

A community advancing society through exploration 2020-2021 YEAR IN REVIEW

ASU's Interplanetary Initiative is a pan-university effort to build the future of humans in space.

We envision an interplanetary future built upon new structures, systems, and perspectives. We achieve our vision by deploying new ways of building teams and solving problems, at scale, partnered across disciplines, sectors, and cultures to shape an inclusive and sustainable interplanetary future.

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Note from the vice president

Dear Friends,

I hope you and yours are safe and well, and that you are feeling some of the relief of returning to a more open life.

Despite the challenges of this year, the Interplanetary Initiative team has forged forward. I'm proud and grateful to work with this team. We figured out how to stay connected and productive despite having most of the team working separately in our homes for the whole year. The exception to working separately was the Interplanetary Lab group, who kept safe procedures and built up our space hardware and software lab, filled it with active projects, installed a new vibe table, and began inviting outside partners. I hope you've had a chance to see this space.

In the middle of COVID, we also assembled a fantastic Advisory Board (scroll down our <u>team page</u> to meet them all). We believe in active thinking and inviting the boldest ideas from the creative minds of our board (no sitting and reading minutes for us), and the whole group rose to the challenge. Part of our work has been an in-depth strategy, vision, and mission process: Stay tuned for our results! These will help us decide which projects to undertake, and how to move directly toward the future we are trying to shape.

And this spring, Jessica Rousset joined us as deputy director, and Katherine McConachie joined us as director of learning. Jessica brings tremendous experience in academia and with startups, and has a bioengineering background. She's going to lead the team to execute on our strategy. Katherine comes from the MIT Media lab, with a deep knowledge of and dedication to learner-centered education. Katherine will lead and grow our formal and informal learning enterprise. Katherine has been joined by Eric Stribling, an engineer and educator, who is creating--get this--online hands-on maker courses for our online undergraduate degree. Stay tuned!

This spring we announced the launch of OpenCitizen, our team-based problem-solving program for learners anywhere in the world, and we announced a new partnership with XPRIZE. We are ramping up our efforts to create networks of collaboration that drive a positive, inclusive, sustainable space exploration and habitation future.

Onward, and so glad to be on this voyage together. Lindy

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Lindy Elkins-Tanton Vice President and Co-chair, <u>ASU Interplanetary Initiative</u> Principal Investigator, <u>NASA Psyche mission</u> Co-founder, <u>Beagle Learning</u>



ear in review 2020-2021

Event highlights

'Practical Solutions for Active Learning Online' webinar

We hosted a webinar July 2, 2020 featuring five experts sharing online active learning techniques and resources. Participants learned inquiry methodology, implementation of group thought processes, virtual lab solutions, and peer evaluation methods. The online event was moderated by Interplanetary Initiative Associate Director Evgenya Shkolnik, with expert panelists Lindy Elkins-Tanton, Turner Bohlen, Jon Harrison, and Jake Pinholster. The recording can be found here.



'Moon Dialogs' research salons

The Interplanetary Initiative, in collaboration with Open Lunar Foundation, Secure World Foundation, MIT Media Lab, and For All Moonkind, hosted 11 interdisciplinary research salons to cultivate thought leadership on lunar surface mechanisms to accelerate peaceful and sustained presence on the Moon. The salons have curated videos and reports that can be found at <u>www.moondialogs.org</u>. Moon Dialogs also created three working groups. 1) Accessible Moon is exploring strategies to assure lunar activities draw upon the diversity of humanity to build a human presence on the Moon and beyond; 2) Peaceful Moon is analyzing stakeholder motivations, responsibilities, and relationships and how they pertain to and affect lunar governance and, in particular, security; and 3) Sustainable Moon is examining models for resource management and infrastructure development to support a vibrant human presence on the Moon and in space.

'Can Space Exploration Save Humanity?' panel

Zocalo and the Interplanetary Initiative co-hosted an evening panel on Oct. 14, 2020 featuring Lindy Elkins-Tanton, vice president of the ASU Interplanetary Initiative, analog astronaut and geoscientist Sian Proctor, and designer and co-founder of Space Exploration Architecture, Melodie Yashar. The three women discussed the next generation of space exploration and its implications for Earth. The conversation can be watched <u>here</u>.

