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2025 Analog Astronaut Conference – Session Summaries

Reported by: Ajani Brown & Giovanna E. R. Ruiz

The Analog Astronaut Conference (AAC), sponsored by the Analog Astronaut Foundation, is the premier annual gathering for researchers, analog astronauts, scientists, artists, students, and space professionals focused on preparing humanity for future exploration beyond Earth. Held at Biosphere 2 in Arizona since 2022, the conference brings together a global community to share research, experiences, and lessons learned from analog missions that simulate living and working on the Moon, Mars, or in deep space. Topics span human factors, space medicine, crew psychology, EVA procedures, robotics, and sustainability, with the goal of advancing knowledge, building standards, and strengthening collaboration across the analog astronaut community. By connecting mission crews, scientists, and industry leaders, the AAC plays a vital role in ensuring that what is tested on Earth today will help humans thrive on other worlds tomorrow.

The following is a summary of the sessions from the 4th Analog Astronaut Conference held at Biosphere 2 from May 1-3, 2025. There were 120 in attendance.

Day 1 – May 1, 2025

Day 1 sessions and activities set the tone for the conference with interactive, imaginative, and hands-on experiences. The evening began with a creative icebreaker workshop that encouraged participants to reflect on the 2025 World's Biggest Analog mission as if looking back from 2044. This session fostered creativity, team-building, and connection among attendees. The day closed with a guided tour of the SAM habitat, bridging imagination with real-world innovation.

Opening Workshop
Facilitators: Dr. Claire Nelson & Brenda Trinidad
Affiliation: OASEAS / Coordinator, Future Fiction Project, World's Biggest Analog
Summary: The opening session featured an imaginative icebreaker where participants revisited the 2025 World's Biggest Analog mission from the perspective of 2044. Attendees created code names, assigned space jobs, and re-enacted cultural and social outcomes, including the popular "Cosmic Clan Celebration Ritual." The session fostered creativity, collaboration, and community spirit.
Keywords: Icebreaker, Collaboration, Imagination, WBA Mission, Community Building

Habitat Tour
Summary: The evening concluded with a behind-the-scenes tour of the Space Analog for the Moon and Mars (SAM). Participants explored its hermetically sealed, pressurized systems, gaining a tangible vision of future off-world living and research that connected the day's imaginative exercise with practical innovation.
Keywords: SAM Habitat, Space Research, Systems Tour, Analog Environments, Innovation

Day 2 – May 2, 2025

Day 2 of the conference featured sessions centered on planetary science, analog research documentation, and global perspectives on space exploration. Talks and panels highlighted the evolution of Mars missions, the importance of Biosphere 2 and SAM for analog science, storytelling in analogs, and the role of inclusivity and indigenous knowledge in shaping future exploration.

Introduction to Biosphere 2 and Update on SAM
Speaker(s): Kai Staats & John Adams
Affiliation: Biosphere 2 / University of Arizona
Summary: An overview of the SAM project's transition from construction to active research and its role in sustainable life support at Biosphere 2.
Keywords: SAM Project, Biosphere 2, Life Support, CO2 Scrubbers, Plant-Based Systems

Update on Mars Exploration and Missions
Speaker(s): Tasha Coelho
Affiliation: University of Arizona
Summary: A comprehensive update on Mars exploration history, current rover missions, and future plans.
Keywords: Mars Missions, Rovers, Perseverance, Curiosity, Exploration

Art of the Analog ~ Mars on Earth | Documenting Analog Missions
Speaker(s): Cassandra Klos
Affiliation: Independent Photographer / Artist
Summary: Exploring the importance of documenting analog missions through art and photography.
Keywords: Analog Missions, Photography, Storytelling, MDRS, HI-SEAS

Echoes of the Heart: RAVE as a Frontier for Heart Rate Variability Optimization in Analog Missions
Speaker(s): Thorsten Eschweiler
Affiliation: Researcher, Graduate Instructor
Summary: Examines heart rate variability (HRV) as a practical biomarker for monitoring crew stress, recovery, and performance in analog missions. Introduces RAVE as an approach for optimizing human performance and operational safety.
Keywords: Heart Rate Variability, HRV, Physiology, Crew Health, Performance Monitoring, Biometrics

The World's Biggest Analog
Speaker(s): Jas Purewal & Dr. Gernot Groemer
Affiliation: Founder, Director, WBA / Operations Director, WBA
Summary: Presents the vision and roadmap for the World's Biggest Analog (WBA), a large-scale, multi-partner initiative to coordinate analog activities, expand participation, and accelerate readiness for human missions. Covers objectives, potential sites and partners, and opportunities for community engagement.
Keywords: World's Biggest Analog, Human Spaceflight Readiness, Analog Research, Community Engagement, Space Education

