

# Blended Worlds: Experiments In Interplanetary Imagination

09.21.2024 –  
01.04.2025

Presented at  
Brand Library  
& Art Center

- |  |   |   |  |  |   |   |
|--|---|---|--|--|---|---|
| 001. Mars Daylight Savings             | 030. Gravity Wave Tool Set              | 059. Planetary State of Mind                  | 080. Vintage Designer Microbes (Paleo Diet)                      | 100. Color Kit: The Comforting Glow Earth Lava             | 125. Extremophile Citizenship   | 141. Gratitude Maps                                     |
| 002. Space Agency "Boredom" Kit        | 031. Heat Shield for Boredom            | 060. Seismic Perception                       | 081. Improved Human-to-Machine Interface                         | 101. Sound Artifacts                                       | 126. Just Listen  | 142. Lifesaver  |
| 003. Mars Sensor                       | 032. Mars Surface Use                   | 061. Earthquake Resistant Hammock             | 082. Association of Martian Artisans                             | 102. Off-World Camping                                     | 127. The Big Unknown  | 143. Microbiome Detection: The Future of Pheromones     |
| 004. Birds from a Different Forest     | 033. Star Field Fingerprints            | 062. An Underwater Hotel                      | 083. Deep Space University                                       | 103. Mars Dune Scouts                                      | [ ]   | 144. Survivor Helper & Mars Interior Decor              |
| 005. Understanding the Blue            | 034. Mars Surface Use                   | 063. The Pollinators of Mars                  | 084. The First Mars Hummingbird                                  | 104. Human Perception via Mission Telemetry                | [ ]   | 145. Catalog of Forest Languages & Chemical Expressions |
| 006. Low Gravity Performance Training  | 035. Mars Surface Use                   | 064. Mars Surface Use                         | 085. Interplanetary Duty-Free Store                              | 105. Gravity Neutral Wellness Zones                        | [ ]   | 146. Exoplanet Stain Remover                            |
| 007. Space Agency "Boredom" Kit        | 036. Proud to be Human                  | 065. Memories of the Earth                    | 086. Solar System Protection Treaty                              | 106. Self-Constructing Growing Mechanisms                  | [ ]   | 147. Library of Possibilities                           |
| 008. The Future of Earth Emergence     | 037. Mars Surface Use                   | 066. "Skills" for Mars                        | 087. Gold Fecal Bank   | 107. Maasai Cosmology                                      | [ ]   | 148. Awe Container (With Lock)                          |
| 009. Interspecies Rights               | 038. Mars Surface Use                   | 067. Blue Sunset Walks                        | [ ]  | 108. What will we become?                                  | 128. Music that Reflects the System's Change                                | 149. "Distance Problem" The Band                        |
| 010. The Future of Earth Emergence     | 039. Mars Surface Use                   | 068. "Skills" for Mars                        | [ ]  | 109. Ancient Echoes: Soundscapes Across Worlds             | 129. Collective Wisdom (Banking Card)                                       | 150. Time Sync Device For People on Different Planets   |
| 011. Awe Container                     | 040. Mars Surface Use                   | 069. Planetary Governance                     | [ ]  | 110. Thermal Moonquake Recording (Sensory Sharing)         | 130. Multi-Species Explorer: Dog Astronauts                                 | 151. Gloves to Feel The Lumpiness                       |
| 012. Jovian Storm Chasers              | 041. Specialized Microbial Diets        | 070. The Human Gut While Living on the Moon   | [ ]  | 111. Multi-Sensory Exploration                             | 131. Finding the Joy in Human Density                                       | 152. Interspecies Affinity Workshops                    |
| 014. Atmosphere Habitats               | 042. Microbiome Travel Kits             | 071. Skin as a Tool                           | [ ]  | 112. Artificial Emotional Intelligence                     | 132. AR Assistance: Overlays  | 153. Consciousness in Landscapes                        |
| 014. Space Station                     | 043. Space Station                      | 072. Connecting With Impossibly Remote Places | [ ]  | 113. In Praise of Mystery                                  | 133. Water Words  | 154. Interplanetary Customs and Biosecurity Checkpoints |
| 015. Space Station                     | 044. Mars Surface Use                   | 073. Radiation Umbrellas                      | 088. Provocation Ruler for Close-Quarter Travel                  | 114. Rocks as Enlightened Mentors                          | 134. Connectedness Coaching   | 155. Human/Robot Counseling                             |
| 016. Space Station                     | 045. Earth Spillover                    | 074. Space Station Graffiti: "Zero-G 4EVA"    | 089. Wear a River  | 115. Earth Embassy: Level 5                                | 135. Living in Darkness On Purpose  |   |
| 017. Today, I'm a Tree                 | 046. Mars Surface Use                   | 075. Mars Farmer's Market: "Eat Local"        | 090. Team Flow Teams Live/Feed/Brain Sync                        | 116. Robotic Companion for Extreme Joyfulness              | 136. Martian Gift Plant (Ball Jar)  |   |
| 018. A Puberty                         | 047. Seeing Through the Eyes of a Rover | 076. Interplanetary Student Exchange          | 091. Haptic Systems for Time Sensitive Data                      | 117. 1027 Words for Rain                                   | 137. Cognitive Echoes & Brain Synchronization                               |   |
| 019. Brain Sync with                   | 048. Mars Surface Use                   | 077. Earth Phases from the Moon               | 092. Conversation with a Star                                    | 118. Interplanetary Internet of Trees (Earth Wisdom)       | 138. Regional Emotion Packs   |   |
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| 021. Brain Sync with                   | 050. Sentient Materials                 | 079. Interstellar Soundings                   | 094. Induction Ceremony to Become a Crewmate for Spaceship Earth | 120. "We" Pluralized Identity                              | 140. Telling Stories of Humanity Billions of Light Years Away With Textiles |   |
| 022. 4D Photogrammetry                 | 051. Wingsuit Flying on Titan           | [ ]   | 095. Second Language School for Animals and Nature               | 121. Unauthorized Interplanetary Transport                 | [ ]   |   |
| 023. Martian Regolith Wedding Vase     | 052. Extremophile Passports             | [ ]   | 096. Cosmic Synesthesia (Sensory Salads)                         | 122. Cosmic Empathy Counseling: Conversation with the Moon | [ ]   |   |
| 024. Bespoke Family Futures            | 053. Organ Donor for Robots             | [ ]   | 097. New Holidays Based on Planetary Alignment                   | 123. Supernova Insurance Policies                          | [ ]   |   |
| 025. Dress for the Moon: Tips & Tricks | 054. Catalog of Human Motivations       | [ ]   | 098. VITALIS ECSTASIS  | 124. Whales from Other Worlds                              | [ ]   |   |
| 026. The present wind                  | 055. Association of Earthlike Planets   | [ ]   | 099. Data Baths & Nuance Candles                                 |  | [ ]   |   |
| 027. Cosmic Connectedness              | 056. 7 Minutes of Terror                | [ ]   |  |  | [ ]   |   |
| 028. Brain Sync Off Switch             | 057. Press the Red Button               | [ ]   |  |  | [ ]   |   |
| 029. Love Letter to the XO Planets     | 058. Sensory Mementos                   | [ ]   |  |  | [ ]   |   |



ART & SCIENCE COLLIDE



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Experience a universe of blended worlds, where the line between 'what if' and 'what is' blurs, and where it's possible to be in more than one place at a time. *Blended Worlds: Experiments In Interplanetary Imagination* explores the landscape of human relationships with our ever-expanding environment. Through a series of art + science collaborations, this exhibit questions how empathy and connectedness can both reveal new worlds and inspire innovative ways to nurture them.

*Blended Worlds: Experiments In Interplanetary Imagination* was developed by the Jet Propulsion Laboratory (JPL), an operating division of Caltech and a Federally Funded Research and Development Center for NASA, in collaboration with the City of Glendale. JPL acknowledges the generous support of the Glendale Arts and Culture Commission and the Glendale Library, Arts & Culture Trust.

This exhibit is among more than 70 exhibitions and programs presented as part of PST ART. Returning in September 2024 with its latest edition, PST ART: Art & Science Collide, this landmark regional event explores the intersections of art and science, both past and present. PST ART is presented by Getty. For more information about PST ART: Art & Science Collide, please visit [pst.art](http://pst.art)



