duties at the cost of scientific career opportunities, or alternatively might need additional flexibility in hybrid work to maintain an effective work/family balance.

Commercial Lunar Payload Services (CLPS)

The Science Committee finds that:

- The CLPS program to accelerate delivery of scientific payloads via development of a commercial space transport network has been well planned and executed. The program is a visionary approach to improving mission performance.
- Maturation of exploration policies (domestic and international) to enable complementary government and commercial sector Lunar operations is necessary building on principles within the Artemis Accords and Lunar Treaty.

The Science Committee recommends that:

- SMD continue to support and evaluate the commercial delivery service model and develop lessons-learned for application to future missions and destinations.
- NASA create a strategy to educate the public on the benefit of innovative projects with mission risk in advance of the CLPS launches.

Consequences of no action on the maturation finding

Failure to address the need for robust operational policy frameworks will lead to ad hoc solutions resulting in possible detrimental consequences to SMD objectives when unexpected conditions arise during operation on the Moon, Mars, and beyond.

SMD Engagement in Climate Science

The Science Committee finds that:

- NASA's assignment of the dual role of Senior Climate Advisor and Chief Scientist provides welcome extra emphasis to NASA's commitment to the issues of Climate Change.
- NASA's collaborative work with other U.S. government agencies on the monitoring and use of climate data provides substantial opportunity to broaden the impact of its Climate Science programs. SMD should utilize such activities strategically to complement its science objectives.

The Science Committee recommends that:

- SMD emphasize improving spatial resolution, sensitivity to chemical species and concentrations, and environmental/human variables in detecting sources of greenhouse gas emissions and make the data publicly available.
- SMD build on NASA's historical role in STEM education and inspiration to augment the climate portfolio to include a segment on utilizing behavioral/social sciences to improve the communication of the science of climate change
- The climate portfolio overview include a nod to the climate impact NASA itself is having, and how this is being mitigated. Additionally, NASA climate goals and metrics could strengthen the renewed climate focus.

SMD programs for Inclusivity, Diversity, Equity, and Accessibility (IDEA)

The Science Committee finds that:

- SMD has developed a holistic plan for integrating NASA's agency DEIA initiative into its Science Strategic Approach (IDEA: Initiative, Diversity, Equity, and Accessibility). This approach incorporates concepts of workforce pipeline, infrastructure, accessibility, community, and relationships, and proposes a set of outcomes-based progress indicators to monitor progress. This is a thoughtful plan that recognizes that incorporating the goals of IDEA is essential to scientific progress and NASA workforce development.
- NASA's goals to increase diverse participation in Grants and perform a study on barriers are commendable.

The Science Committee recommends that:

- SMD provide training opportunities for its grant recipients in how to implement IDEA concepts.
- SMD enhance its local efforts to educate communities about NASA's data tools through increased virtual training sessions and other methods.
- SMD continue to refine its outcomes-based indicators for its IDEA goals within the Science Strategic Approach and ensure that these can be tracked and compared over time.
- SMD illuminate, where relevant, the direct impact NASA researchers can have via IDEA through applications of their research with equity and underserved communities in mind.
- SMD take diversity into account when mentoring and hiring for leadership roles.

Environmental Impacts in Extraterrestrial Missions

The Science Committee finds that:

- NASA's Planetary Protection effort continues to evolve and integrate issues of biological and chemical contaminants into operational planning for new missions.

The Science Committee recommends that:

- In addition to biological and chemical contamination, SMD consider and document other environmental impacts at extraterrestrial environments that could affect future science activities including, but not limited to, discarded or waste materials, electromagnetic spectrum pollution, and impacts such as formation of long-lasting dust clouds.
- SMD determine a lead entity responsible for considering strategies for mitigation of non-biological impacts on extraterrestrial environments while ensuring that potential mitigation strategies take into account current and future science needs. To the extent possible, this should be an international discussion.

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