From Orbit to Mars ~ Unlocking Transit Analog Missions for Human Exploration
Speaker(s): Panel: Dr. Shawna Pandya, Dr. Sian Proctor, Ashley Kowalski; Moderator Dr. Tiffany Vora
Affiliation: Explore Mars Collaborative
Summary: A panel discussion on using space stations for Mars transit analogs and addressing mission challenges.
Keywords: Transit Missions, ISS, Mars Analogs, Human Exploration, Collaboration

Cosmic Vision from Space Analog Missions: Application for Professional Careers
Speaker(s): Professor Julio Rezende
Affiliation: Habitat Marte (Brazil)
Summary: Linking analog astronaut training with professional development, sustainability, and creativity.
Keywords: Analog Training, Sustainability, Professional Development, Cosmic Vision, Habitat Marte

African Analogs – OASEAS.org (Omni Africa Space Exploration Analog Simulation)
Speaker(s): Dr. Claire Nelson
Affiliation: OASEAS
Summary: Presentation of Africa's first proposed analog station and its vision for inclusivity in space exploration.
Keywords: Africa, Analog Research, Inclusivity, Space Exploration, OASEAS

Understanding Indigenous Ways of Knowing, Being & Doing Through the Lens of Analog Design
Speaker(s): Dr. Ren Freeman, Nicole McGaa, Dr. Alvin Harvey
Affiliation: University of Michigan / MIT / Indigenous Communities
Summary: Highlighting Indigenous methodologies and perspectives for analog design and community-based research.
Keywords: Indigenous Knowledge, Analog Design, Ethics, Reciprocity, Relationality

Workshop: Analog Missions and Cultural Preservation
Speaker(s): Rachel Tillman
Affiliation: Viking Mars Missions Education & Preservation Project
Summary: Exploring how lessons from the Viking Mars missions can inspire analog communities today. Participants reflected on cultural heritage, storytelling, and preservation as essential components of space exploration and analog practice. The session emphasized intergenerational learning and connecting mission history to future exploration.
Keywords: Viking Missions, Cultural Preservation, Education, Analog Missions, Heritage, Storytelling

Day 3 – May 3, 2025

Day 3 emphasized innovation in habitat design, accessibility, and human factors in analog missions. Presentations ranged from technical approaches like modular research systems and sustainable habitats, to human-centered themes including emotional intelligence, identity transformation, and resilience practices. The day also showcased global initiatives and creative visions for Mars and beyond.

Terrestrial Arcologies as a Test Bed for Space Analogue Components
Speaker(s): Colin A. Lennox
Affiliation: ArcologyX
Summary: ArcologyX, a collaborative of scientists focused on climate resilience, built its first analogue habitat featuring four in-house innovations: self-organizing wetland bioreactors (SOWBs), cube octahedral supports, 3D-printed plant structures, and GaiaOS 1.0. These systems work together as the bones, guts, lungs, and brain of a scalable, responsive biological life support system for sustaining life beyond Earth.
Keywords: Climate Resilience, Biological Life Support System (BLSS), 3D-Printed Plant Structures, Space Habitation, Sustainability

RAF - Analog Space Mission - The first analog space base on mining heaps
Speaker(s): Mikołaj Zawadzki

Affiliation: Co-leader of the RAF-Analog Space Mission project, PhD student, principal investigator of a research project funded by the Polish Ministry of Science
Summary: For ten days, three students from the University of Warsaw transformed a post-mining heap in Bytom into an analog Mars base, living under space-like rules in a camper-lab setup. Their RAF-Analog Space Mission focused on geophysical, geological, psychological, and astrobiological research while testing the challenges of life on Mars.
Keywords: Mars simulation, Astrobiology, Space psychology, Bytom coal mine

Agile Space Analogs as Progress Accelerators
Speaker(s): Kent Nebergall
Affiliation: MacroInvent
Summary: Applying agile development principles to analogs for solving challenges in space settlement.
Keywords: Agile, Analog Research, Space Settlement, Innovation, Roadmaps

Frontiers in Mars Analogs - Insights from the Mars Society's Twin Analog Stations
Speaker(s): James Burk
Affiliation: Mars Society
Summary: Showcases the Mars Society's pioneering research at the Mars Desert Research Station (MDRS) and Flashline Mars Arctic Research Station (FMARS). Highlighted projects include the EVALink mesh data system for real-time communication, MarsVR for virtual training and digital twins, and innovations in closed-loop life support systems for long-term sustainability.
Keywords: Human Factors, Team Dynamics, Psychological Resilience, MarsVR, Closed-Loop Life Support, Digital Twins