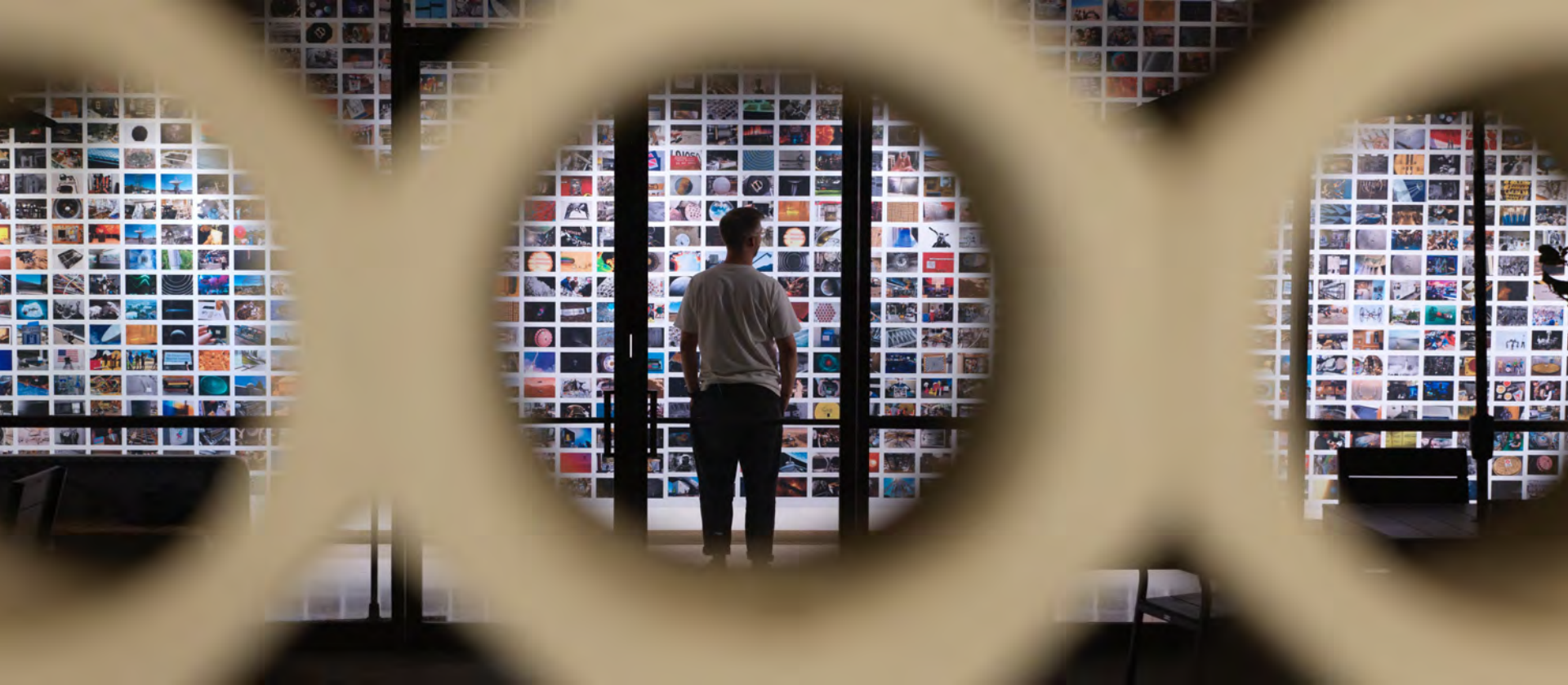
**JPL**

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*“Blended Worlds* is about questions—  
questions take you deeper in the same  
way that breathing takes you deeper.”

Craig Joiner



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**“There is nothing in a caterpillar that tells you  
it’s going to be a butterfly.”**

Buckminster Fuller

This collection of experiments was developed by a multidisciplinary team of artists, scientists, technologists, designers, and other curious minds to reimagine our place in the cosmos and create new relationships with the natural world, from Earth to distant galaxies and potential life beyond.

This catalog contains the processes and reflections of the teams that collaborated to enable the experiments featured in the exhibit. We hope the research and experimentation within this collection will serve as a catalyst, inspiring everyone to create their own experiments so that, as a species, we can become more imaginative in shaping positive futures built on foundations of greater connectedness with Earth, all life, and the cosmos.

Blended Worlds Research Team

### How to Know Everything: Vocabulary for an Expanding World

Dr. Lois Rosson, Historian, NASA History Office & Octavia E. Butler Fellow, 2023-24, Huntington Library

In English, the verb “to know” covers such a vast territory that other languages often split it into different words. In German, the verb “wissen” refers to knowledge of information, the way you might know a telephone number, or memorize the capitals of different countries. The word’s counterpart, “kennen,” refers to the type of knowledge you gain after experiencing something directly. If a nice cup of coffee is described as having notes of citrus or hazelnut, it’s much easier to understand that explanation if you’ve eaten those things before.

*Blended Worlds*, developed by NASA’s Jet Propulsion Laboratory in collaboration with Caltech, the City of Glendale Library, Arts & Culture department, Glendale Arts and Culture Commission and the Glendale Library, Arts & Culture Trust, is composed of a series of thought experiments designed to help us explore how we know unfamiliar subjects. How might the experience of something alien be different from reading information about it? The exhibition asks viewers to contemplate new ways of connecting to other entities—other people, other species, other planets.

Another way to think of *Blended Worlds* is as a set of experiments in empathy. Would feeling all of Earth’s seismic activity as a physical sensation help us think of it as a singular entity? Can watching Martian wind breeze through a field of mechanical wheat help us imagine ancient planetary ecosystems? Does using a living, breathing, human as an avatar in a video game change how we play?

An equally pressing question might be: but what does empathy have to do with science? Here linguistics can help once again. In the early twentieth century, “empathy” referred not just to familiarity with the emotional conditions of other people, but with the sensation of using one’s own experiences to

inhabit a separate entity or phenomenon more fully. In other words, to see a bird cutting through the sky and imagine yourself soaring overhead.

One of *Blended Worlds*' most ambitious interventions is casting empathy as a form of data collection. Data can be understood most simply as a set of values that convey information about something else, like a database tracking holiday spending or an Excel sheet with fluctuating weather measurements. As a noun, data can also be thought of as an action that refers to the passage of information from one entity to another: data is information about a subject made legible to someone (an individual observer) or something else (an algorithm, a team of scientists).

*Blended Worlds* proposes a radical rethinking of scientific and creative collaboration. What if "data"—a principle located squarely in the realm of numerical quantification—and empathy, a domain of human emotion, were part of the same perceptual phenomenon? What if bolstered connectedness helped us do better science?

To answer these questions, this exhibition reframes artistic practice as a research methodology relevant to the production of new knowledge. Installations at Brand Library & Art Center function as thought experiments prompting visitors to explore the different ways scientific data can be made legible.

Reframing empathy as symbiotic with the scientific process—instead of as antithetical to impartial documentation—can lead to fresh interpretations of old problems. For example, when reflecting on recent oceanographic research into melting glaciers, Josh Willis lamented that he hadn't personally experienced the landscapes of Greenland before designing a research proposal to study it. In his estimation, reframing information about ocean warming to emphasize sensation on a planetary scale, would have helped him ask more creative questions about how global temperatures are changing.

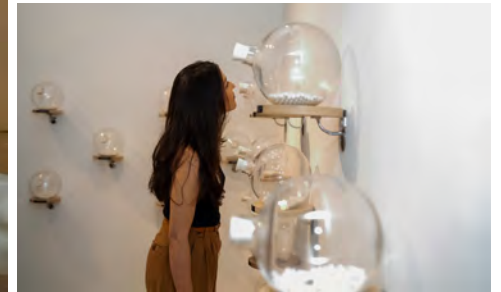
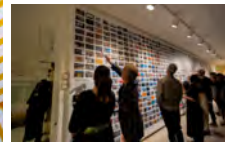
*Blended Worlds* asks how empathy can function as a tool for approaching new scientific subjects, building towards a greater theory of how science might help foster deeper connections with others. The "Belongingness Hypothesis," articulated by psychologists Baumeister and Leary in 1995, asserts that people have an almost universal need to form and maintain at least some degree of interpersonal relationships with other humans. This theory views belongingness as an innate quality with an evolutionary basis and clear survival and reproductive benefits. *Blended Worlds* takes this one step further, using empathy to build belongingness with both humans and the natural world.

A goal of the exhibition is to prompt visitors who attend the show expecting a meditation on space travel at the level of the individual explorer to walk away considering how human interdependence can sharpen scientific achievement. Depictions of space exploration, both pictorial and conceptual, have historically borrowed from the vocabulary of colonial expansion. Descriptions of future space settlements often resemble the agrarian outposts of the New World or American Frontier, modeling space exploration after the scientific expeditions of earlier centuries.

*Blended Worlds* offers an alternative blueprint for asking questions about the universe instead of reiterating space as a type of empty landscape that calls humanity to settle its horizons. This alternative to frontier narratives is similar to and inspired by depictions of humanity's extension into space as articulated in Afrofuturism, especially in the work of Octavia E. Butler. In Butler's oeuvre, the worthiest frontier of exploration is always the interiority of those around you, in the service of building stronger communities.

If one is to imagine the entire solar system as an extension of nature, how does that reframe how we relate to our home planet? By emphasizing belonging and connectedness, this exhibition hopes to prompt more responsible stewardship of Earth—and universe—by rethinking traditional scientific methodologies and emphasizing creative ways of knowing.







# Experiments In Interplanetary Imagination

This exhibit uses art + science experimentation to explore the landscape of human relationships with our ever-expanding environment. We invite you to explore with us and question how empathy and connectedness can both reveal new worlds and inspire innovative ways to nurture them.

This collection of experiments was created by a multidisciplinary team of artists, scientists, technologists, designers, and other creatives to reimagine our place in the cosmos and explore new relationships with the natural world, from distant galaxies and potential life on other planets to some experiments from this list have been selected for this gallery, while others are for you to explore at home. Please consider which experiments you would like to bring to life and how the process might unfold.