'Building Planets' series

Lindy Elkins-Tanton, vice president of the Interplanetary Initiative, presented a series of nine science talks covering the span of time from the formation of our solar system to when the Earth became habitable. The series was designed to be supportive material for in-class or informal learners. Watch the science talks <u>here</u>.

Breakthrough Starshot proposal kickoff

Breakthrough Initiatives partnered with the Interplanetary Initiative to host multiple Breakthrough Starshot meetings in December 2020. Breakthrough Starshot aims to demonstrate proof-of-concept for ultra-fast lightdriven nanocrafts, and lay the foundations for a first launch to Alpha Centauri within the next generation. The virtual meetings gathered more than 100 experts who exchanged ideas around the development of the Starshot communications sailcraft and ground station transmission and receiving systems. The resulting proposal submitted by ASU was selected for funding.

Interplanetary quarterly meetings

Throughout the year, we held four virtual meetings showcasing milestone updates from the Interplanetary Lab, Technological Leadership academic program, and eight pilot projects including: Earth Operations Center, Meta-Examination of Interplanetary, eLearning in Space, Five Senses in Space, Port of Mars, Mission: Interplanetary, and Commons in Space. All quarterly meetings can be viewed <u>here</u>.

'Exploring Jupiter's Moon Europa: A Potentially Habitable World' webinar

The School of Earth and Space Exploration joined efforts with the Interplanetary Initiative on Feb 4, 2021 by co-hosting a live webinar with more than 500 attendees, featuring Bob Pappalardo, Europa Mission project scientist at JPL, with moderator Everett Shock, professor in the School of Earth and Space Exploration. Bob's presentation focused on Jupiter's moon, Europa, and whether it could harbor conditions suitable for life. NASA's Europa Clipper probe will launch in October 2024 and arrive at Jupiter in April 2030. The webinar can be viewed <u>here</u>.

Mars Madness tournaments

We held two Mars Madness tournaments in the fall and spring where 225 ASU undergraduate students became citizens of an early Martian community charged with working together to survive and thrive on the Red Planet. The tournaments involved the online game and social experiment called 'Port of Mars' where players are assigned characters and use a dashboard to make decisions, monitor changes, and chat with other players. The published results of the original pilot study can be viewed <u>here</u>.

Space Futures Convening' virtual edition

We hosted a two-part virtual forum on May 21, 2021 to explore the biggest questions we can imagine toward forging our future in space. The first forum gathered experts to exchange ideas and collectively take next steps toward building successful human space futures. The second forum featured ASU President Dr. Michael Crow, who described universities as protectors of the future - places where humanity can best design its interplanetary future. Dr. Lindy Elkins-Tanton, ASU Interplanetary Initiative vice president, announced new programs and partnerships with OpenCitizen and XPRIZE, and Tracy Drain, keynote speaker and flight systems engineer, shared her vast experience with space missions, transporting us to Jupiter's icy moon, Europa. The convening can be viewed here.

'Why We Go' interplanetary exploration series

A collaboration between the Interplanetary Initiative and the <u>Translational Research Institute</u> for Space Health (TRISH) at Baylor College of Medicine, 'Why We Go' is a monthly discussion series with diverse experts examining the question, Why do humans go to space? The series launched April 22, 2021 discussing why humans explore space, why going to space is difficult for humans, social futures of humanity as an interplanetary species, and the challenges of terraforming on Mars. Watch the full series <u>here</u>.

Lab SmallSat lunch

The Interplanetary Lab hosted its first in-person 'SmallSat Lunch' on May 20, 2021. Attendees learned about the lab's space hardware <u>capabilities and equipment</u> with demonstrations of design-build-fly testing for small satellites, and explored collaboration and funding opportunities.

MISSION: INTERPLANETARY

'Mission: Interplanetary' podcast launch

We announced a partnership with <u>Slate</u> on a new podcast - 'Mission: Interplanetary' with a launch event on March 17, 2021, attracting 3K listeners through Facebook and YouTube. The Mission: Interplanetary launch event, hosted by former NASA astronaut <u>Cady Coleman</u> and scientist/ author <u>Andrew Maynard</u>, featured conversations about the Mars Perseverance mission with <u>Jim</u> <u>Bell</u>, Mastcam-Z principal investigator and professor at <u>ASU's School of Earth and Space</u> <u>Exploration</u> who's team built the cameras mounted on Perseverance that are beaming down detailed images of Mars to the world.



podcast launch.