AstroAccess: Advancing Accessibility in Space Habitat Design
Speaker(s): Andi Limon
Affiliation: AstroAccess.org
Summary: Discussing universal design and disability inclusion in human spaceflight.
Keywords: Accessibility, Universal Design, Inclusion, Human Spaceflight, Disability

Design and Operation of SAM's CO2 Scrubber, and Implications for Future Analogs
Speaker(s): Griffin Hentzen
Affiliation: Design Engineer & Fabricator at SAM (Space Analog for Moon and Mars)
Summary: A surface level showcase of SAM's (Space Analog for Moon and Mars) CO2 scrubber, including process walkthrough, research potential, and system capabilities. This talk will also feature a discussion of the implications of designing complex systems for analog facilities, and how these systems will differ from their flight-rated counterparts.
Keywords: CO_2 Scrubber, Complex System Design, Flight-Rated Systems

No Longer Earthlings: Impacts of Extreme Environments on Identity
Speaker(s): Michael Murphy
Affiliation: University of Oxford
Summary: An anthropological perspective on how extreme environments transform identity and community.
Keywords: Identity, Extreme Environments, Anthropology, Space Migration, Transformation

Project Chickenhole (CHIRP – Chicken Hole Interplanetary Research Project)
Speaker(s): CodyDon Reeder
Affiliation: Independent Researcher
Summary: Building a Mars-like homestead to test sustainable systems in extreme environments.
Keywords: Mars Homestead, Sustainability, Self-Sufficiency, Off-Grid, Innovation

The Astronaut Mindset: Harnessing Emotional Intelligence for Success in Analog and Space Missions
Speaker(s): Dr. Jenni Hesterman
Affiliation: Professor, Risk, Safety and Security Consultant
Summary: Emphasizing emotional intelligence as a critical factor for mission success and team resilience.
Keywords: Emotional Intelligence, Astronaut Mindset, Resilience, Team Dynamics, Leadership

How to Write and Publish Best Selling Space Books
Speaker(s): John Read
Affiliation: Director, Abbey Ridge Observatory
Summary: Discussion about the writing process, the author's career journey, publishing successes, and failures. How to get an agent, land major publishing deals, marketing, sales, and more.
Keywords: Book Publishing, Writing Process, Publishing Success, Literary Agents, Book Marketing, Book Sales

Zero-G-Ames
Speaker(s): Dan Novy
Affiliation: Assistant Professor of Emerging Media Arts at the University of Nebraska-Lincoln, Research Scientist at the MIT Media Lab
Summary: How games and play can support astronauts' psychological health and creativity in space. It explores the history of games used in extreme environments (like the Chilean miners and the ISS), applies game design frameworks (mechanics, dynamics, aesthetics) to microgravity, and challenges participants to design new games suited to space constraints.
Keywords: Games In Space, Gamifying, Psychological Health, Astronaut Well-Being, Recreation, Team Dynamics

Back to Mars After 55 Years: From Prop-M to Amadee-24 & the Road WBA
Speaker(s): Hayk Aslanyan
Affiliation: Armenian Space Forum
Summary: Reflecting on Armenia's contributions to space and future Mars mission plans.
Keywords: Mars, Armenia, Space Forum, History, Amadee-24

Designing the Mars Tesseract-1 Habitat: An Ecologically Sustainable & All-Vegan Astronaut Training Facility
Speaker(s): Scott Beibin & Elizabeth Cole
Affiliation: offworld.voyage
Summary: Presenting a vision for vegan, ecologically sustainable analog astronaut training habitats.
Keywords: Tesseract Habitat, Sustainability, Vegan, Analog Training, Design

Virtual Simulations of Analog Missions
Speaker(s): Bryan Versteeg
Affiliation: Spacehabs.com
Summary: Using design, visualization, and gaming to create immersive analog mission simulations.
Keywords: Simulation, Visualization, Gaming, Analog Missions, VR

Performance & Resilience: AstroMeditation & Breathwork
Speaker(s): Karim Nahabet
Affiliation: Independent
Summary: Integrating meditation and breathwork into astronaut training for resilience and performance.
Keywords: Meditation, Resilience, Astronaut Training, Breathwork, Human Performance

For more detailed information on sessions, please email jennihesterman@gmail.com