001. Mars Daylight Sings	018. A.I. Puberty	036. Proud to be Human	053. Extraterrestrial Passports	070. Planetary Governance	087. Solar System Protection Treaty	105. Human Perspiration via Mission Telemetry	122. Unauthorized Interplanetary Transport	139. Cognitive Ethics & Brain Synchronization	157. Human/Robot Counseling
002. "Sense of Agency" Stimulator	019. Anti-Stress Odor	037. Turn the Galaxy into a Musical Instrument	054. Organ Donor for Robots	071. The Human Gut While Living on the Moon	088. Gold Fossil Bank	106. Gravity Neutral Wellness Zones	123. Cosmic Empathy Countering Conversation with the Moon	140. Regional Emotion Packs	158. 4th Grade on Proxima B
003. Tattoos as Magnetic Field Sensors	020. Brain Sync with a Former Version of Yourself	038. Extraterrestrial Gangs & Microbial Subcultures	055. Catalog of Human Motivations	072. Skin as a Tool	089. Precavation Rules for Close-Quarter Travel	107. Self-Constructing Growing Mechanisms	124. Supermove Insurance Policies	141. Undeniable Sincerity	159. Subtle Transition to Hyperdrive (Test 5)
004. Birds from a Crimson Forest	021. The New Formation of Languages	039. The Kinobird Quilt	056. Association of Earthlike Planets	073. Connecting with Impossibly Remote Places	090. Wear a River	108. Massal Cosmology	125. Whales from Other Worlds	142. Telling Stories of Humanity Billions of Light Years Away With Textiles	160. Intellectual Humility
005. Decentralizing the Human	022. 4D Photogrammetry	040. <b>Parade of a Sense</b> Lead Investigator: Artist Moon Ribas	057. 7 Minutes of Terror	074. Radiation Umbrella	091. Team Flow Teams: Live Feed Brain Sync	109. Ancient Echoes: Soundscapes Across Worlds	126. Extraterrestrial Citizenship	143. <b>Lifesever</b> Lead Investigator: Artist Erika Ippolito	161. Enceladus Spawning
006. Low Gravity Performance Training	023. <b>Marian Regolith Wedding Vase</b> Lead Investigator: Creative Technologist: Libeth B. De La Torre, JPL	041. Gravity Wave Tool Set	058. <b>Sensory Mementos</b> Lead Investigator: Artist Shane Myrbek	075. Space Station Graffiti: "Zero-G 40in"	092. Health Systems for Time Sensing of Data	110. <b>Geomagnetic Sunsets On K2-18 b</b> Lead Investigator: Visual Strategist: Christy Stevens, JPL	127. Just Listen	144. Gratitude Maps	162. Quantum Teleportation
007. Sound as a Vehicle	024. Bespoke Family Futures	042. Specialized Microbial Dims	059. <b>Press the Red Button</b> Lead Investigator: Artist Moon Ribas	076. Mars Farmer's Market, "Eat Local"	093. Conversation with a Star	111. Thermal Memory Processing: Sharing	128. <b>Unknown Investigator: Interplanetary</b>	145. Microbiome Detection: The Future of Phenomena	163. <b>The Golden Record Cover NASA/JPL</b>
008. <b>The Texture of Emergence</b> Lead Investigator: Artist: Darel Carey	025. Dress for the Moon: <b>Dark Space</b>	043. Microbiome Travel Kit	060. <b>Seismic Perception Score</b> Lead Investigator: Artist: Moon Ribas	077. Interplanetary Student Exchange	094. Induction Ceremony to Reinvigorate a Community for Geoscientific Earth	112. Multi-Sensory Perception	129. <b>Survival</b>	146. Survival Helper & Mars Interior Decor	164. Dark Matter Navigation
009. Interspecies Rights	026. <b>Off Switch</b>	044. Space Station Reengineering	061. Planetary State of Mind	078. Earth Phases from the Moon	095. Second Language School for Animals and Nature	113. <b>In Praise of</b>	130. <b>Library of Possibilities</b> Lead Investigator: Futurist: Brent Candy	147. Caring of Forest Landscapes & Chemical Expressions	165. Psycho-Spatial Gifting
010. The 60th Sense	027. <b>Astroglyphs</b> Lead Investigator: Visual Strategist: David B. Levin Visual Strategist: Thomas Guffee	045. Space Station Reengineering	062. Extraterrestrial Bionics	079. <b>Interstellar Soundings</b> Lead Investigator: Artist: Shane Myrbek Artist: Saskia Wilson-Brown	096. Cosmic Synthesis (Sensory Sebaste)	114. <b>Artificial Intelligence</b>	131. <b>VITALIS ECSTASIS</b> Lead Investigator: Artist: Victoria Modesta	148. <b>Supralunar Stain Remover</b>	166. <b>Sentient Spacecraft</b>
011. <b>001</b>	028. <b>Off Switch</b>	046. Testing Atmospheres	063. An Underwater Hotel	080. Scent to Enhance Non-Tangible Connection	097. <b>VITALIS ECSTASIS</b> Lead Investigator: Artist: Victoria Modesta	115. <b>Artificial Intelligence</b>	132. <b>Space Container (with Lock)</b>	149. <b>Artificial Intelligence</b>	167. Low Orbit Waste Management
012. "Jovian Storm Chasers"	029. <b>Off Switch</b>	047. Humankind Invented Vision Glasses	064. An Underwater Hotel	081. Village Designer Microbes (Paper Dots)	098. New Holidays Based on Planetary Alignment	116. <b>Artificial Intelligence</b>	133. <b>Space Container (with Lock)</b>	150. <b>"Artificial Intelligence Problem,"</b> a Band	168. <b>Artificial Intelligence</b>
013. Atmospheric Habitats	030. <b>Off Switch</b>	048. Seeing Through the Eyes of a Rooster	065. "Can I Eat That?" Resourcefulness Device	082. Improved Human-to-Machine Interface	100. Data Baths & Nuisance Candles	117. <b>Artificial Intelligence</b>	134. <b>Space Container (with Lock)</b>	151. <b>"Artificial Intelligence Problem,"</b> a Band	169. <b>Artificial Intelligence</b>
014. Moon Water	031. <b>Off Switch</b>	049. Wearable Plasma Scrubbers	066. Memories of the Color Green	083. Association of Martian Artisans	101. Color Kit: The Comforting Glow of Earth Land	118. <b>Artificial Intelligence</b>	135. <b>Space Container (with Lock)</b>	152. <b>"Artificial Intelligence Problem,"</b> a Band	170. <b>Artificial Intelligence</b>
015. Interplanetary Hepatic Systems	032. <b>Off Switch</b>	050. Talking to Microbes	067. Social Skills for Robots	084. Deep Space University	102. Sound Artifacts	119. <b>Artificial Intelligence</b>	136. <b>Space Container (with Lock)</b>	153. <b>"Artificial Intelligence Problem,"</b> a Band	171. <b>Artificial Intelligence</b>
016. Forest Starters & Ecosystem Bots	033. <b>Off Switch</b>	051. Sentient Materials	068. Blue Sunset Walks	085. The First Mars Hummingbird	103. Off-World Camping	120. <b>Artificial Intelligence</b>	137. <b>Space Container (with Lock)</b>	154. <b>"Artificial Intelligence Problem,"</b> a Band	172. <b>Artificial Intelligence</b>
017. Today, I'm a Tree	034. <b>Off Switch</b>	052. Wingsoft Flying on Titan	069. "This Human Moment" The Zero-G Musta	086. Interplanetary Duty-Free Store	104. Mars Dune Sounds	121. <b>Artificial Intelligence</b>	138. <b>Space Container (with Lock)</b>	155. <b>"Artificial Intelligence Problem,"</b> a Band	173. <b>Artificial Intelligence</b>

# How might empathy reshape the ways we relate to nature?

## Blended Worlds: Experiments In Interplanetary Imagination

“Our aspiration is to benefit humanity through these experiments and allow a brighter future to emerge from small shifts within our inner worlds.”

David Delgado | Cultural Strategist

Lead Investigator:  
David Delgado

*Blended Worlds: Experiments In Interplanetary Imagination* explores the landscape of human relationships with our ever-expanding environment. Through a series of art + science collaborations, this exhibit questions how connectedness and empathy can both reveal new worlds and inspire innovative ways to nurture them. This project invites us to consider the impact of greater connectedness with nature, and its ability to foster a renewed sense of wonder and curiosity with our planet and the cosmos.