MISSION: INTERPLANETARY





virtual workshops.



Thurs, June 10





research salons.





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These programs and collaborations engaged

10,000+ people

Media highlights

Social media momentum

Top posts:

Instagram: eLearning in space

"We're thinking about how to predict what future settlers might need or want to live happily and healthily."

- Kathryn Powell, planetary scientist at ASU

LinkedIn: Unearthing: A story based on Port of Mars

"This is the only time in human history where a civilization's foundation is rooted in intersectionality and diversity; where each settler is respected and accommodated for by one another. I pray to the stars that it stays that way in the future."

- Olympia Lebedev, sci-fi character from the year 2057

Mission: Interplanetary podcast ranking

- 61,000 downloads.
- Top 1% of podcasts.
- Listeners in 133 countries.
- 20% of listeners from outside the U.S.

"I'm so excited about the launch of this podcast. Andrew Maynard and Cady Coleman are such natural, welcoming hosts — a joy to spend time with — and it's refreshing to hear discussions about the human side of space exploration, not just the science."

-David Boulder, podcast fan

Twitter: Mission: Interplanetary with Katie Mack

"Having some perspective of how we fit into the greater cosmos and having perspectives of the universe as a whole can help us see how we fit into the bigger picture."

-Katie Mack, theoretical cosmologist

YouTube: Exploring Jupiter's M

Exploring Jupiter's Moon Europa: A Potentially Habitable World

"Europa, we believe, has a subsurface ocean under the ice, and that ocean might be a place where life could exist."

- Dr. Robert Pappalardo, Europa Clipper Project scientist and ASU alumnus

"This was fantastic! I'm so glad I attended! I am rethinking my entire career now, as this really engages me. Thank you so much."

-Event participant



We engage broadly across disciplines, sectors and cultures to investigate, design, and communicate an inclusive and sustainable human space future. Our interdisciplinary teams focus on producing targeted progress on key challenges for interplanetary futures.

2020-2021 pilot projects

Commons in Space conference

How will shared resources in space, from satellites and space debris to mining of celestial bodies, be managed? A group of 145 interdisciplinary scholars gathered for a virtual conference Feb. 24-26, 2021 to explore how to solve collective action problems and ensure long-term sustainability of space exploration activities. The recorded conference material can be found <u>here</u>.

Earth Operations Center

Together with collaborators at MIT and NASA, we are creating an earth science research center and collaborative decision-making space to produce an understanding of the planet's complexity through both virtual and physical spaces. This year, the team designed and executed a virtual reality prototype that is now undergoing testing and feedback by researchers and stakeholders.

eLearning in Space

This project seeks to define what methodologies, resources, delivery systems, and technologies will be advantageous to provide an optimum learning environment in space. The team achieved major milestones this year: the creation of a video outlining the limits of <u>communications with</u> Mars, and a set of <u>sci-fi short stories based on</u> the team's work, called Unearthing, describing the formal and informal learning experiences of interplanetary settlers in the year 2057.

Five Senses in Space

Through the Five Senses in Space project, we are designing and developing creative, multisensory products to engage the public around space exploration:

- A large, physical Mars Habitat, in which one can experience what it might be like in the future to "live and work on Mars."
- A set of virtual reality experiences in which one can see and feel what it would be like to walk out of the Mars Habitat and onto the varying terrains of Mars.
- A physical smell engine that mimics the smells one is likely to experience on Mars.

Through these multi-sensory experiences, we have married ideas with scientific discovery to fully immerse people, both physically and/ or virtually, in scenarios that we believe will engender and heighten public support for space exploration.

Mission: Interplanetary

<u>Mission: Interplanetary</u> is a podcast about space exploration. It looks at the big questions, the challenges to overcome, and the opportunities within reach. Astronaut Cady Coleman and scientist/author Andrew Maynard talk to the people working to take us to new worlds. A partnership between the Interplanetary Initiative and Slate, the Mission: Interplanetary team produced a season of eight episodes featuring guests including astrophysicist and bestselling author Katie Mack, the Smithsonian's undersecretary for science and research Ellen Stofan, and former NASA astronaut Mark Brown.