**Top Right:**  
The Blended Worlds Team at JPL

**Bottom Right:**  
Dan Goods, Manager of DesignLab Studio & David Delgado



001.	Mars Daylight Savings	023.	Martian Regolith Wedding Vase	044.	Space Station Beekeeping	066.	Memories of the Color Green
002.	“Sense of Agency” Stimulator		Lead Investigator: Creative Technologist: Lizbeth B. De La Torre, JPL	<b>045.</b>	<b>Earth Speaks</b>	067.	Social Skills for Robots
003.	Tattoos as Magnetic Field Sensors				<b>Lead Investigators: Creative Technologist: Lizbeth B. De La Torre, JPL Poet Laureate, City of Glendale: Raffi Joe Wartanian</b>	068.	Blue Sunset Walks
004.	Birds from a Crimson Forest	024.	Bespoke Family Futures	046.	Tasting Atmospheres	069.	This Human Moment The Zero -G Musical
005.	Decentralizing the Human	025.	Dress for the Moon: Tips & Tricks			070.	Planetary Governance
006.	Low Gravity Performance Training	<b>026.</b>	<b>tele - present wind</b>	047.	Homemade Inverted Vision Glasses	071.	The Human Gut While Living on the Moon
007.	Sound as a Vehicle		<b>Lead Investigator: Artist: David Bowen</b>	048.	Seeing Through the Eyes of a Rover	072.	Skin as a Tool
<b>008.</b>	<b>The Texture of Emergence</b>	027.	Cosmic Connectedness	049.	Wearable Plasma Scrubbers	073.	Connecting With Impossibly Remote Places
	<b>Lead Investigator: Artist: Darel Carey</b>	028.	Brain Sync Off Switch	050.	Talking to Microbes	074.	Radiation Umbrellas
009.	Interspecies Rights	<b>029.</b>	<b>A Love Letter to the XO Planets</b>	051.	Sentient Materials	075.	Space Station Graffiti, “Zero -G 4EVA”
010.	The 60 <sup>th</sup> Sense		<b>Lead Investigator: Artist: Bruce Mau</b>	052.	Wingsuit Flying on Titan	076.	Mars Farmer’s Market, “Eat Local”
<b>011.</b>	<b>Astroglyphs</b>	030.	Gravity Wave Tool Set	053.	Extremophile Passports	077.	Interplanetary Student Exchange
	<b>Lead Investigators: Visual Strategist: David B. Levine, JPL Visual Strategist: Thomas Gottelier, JPL</b>	031.	Heat Shield Lunch Boxes	054.	Organ Donor for Robots	078.	Earth Phases from the Moon
012.	Jovian Storm Chasers	032.	Martian Treehouse	055.	Catalog of Human Motivations	<b>079.</b>	<b>Interstellar Soundings</b>
013.	Atmosphere Habitats	033.	Star Field Fingerprints	056.	Association of Earthlike Planets		<b>Lead Investigators: Artist: Shane Myrbeck Artist: Saskia Wilson -Brown</b>
014.	Moon Water	034.	Edible Shelters	057.	7 Minutes of Terror	080.	Scent to Enhance Non - tangible Connection
015.	Interplanetary Haptic Systems	035.	Lost & Found for Bots	<b>058.</b>	<b>Sensory Mementos</b>	081.	Vintage Designer Microbes (Paleo Diet)
016.	Forest Starters & Ecosystem Bots	036.	Proud to be Human		<b>Lead Investigators: Artist: Shane Myrbeck Artist: Saskia Wilson -Brown</b>	082.	Improved Human - to - Machine Interface
017.	Today, I’m a Tree	037.	Turn the Galaxy into a Musical Instrument	059.	Press the Red Button	083.	Association of Martian Artisans
018.	A.I. Puberty	038.	Extremophile Gangs & Microbial Subcultures	<b>060.</b>	<b>Seismic Percussion Score</b>	084.	Deep Space University
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020.	Brain Sync with a Former Version of Yourself	<b>040.</b>	<b>Burial of a Sense</b>	061.	Planetary State of Mind	085.	Interplanetary Duty - Free Store
021.	The Formation of Languages		<b>Lead Investigator: Artist: Moon Ribas</b>	062.	Extraterrestrial Biomes	086.	Solar System Protection Treaty
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		042.	Specialized Microbial Diets	064.	Robotic Pollinators	088.	Provocation Ruler for Close - Quarter Travel
		043.	Microbiome Travel Kits	065.	“Can I Eat That?” Reassurance Device		

089.	Wear a River	111.	Thermal Moonquake Recording (Sensory Sharing)	133.	Finding the Joy in Human Density	153.	Gloves to Feel The Lumpiness
090.	Team Flow Teams Live Feed/Brain Sync	112.	Multi-Sensory Exploration	<b>134.</b>	<b>Water Words</b>	154.	Interspecies Affinity Workshops
091.	Haptic Systems for Time Sensing Data	<b>113.</b>	<b>In Praise of Mystery</b>		<b>Lead Investigators: Producer: Preston Dyches, JPL</b>	155.	Consciousness in Landscapes
<b>093.</b>	<b>Geomagnetic Sunsets On K2 - 18 b</b>		<b>Lead Investigator: United States Poet Laureate: Ada Limón</b>		<b>Visual Strategist: Dan Goods, JPL</b>	156.	Interplanetary Customs and Biosecurity Checkpoints
	<b>Lead Investigator: Visual Strategist: Chrissy Stevens, JPL</b>	114.	Artificial Emotional Intelligence	135.	AR Assistance Overlays	157.	Human/Robot Counseling
094.	Conversation with a Star	115.	Rocks as Enlightened Mentors	136.	Connectedness Coaching	158.	4 <sup>th</sup> Grade on Proxima b
095.	Induction Ceremony to Become a Crewmate for Spaceship Earth	116.	Earth Embassy at L5	137.	Living in Darkness On Purpose	159.	Subtle Transition to Hyperdrive (Test 1)
096.	Second Language School for Animals and Nature	117.	Robotic Companion for Extreme Joyfulness	138.	Martian Gift Plant (Bell Jar)	160.	Intellectual Humility
097.	Cosmic Synesthesia (Sensory Salads)	118.	1027 Words for Rain	139.	Cognitive Echoes & Brain Synchronization	161.	Enceladus Spelunking
<b>098.</b>	<b>VITALIS ECSTASIS</b>	119.	Interplanetary Internet of Trees (Earth Wisdom)	140.	Regional Emotion packs	<b>162.</b>	<b>The Golden Record Cover NASA/JPL</b>
	<b>Lead Investigator: Artist: Viktoria Modesta</b>	120.	Sensory Expansion Kits	141.	Undeniable Sincerity	164.	Dark Matter Navigation
099.	New Holidays Based on Planetary Alignment	121.	“We” Pluralized Identity	142.	Telling Stories of Humanity Billions of Light Years Away With Textiles	165.	Psycho - Spatial Gifting
100.	Data Baths & Nuance Candles	122.	Unauthorized Interplanetary Transport	<b>143.</b>	<b>Lifesaver</b>	166.	Sentient Spacecraft
101.	Color Kit: The Comforting Glow Earth Lava	123.	Cosmic Empathy Counseling: Conversation with the Moon		<b>Lead Investigator: Artist: Ekene Ijeoma</b>	167.	Low Orbit Waste Management
102.	Sound Artifacts	124.	Supernova Insurance Policies	144.	Gratitude Maps	168.	Asteroid Geocaching
103.	Off-World Camping	125.	Whales from Other Worlds	145.	Microbiome Detection: The Future of Pheromones	169.	Bio-Mechanical Symbiosis
104.	Mars Dune Scouts	126.	Extremophile Citizenship	146.	Survivor Helper & Mars Interior Decor	170.	Nano Planets
105.	Human Perception via Mission Telemetry	127.	Just Listen	147.	Catalog of Forest Languages & Chemical Expressions	171.	Technosignature Archeology
106.	Gravity Neutral Wellness Zones	<b>128.</b>	<b>The Big Unknown</b>	148.	<b>Library of Possibilities</b>	172.	Looking for Wormholes
107.	Self-Constructing Growing Mechanisms		<b>Lead Investigator: Visual Strategist: Dan Goods, JPL</b>		<b>Lead Investigator: Futurist: Stuart Candy</b>	173.	Secret Order of Dark Matter and Dark Energy
108.	Maasai Cosmology	129.	Inner Space Exploration			<b>174.</b>	<b>Earth Data: The Musical at the Alex Theatre</b>
<b>109.</b>	<b>Ancient Echoes: Soundscapes Across Worlds</b>	130.	Music that Reflects the Systems Change				<b>Lead Investigator: Creative Lead: Brian Brophy</b>
	<b>Lead Investigator: Artist/Astrophysicist: Annette S. Lee</b>	131.	Collective Wisdom (Banking Card)	149.	Exoplanet Stain Remover		
110.	What will we become?	132.	Multi-Species Explorers: Dog Astronauts	150.	Awe Container (With Lock)		
				151.	“Distance Problem” The Band		
				152.	Time Sync Device For People on Different Planets		

# How might complexity emerge from simplicity?

## The Texture of Emergence

“Complex things are just arrangements of simple things. My art emulates this idea by arranging lines in a consistent manner to create something greater than the sum of its parts: form, curvature, and depth.”

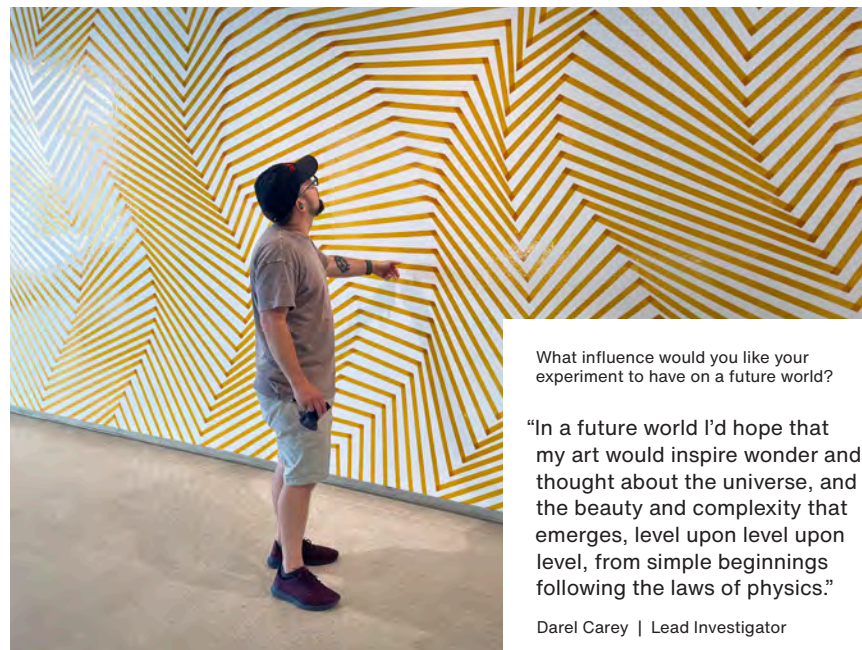
Darel Carey | Lead Investigator

Darel Carey uses Kapton Tape, a material common in NASA spacecraft, to create a mural from lines of tape. A single line is simple, but when combined with others precisely in a consistent manner, something more complex emerges that is greater than the sum of its parts. Carey’s organic creation process is key, reflecting emergent properties in nature, like organisms from cells or consciousness from the brain.

Multiple lines arranged in particular ways can bring about the perception of depth and curvature, even if individually they possess neither of these traits. Carey’s approach balances attention to detail and the bigger picture, allowing the work to naturally develop its intricate forms.

Lead Investigator:  
Artist: Darel Carey

**Right:**  
Darel Carey installing  
*The Texture of Emergence*



What influence would you like your experiment to have on a future world?

“In a future world I’d hope that my art would inspire wonder and thought about the universe, and the beauty and complexity that emerges, level upon level upon level, from simple beginnings following the laws of physics.”

Darel Carey | Lead Investigator



# How do we help bridge a 140,000,000 mile divide? And what happens when we do?

## tele-present wind

“Collaborating with JPL on this project has given me the opportunity to greatly expand the scale of the work off planet.”

David Bowen | Lead Investigator

*tele-present wind* features 126 x/y tilting mechanical devices connected to thin grass stalks that move in response to Martian wind data collected by NASA rover and lander missions managed for NASA by JPL. In the gallery space, the stalks move in synchrony with the Martian wind, temporarily uniting Glendale, California and Mars through the dynamic interaction of wind and motion.

Lead Investigator:  
Artist: David Bowen

**Right:**  
David Bowen and  
Rishi Verma testing  
*tele-present wind*



“Does the wind on the Earth take on new meaning after experiencing wind on Mars?”

Rishi Verma | Data Systems Architect, JPL



**“We want to show, or perhaps share, a part of the environment of a world we could potentially inhabit in the future.”**

→ Jose Antonio Rodriguez Manfredi | Scientist/Principal Investigator of the Mars Environmental Dynamics Analyzer (MEDA) on NASA's Perseverance Rover; Jose Antonio Rodriguez Manfredi, Centro de Astrobiologia, Spain



**Image Credit:**

NASA and the Hubble Heritage Team (STScI/AURA)  
Acknowledgment: J. Bell (Cornell U.), P. James (U. Toledo), M. Wolff (Space Science Institute), A. Lubenow (STScI), J. Neubert (MIT/Cornell)



# Can we imagine an interplanetary culture that is more highly developed than our current planetary one?

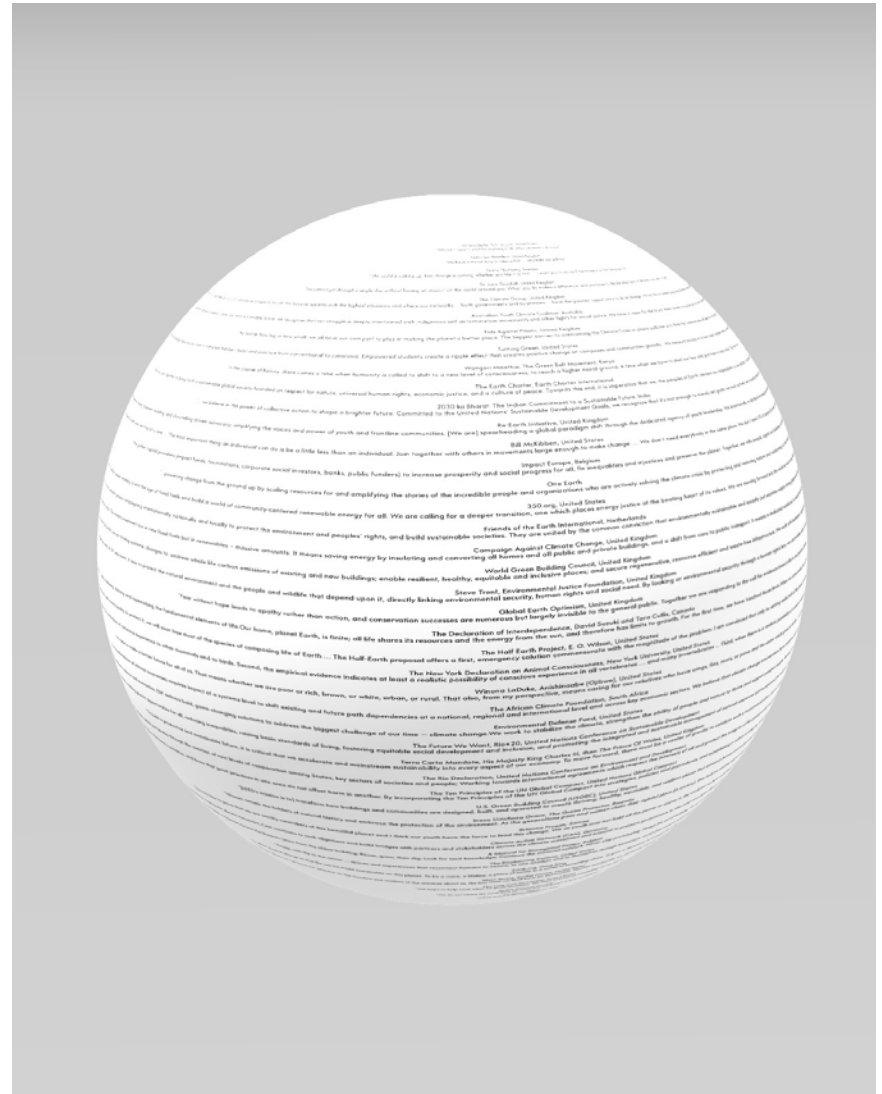
## A Love Letter to the XO Planets

In the early 21<sup>st</sup> century, faced with an exponential cascading poly-crisis, and the urgent need for massive change across every dimension of human experience, the human population of Earth managed to consolidate and synthesize its scientific knowledge with Indigenous wisdoms to create the global collective capacity to develop life-centered solutions to the most challenging and vexing problems in human history.

*A Love Letter to the XO Planets* is a fictional factual future of interplanetary civilization. Each of the “next(ing) globes” is a mission statement articulating the challenges we face and a new positive future beyond the limitations of a single planet. Together they embody a collective cultural movement that traces its roots back to the Apollo mission and the awe-inspiring first images of Earth from space—our beautiful blue marble. The globes reveal the deep rich beauty of our planet and the diversity and complexity of its dynamic ecosystems. They express our optimism, ingenuity, wisdom, and cooperative efforts to address existential threats and ensure the future of interplanetary life.

Lead Investigators:  
Artist: Bruce Mau  
Fabricator: Adam Lowe  
and Factum Arte 2024

**Right:**  
Concept art for  
Mosaic Manifesto



**Planet 1: Mosaic Manifesto—**  
How can we bring together diverse elements from our collective history to foster a transcendent interplanetary future?

*Mosaic Manifesto*—A manifesto of manifestos imagining a beautiful future

For years, I've collected manifestos, and I even wrote one about what it takes to sustain a creative life. I thought about creating a new manifesto, but what's the point? There are thousands of inspiring statements. Instead, I imagined bringing together these diverse manifestos, each one a tiny pixel coalescing into an image of a transcendent future so heartbreakingly brilliant, so utterly unlike our history of planetary destruction, that we can hardly bear to look directly at it — but this is who we really are.

**Planet 2: Memory, Reason, and Imagination—**How can we build upon old models of knowledge mapping with a charting system for the ever expanding landscape of human knowledge?

Memory, Reason, and Imagination  
Diderot's map of knowledge + the new knowledge

Throughout history, humanity has sought to classify the totality of knowledge. Each era's attempt to map all that is known reflects

shifting perspectives about knowledge categories and the relationships between them. Diderot visualized the structure of knowledge as a tree with three main linear branches; today's model is networked like a living brain, branching out in every direction. Technology exponentially enhances our ability to synthesize vast datasets in a single visualization, enabling us to see more connections across knowledge domains and catalyzing innovative thinking at these intellectual convergences.

**Planet 3: Deities of the Milky Way**  
How can we better inspire connection with the exoplanets—the planets located outside our solar system?

*Deities of the Milky Way*—5700 exoplanets in the neighborhood

One of the most momentous confirmations of the possibility of life beyond Earth is the discovery of the exoplanets, yet they have gone almost unnoticed. The closest known exoplanet is 4 light years away, too far for us to imagine the distance. If we make exoplanets more familiar, and help people understand their remoteness, let alone the effort involved in inhabiting them, we will inspire more serious reflection on the urgency of sustaining Earth in perpetuity.

**Planet 4: Planet Ocean—**Can we overcome our terrestrial bias to

recognize the unexplored depths that make up the majority of Earth's surface and see ourselves in this new context?

*Planet Ocean*—The mapping of the deeps “How inappropriate to call this planet Earth when it is quite clearly Ocean.” — Arthur C. Clarke

We have named five oceans, but in fact there is only one global ocean. It covers three-quarters of Earth's surface and makes up 95% of the planet's possible living space, yet we know and experience so little of it.

**Planet 5: Islands of Intelligence in a Sea of Indifference—**Can we get all forms of life through the current era—which the late scientist E.O. Wilson described as a 50-year bottleneck—by making environmental stewardship the norm and confining irresponsible practices to isolated regions on the planet?

*Islands of Intelligence in a Sea of Indifference*—The regions of our planet preserved for the future. Wilson argued Earth and its inhabitants will survive—if we significantly reduce negative environmental impacts for 50 years, when global population growth is predicted to decline.

Nature parks are not the solution; they are symptoms of our problem. We preserve areas of natural beauty, neglecting less scenic yet vitally

important natural ecosystems. We are good environmental stewards in protected areas, leaving no trace behind. But outside park borders, we leave waste everywhere.

Inverting the geography of our behavior would prompt global responsibility for vast areas and reduce unsustainable practices.