Meta-examination of the Interplanetary Initiative

There are many paths to coordinating resources in support of the exploration and use of interplanetary space. This project examined one of those paths as represented by ASU's Interplanetary Initiative. We built from interviews with Interplanetary members across all levels of the organization, and drew on numerous hours of participant observation in meetings and social interactions within Interplanetary and the broader space community. The first phase of the project focused on examining the culture, structure, and strategy of the Initiative as they relate to its overall mission of, "Helping humanity prepare for its space futures." Additionally, a process of mapping the Initiative within the broader network of global space-related organizations has begun.

Port of Mars

How can we sustain healthy human communities in space? Port of Mars is a game-based science experiment designed to find solutions. Each game produces data to help us build successful societies in space and on Earth. In the past year, the Port of Mars team published results of its pilot study in the International Journal of the Commons, developed a digital, online version of the game to enable larger sample sizes, conducted a series of experiments with the new digital platform--the Mars Madness Tournament--and secured a grant from the National Science Foundation to scale the project.

SpaceWorks

SpaceWorks prepares students for the STEM workforce through team projects in collaboration with NASA. The project won the student collaboration contract for the NASA Discovery Lucy mission, and is setting a new paradigm for effective undergraduate learning.

Project impact by the numbers (2020-2021)



External collaborations.

Projects active this year; 20 total over Interplanetary's four years.

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Disciplines crossing private, government and university sectors.



\$95,000 Interplanetary project

seed funding.

\$538,240 External funding.

Cumulative return on project investments (2017 - 2021)

\$865,000

Interplanetary project seed funding.

ROI 7.5x. \$6.5 Million External funding.

Get involved

If you are interested in pilot project collaboration or funding opportunities, please reach out to Jessica Rousset at jessica.rousset@asu.edu.

Interplanetary Lab

We design, build and test space hardware and software in our space makerspace in collaboration with external partners, ASU faculty and students.

The lab made considerable progress within the last year with active projects including the <u>DORA mission</u>, a cubesat test of a novel laser communications method, and <u>Lightcube</u>, an educational mission allowing people on Earth to interact directly with an orbiting spacecraft.





Get involved

If you're interested in exploring funding opportunities or utilizing the lab's facility, please reach out to Danny Jacobs at <u>dcjacobs2@asu.edu</u> or visit <u>https://interplanetary.asu.edu/Lab</u>.





Future of learning

Our educational endeavors foster student agency and empower learners to become the leaders and collaborative problem solvers of the future.

B.S. in Technological Leadership

Last fall, we launched our three-year, workforcefacing Bachelor of Science in Technological Leadership. In addition to providing on-the-job work experience through internships, the degree provides students with essential skills in critical thinking and problem solving, collaboration and teamwork, communication, coding, math, and the foundations of leadership to drive innovation and effectiveness in the workplace. We're delighted to have 45 students enrolled at the end of our first year, and we look forward to welcoming more in the fall. This summer, our students will experience their first internship placements at companies including American Express, Salt River Project, Arizona's largest utilities company, and Perfect Storm Media.

OpenCitizen

OpenCitizen is a network of teams built around a shared desire to address important local problems.

People of all ages are invited to join groups of peers from their local communities to work on a project, community challenge, or academic topic that matters to them. Using a facilitated, openinquiry process, teams identify local community needs, research them, and plan and follow through with meaningful action. The program also offers a pathway for participants to earn ASU credit for skills mastered along the way.

Collaborators

OpenCitizen is a collaboration among ASU's Learning Enterprise, dedicated to lifelong learners, Beagle Learning, which provides endto-end programs for running real-world learning experiences, and the Interplanetary Initiative. In addition, OpenCitizen is being piloted in collaboration with the Zuckerberg Institute, the ASU Office of Applied Innovation, Mesa Public Schools, Edmonds College, CSU Fresno, Illinois State, and WSU Tech.

Get involved

If you are interested in launching an OpenCitizen team, or learning more about our learner-led structure, please reach out to Katherine McConachie at <u>kmcconachie@asu.edu</u>

Industry solutions

We connect ASU students and faculty with corporate partners to address real-world industry problems and deliver rapid, scalable results.