**Planet 6: XO Planet 2M1207b**  
Can we create a sense of wonder and mystery with imperfection?

*XO Planet 2M1207b*—Gorgeously out of focus

In the first image taken of an exoplanet, the edges of 2M1207b appear blurry and undefined. The beauty of uncertainty is that it prompts us to use our imagination. Advances in imaging technologies deliver ever sharper representations of reality. Every detail, even those invisible to us, can be rendered in incredibly high resolution. But in the moment of not knowing, in our blurred and uncertain impressions of novel phenomena, we experience awe and we envision new possibilities.



What influence would you like your experiment to have on a future world?

“I hope people discover the deep, rich beauty of our existing world, much like when we went to the moon and we discovered the Earth in that first image of our beautiful blue marble. Before we set up our tents on Mars, we have the opportunity now to preserve the wealth of diversity and complexity in our dynamic ecosystem, knowing it will ultimately fit into the bigger picture of a future interplanetary civilization.”

→ Bruce Mau | Co-lead Investigator

# What happens when you can feel an entire planet inside you?

## Burial of a Sense

“For me art is about making questions, questions about where we are, how we relate to reality, and science does the same—that is why they are so close.”

Moon Ribas | Lead Investigator

Moon Ribas implanted vibrating microchips connected to the global earthquake network into her body, feeling each tremor internally. This transformed her perception of Earth, making it an extension of herself. After seven years, Ribas removed the microchips and buried them ceremonially, marking a farewell to her unique planetary sense.

Ribas said, ‘I felt like I had a new beat inside my body; I had two beats. Apart from my heartbeat, I had the Earthbeat.’ The exhibit includes soil from the burial site to connect visitors with her story.

Lead Investigator:  
Artist: Moon Ribas

**Top Right:**

Moon Ribas at the burial site where she returned her implants back to Earth

**Bottom Right:**

Installation photo, dirt from burial site





**“In the case of this piece,  
I would like the audience  
to focus on Earth itself.  
The idea of returning to  
Earth, the implants that  
allowed being connected  
to it for so long.”**

→ Moon Ribas | Lead Investigator

**Feature Image:**

Moon Ribas returning her implants back to Earth





# How might the interiors of Earth, Mars, and myself relate to each other?

## Seismic Percussion Score

“Humans have built our lives, our cities, thinking that our planet is a static rock, but Earth is a living organism that moves, evolves, and shakes constantly”

Moon Ribas | Lead Investigator

*Seismic Percussion* translates Earth's seismic activity into a drum score, creating a data-driven performance. For *Blended Worlds*, Ribas includes quake activity from the Moon and Mars, using seismic data collected from the historic NASA Apollo Moon missions as well as the more recent NASA Mars InSight Lander. This performance condenses multi-planetary seismic activity into music, connecting audiences with the natural rhythms of the Earth, Moon and Mars.

Lead Investigator:  
Artist: Moon Ribas

**Right:**  
Seismic scores incorporating quake activity from the Moon, Mars, and Earth



**“Earth is always talking to us.  
We just need the courage  
and the empathy to listen.”**

→ Josh Willis | Principal Scientist/Oceanographer, JPL



**Image Credit:**

NASA Apollo 8: Earthrise image  
taken aboard Apollo 8  
by astronaut Bill Anders

# How might we listen to Earth if it spoke to us?

## Earth Speaks

“I would especially like participants to experience the tangible-ness of this exhibit; the receipt paper brings to mind the finite nature of the piece. Eventually the paper, taken from the Earth, in order to ‘hear the planet speak’ will run out.”

Lizbeth B. De La Torre | Co-Lead Investigator

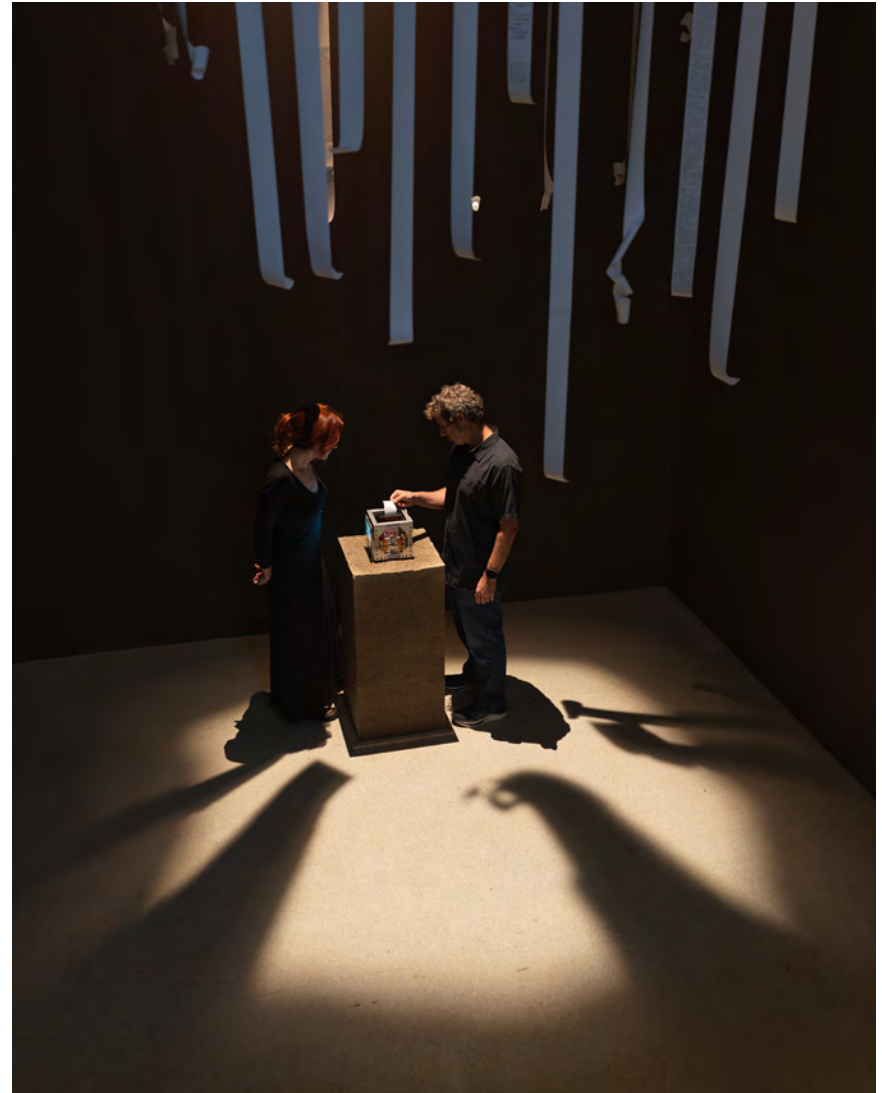
*Earth Speaks* converts NASA Earth Science data—carbon dioxide, global temperature, and sea level—into poetry, creating a unique way to “listen” to the planet. The resulting poetry is both foreign and familiar, prompting questions about Earth’s potential as a living, communicative entity.

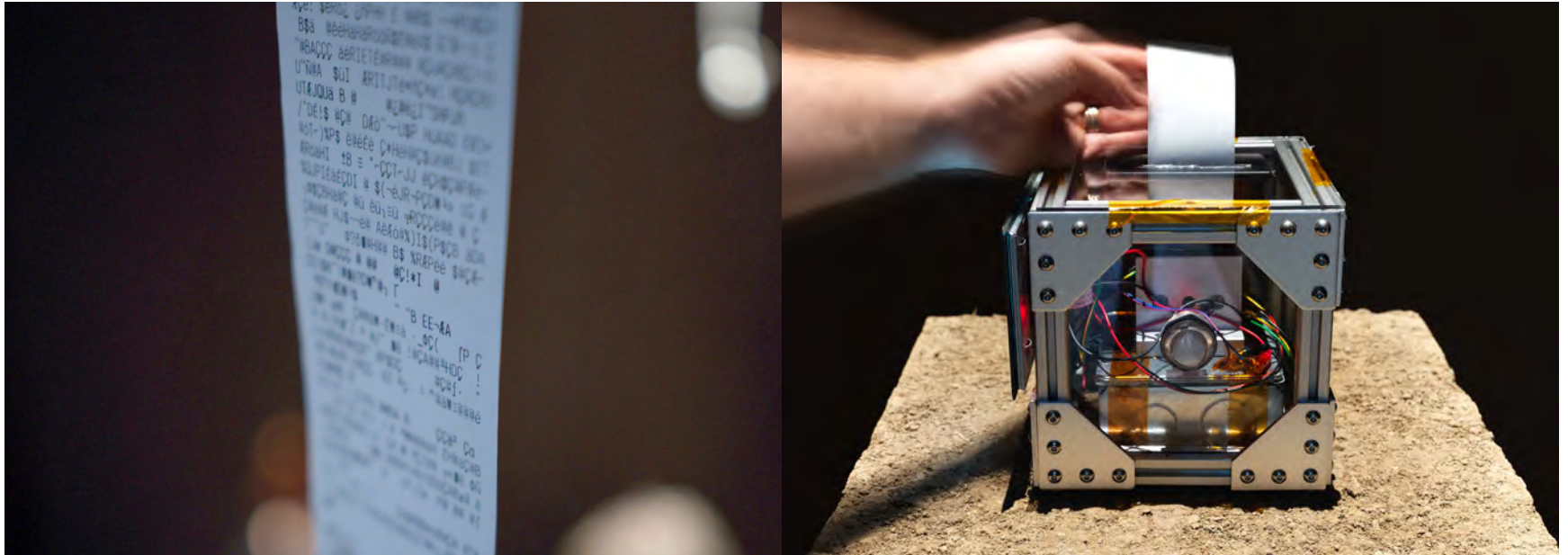
This experiment doesn’t humanize Earth but invites humans to try understanding it, offering hope for clearer future communication if we are willing to listen, and become better listeners.

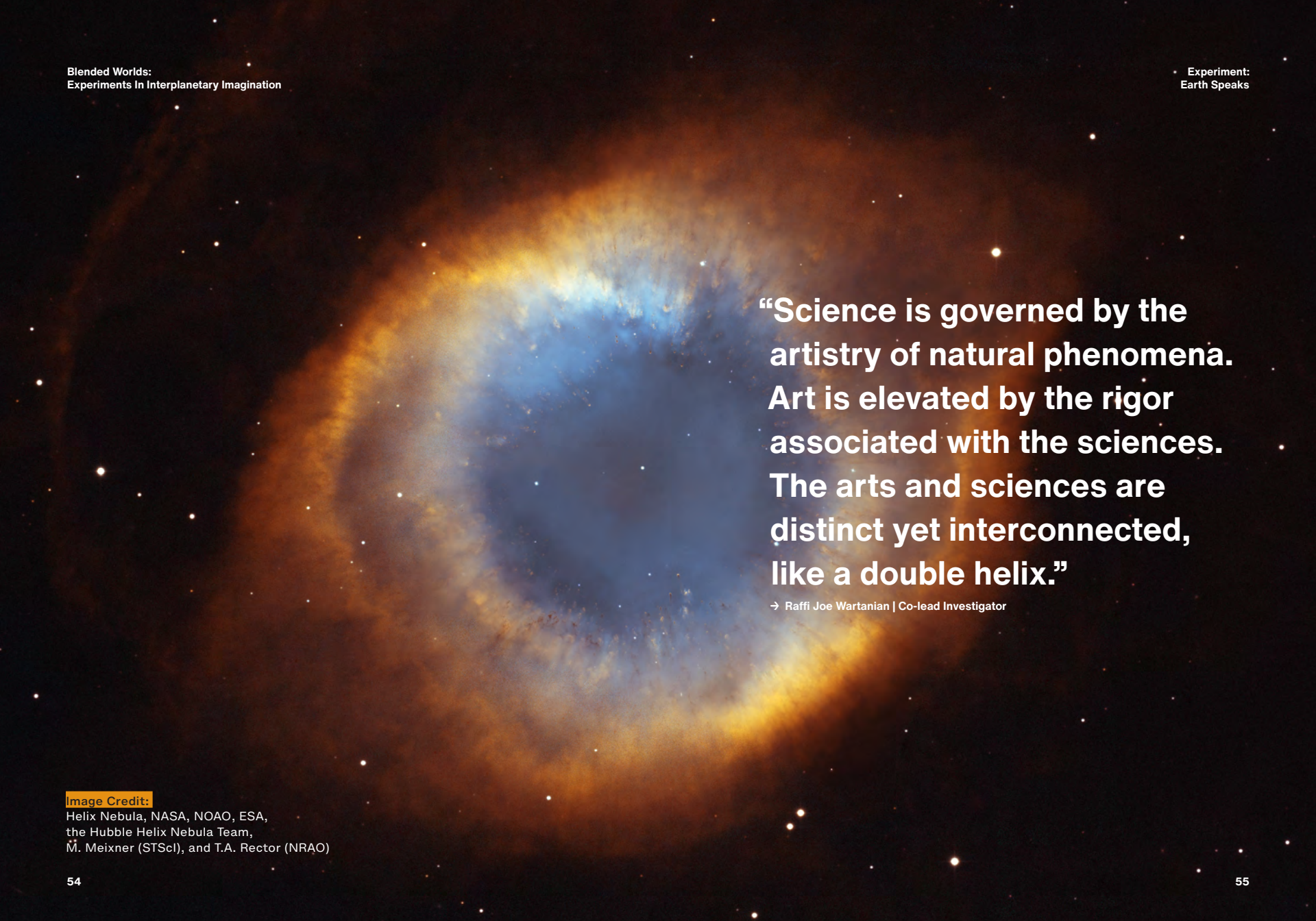
Lead Investigators:  
Creative Technologist:  
Lizbeth B. De La Torre, JPL

Poet Laureate,  
City of Glendale:  
Raffi Joe Wartanian

**Right:**  
Installation photo,  
*Earth Speaks*







**“Science is governed by the  
artistry of natural phenomena.  
Art is elevated by the rigor  
associated with the sciences.  
The arts and sciences are  
distinct yet interconnected,  
like a double helix.”**

→ Raffi Joe Wartanian | Co-lead Investigator

**Image Credit:**

Helix Nebula, NASA, NOAO, ESA,  
the Hubble Helix Nebula Team,  
M. Meixner (STScI), and T.A. Rector (NRAO)

## WORDS FOR NAVIGATING BLENDED WORLDS

<b>Animaphone</b>	someone who has lengthy conversations with inanimate objects and swears it “hears” them, somehow	<b>Overview Effect</b>	a cognitive shift reported by some astronauts while viewing the Earth from space, characterized as “a state of awe with self-transcendent qualities, precipitated by a particularly striking visual stimulus”
<b>Astrophilia</b>	love of and/or obsession with planets, stars, and outer space	<b>Pathramble</b>	to wander aimlessly in nature, admiring its magnificence
<b>Consight</b>	a profound insight made about a thing while feeling a deeper sense of connectedness to it	<b>Resonance</b>	a deep, harmonious connection with someone or something that touches you emotionally
<b>Decoraphiliac</b>	someone who lacks exposure to nature and finds themselves overly intrigued by garden gnomes and/or lawn flamingos	<b>Stumbelance</b>	the act of suddenly stumbling while walking on the surface of another planet and then looking around to see if there were any witnesses
<b>Dépaysement</b> (French)	a sense of displacement that can happen when deeply immersed in nature	<b>Symbiosis</b>	a mutually beneficial relationship, often creating an emotional connection
<b>Drizzle Dilemma Syndrome (DDS)</b>	the appreciation of rain that is conflicted by the annoyance of getting wet	<b>Telexistence</b>	a concept that denotes an extension of human existence, wherein a person exists wholly in a location, other than his or her actual current location, and can perform tasks freely there
<b>Ecohollerance</b>	someone shouting at nature to behave	<b>Telepresence</b>	the feeling of being present in a live, remote location
<b>Empathic Resonance</b>	the ability to deeply understand and feel another’s emotions as if they were your own	<b>Tenalach</b> (Irish)	the relationship and deep connection with the land/air/water that allows one to literally hear the Earth sing
<b>Hyper-embodiment</b>	an intensified or heightened experience of the body and its sensations, often emphasizing a deeper awareness or engagement with one’s physical presence.	<b>Uitwaaien</b> (Dutch)	going out into the wind to refresh and clear one’s mind
<b>Kalpa</b> (Sanskrit)	the passing of time on a grand cosmological scale	<b>Yugen</b> (Japanese)	the awareness that the universe is so profound that the emotions we feel when trying to contemplate it are too deep and mysterious to convey
<b>Murr-ma</b> (Waanyi, Australia)	the act of searching for something in the water with your feet		
<b>Nagvocate</b>	an overly-critical nature guide		

# Can we recreate the smells of a lost home when only stories and data remain?

## Sensory Mementos

“Scent can be challenging in that it is inhaled, literally brought into the body. I hope that people will move beyond immediate reactions to engage with smell with curiosity.”

Saskia Wilson-Brown | Co-Lead Investigator

*Sensory Mementos* imagines a future in which humans seek to reestablish a connection by recreating what is now, for them, only a generational memory. Their experiment recreates lost olfactory landscapes, preserved through narratives and molecular signatures, to evoke memories of their life on Earth as we journey outward into the stars. These reconstructed scentscapes prompt us to reflect on loss, meaning, and the unreliability of memory.

Lead Investigators:  
Artist: Saskia Wilson-Brown  
Artist: Shane Myrbeck

**Right:**  
Saskia Wilson-Brown  
creating and testing scents  
for *Sensory Mementos*







**“How do we instill a sense  
of awe and connection  
with planets beyond our own?  
Especially when some  
of these might be familiar  
Earth-like planets with life  
and some might be totally  
different from anything  
we’ve ever experienced.**

**Since we can’t actually  
see what their surfaces  
are like, what else can we  
sense about them?”**

→ Anjali Tripathi | Astrophysicist, JPL

**Image Credit:**

NASA Kepler image of an expansive  
star-rich patch of sky in the constellations  
Cygnus and Lyra stretching across  
100 square degrees

# Can sound help us feel the proximity of exoplanets as we search the cosmos for a new home?

## Interstellar Soundings

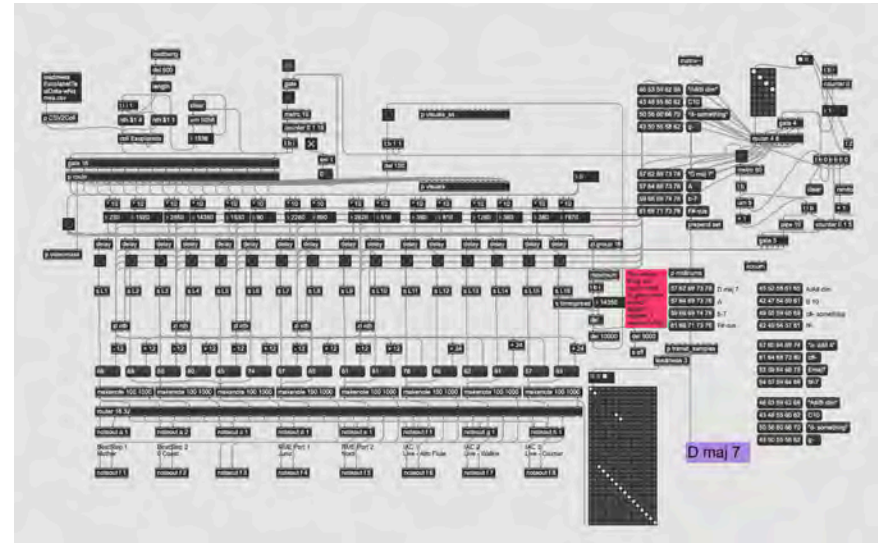
“What role do our sensory experiences play in our understanding of who we are?”