Workforce development

We're building partnerships for workforce development and continuing education. Whether you're looking to co-create skill-development courses or access ASU undergrads for internships, we welcome new collaborations to enhance future workforce training and learning.

Become a sponsor

Share our passion to advance human space futures by becoming a valued sponsor. Your company will be immersed in our community of ASU students, faculty, and space experts.

To get involved, contact Jessica Rousset at jessica.rousset@asu.edu.

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Our team is built on character, rooted in deliberation, and energized through action. Respect, curiosity, and inclusivity drive our culture and the space futures we seek to create.

Team

Michael Crow ASU President Co-chair, ASU Interplanetary Initiative

Lindy Elkins-Tanton Vice President and Co-chair, ASU Interplanetary Initiative Principal Investigator, NASA Psyche mission Co-founder, Beagle Learning

William Campbell Interaction Designer

Laura Craft Business Operations Specialist

Lance Gharavi Associate Director

Daniel Jacobs Associate Director

Catherine Johnston Project Management Assistant

Amanda Koeller Academic Financial Specialist

Katherine McConachie Director of Learning

Alex Minotto Student Assistant

Jessica Rousset Deputy Director

Sona Seely Executive Assistant

Evgenya Shkolnik Associate Director

Eric Stribling Instructional Professional

Taryn Struck Manager of Marketing and Publicity

Joshua Thompson Academic Success Coordinator

Abigail Weibel Project Coordinator

Advisory Board

Lisa B. Callahan Vice President and General Manager of Commercial Civil Space, Lockheed Martin Space

Rejane Cantoni Interactive Installation Artist

Tracy Drain Flight Systems Engineer, Jet Propulsion Laboratory

Tanja Masson-Zwaan President, Emerita of the International Institute of Space Law (IISL)

Rob Meyerson Aerospace Consultant

Amy Salzhauer Founder and Managing Partner, Good Growth Capital

Jessy Kate Schingler Founder and Chief Policy Analyst, Open Lunar Foundation

John Thurmond Principal Advisor, Hess

Lab

Matthew Atkins Student Lab Lifeguard

Joe DuBois Special Projects Engineer

Chandler Hutchens Student Lab Lifeguard

Christopher McCormick Student Lab Lifeguard

Amisha Patel Student Lab Lifeguard Graduate

Pawan Vijayanagar Student Lab Lifeguard Graduate



Celebrating our team member's achievements

Lindy Elkins-Tanton was elected to the <u>National</u> <u>Academy of Sciences</u> for her distinguished and continuing achievements in original research in planetary science.



Amanda Koelle earned her Lean Six Sigma Yellow Belt.

Josh Thompson was invited as a guest speaker for After the Election: What's next for the Supreme Court and the LGBTQ+Community?, Improving Inclusion Efforts by Articulating Hidden Curriculum and More to Explore: The Future of Work. **Eric Stribling** published an article in the SFRA Review: Librarians of a Vampire: Fighting against Hegel's dialectic narrative of colonialism and slavery, and was selected as a Recovering Truth graduate fellow for the 2021-22 academic year. He also presented research on engineering professionals' environmental and social values at the Engineering Change Lab - USA Summit 12.

Abigail Weibel earned her Certified Associate in Project Management (CAPM) and Certified Scrum Master (CSM).





ooking ahead

A glimpse into the future

We envision an interplanetary future that empowers people to see their place in the universe and inspire a greater sense of stewardship of the Earth and our fellow humans. A future where more diverse groups of people connect to, shape, and access space exploration and habitation.

Empowering individuals

We will expand our learning programs to help more diverse communities identify and solve problems that they see around them, starting with the launch of the OpenCitizen Project.

Broad societal participation

We will create new projects and partnerships, such as our collaboration with XPRIZE, that aim to engage and enable broader societal participation in space exploration and habitation.



Thank you for your support

We are creating one possible vision for the New American University, and this venture will help keep ASU at the forefront of both the space enterprise, and of innovation in education.

To learn more about how you can get involved with the Interplanetary Initiative, please visit Interplanetary.asu.edu or click here to subscribe.

ASU Interplanetary Initiative is a unit of ASU Knowledge Enterprise.

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