Shane Myrbeck | Co-lead Investigator

*Interstellar Soundings* uses sound to convey the vast distances of exoplanets in our galaxy. An algorithm selects exoplanets from the NASA Exoplanet Archive in groups of 16, playing artistically composed sounds for each planet, with delays based on their distance from Earth. Shorter delays indicate closer planets, while longer delays signify those farther away. Every three milliseconds of delay represents one light-year of distance.

Lead Investigators:  
Artist: Shane Myrbeck  
Artist: Saskia Wilson-Brown

**Right:**  
In progress custom control software for Interstellar Soundings





# Is there sublime beauty beyond what we already know?

## Geomagnetic Sunsets On K2-18 b

“The experiment asks viewers to connect with new forms of natural light and beauty beyond our Sun. The role of empathy is within the process of redefining familiarity through imagination. Making unfamiliar stellar wind familiar through a speculative scenario.”

Chrissy Stevens | Lead Investigator

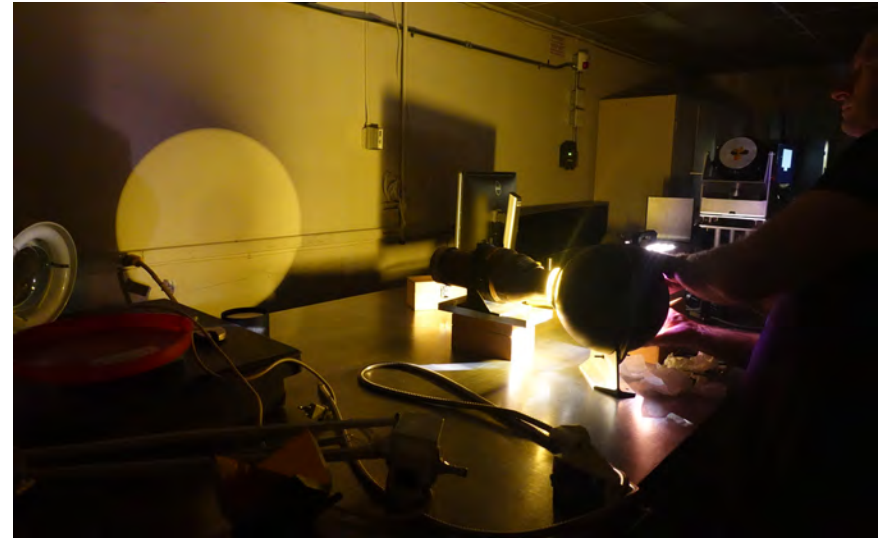
As the red dwarf star disappears into the horizon, the sky is illuminated not just by the deep reds and purples of the fading light, but also by the vibrant aurorae that dance across the atmosphere of an alien world.

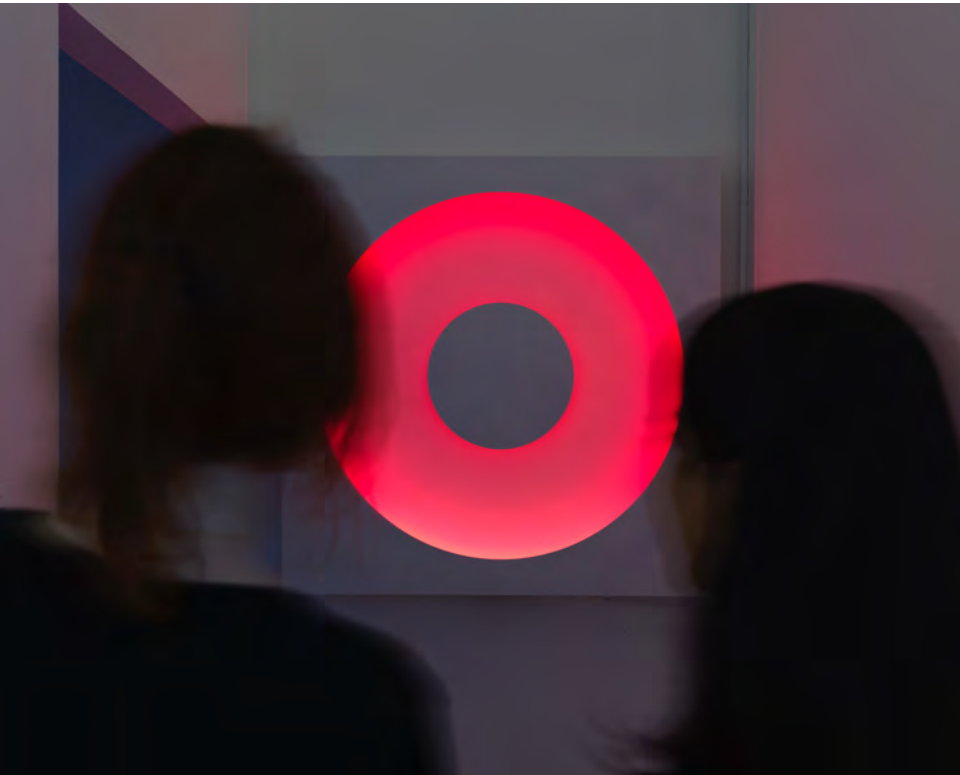
This experiment reimagines our experience of sunsets on Earth, by exploring sunsets on exoplanet K2-18 b, where the intense stellar activity creates a geomagnetic sunset. This surreal interplay of color invites the viewer to contemplate beauty beyond our Earth-based experiences.

Lead Investigator:  
Visual Strategist:  
Chrissy Stevens, JPL

**Top Right:**  
Brian Monacelli prototyping lighting techniques using an integrating sphere from the Optics Lab, JPL

**Bottom Right:**  
Corner cube retroreflector and test filters from the Optics Lab, JPL





**“I would love people to think about  
how they could become involved  
in this technology.**

**Ask yourself:  
What role could I play?”**

→ Brian Monacelli | Principal Optical Engineer, JPL

**Image Credit:**  
Hubble WFC3 image of NGC 6302,  
planetary nebula in Scorpius  
NASA/ESA and the Hubble SM4 ERO Team

# How might water unite life?

## Ancient Echoes: Soundscapes Across Worlds

“We have embraced rationalism to such an extreme that we have made footprints on the Moon, but we poison our water with ‘forever chemicals’ and plastics.”

Annette S. Lee | Lead Investigator

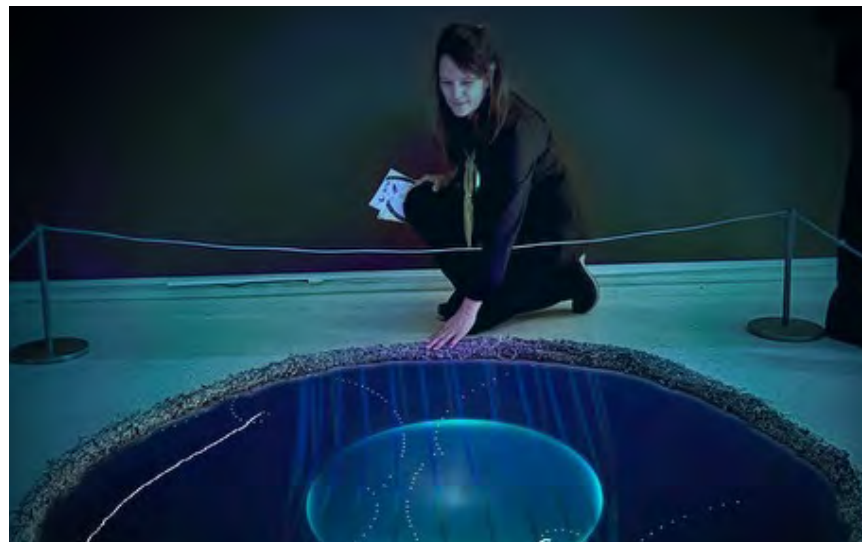
This experiment gives physical form to the artist's Indigenous process of thanking the spirits of nature, a process called “Putting Down Thanks.” The power held in this intention is about recognizing the presence of the spiritual world and the gift of water that supports life across the universe.

This piece invites you to reflect on your relationship with water and ‘put down thanks’ in your own tradition or practice. The soundscape blends whale song, human heartbeats, and Europa's sonified magnetic field, connecting Earth's known life with Europa's unknown possibilities.

Lead Investigator:  
Artist/Astrophysicist:  
Annette S. Lee

**Top Right:**  
Installation photo,  
*Ancient Echoes*

**Bottom Right:**  
Installation photo,  
sage and sacred herbs  
surrounding projected  
visuals of *Ancient Echoes*





**“Take a moment to recalibrate the compass and magnetic field inside you. Start with finding North. Pause a moment. Put down thanks. Turn East. Pause, give thanks. Turn South, pause, put down thanks. Turn West, take a breath and feel gratitude.”**

→ Annette Lee | Lead Investigator



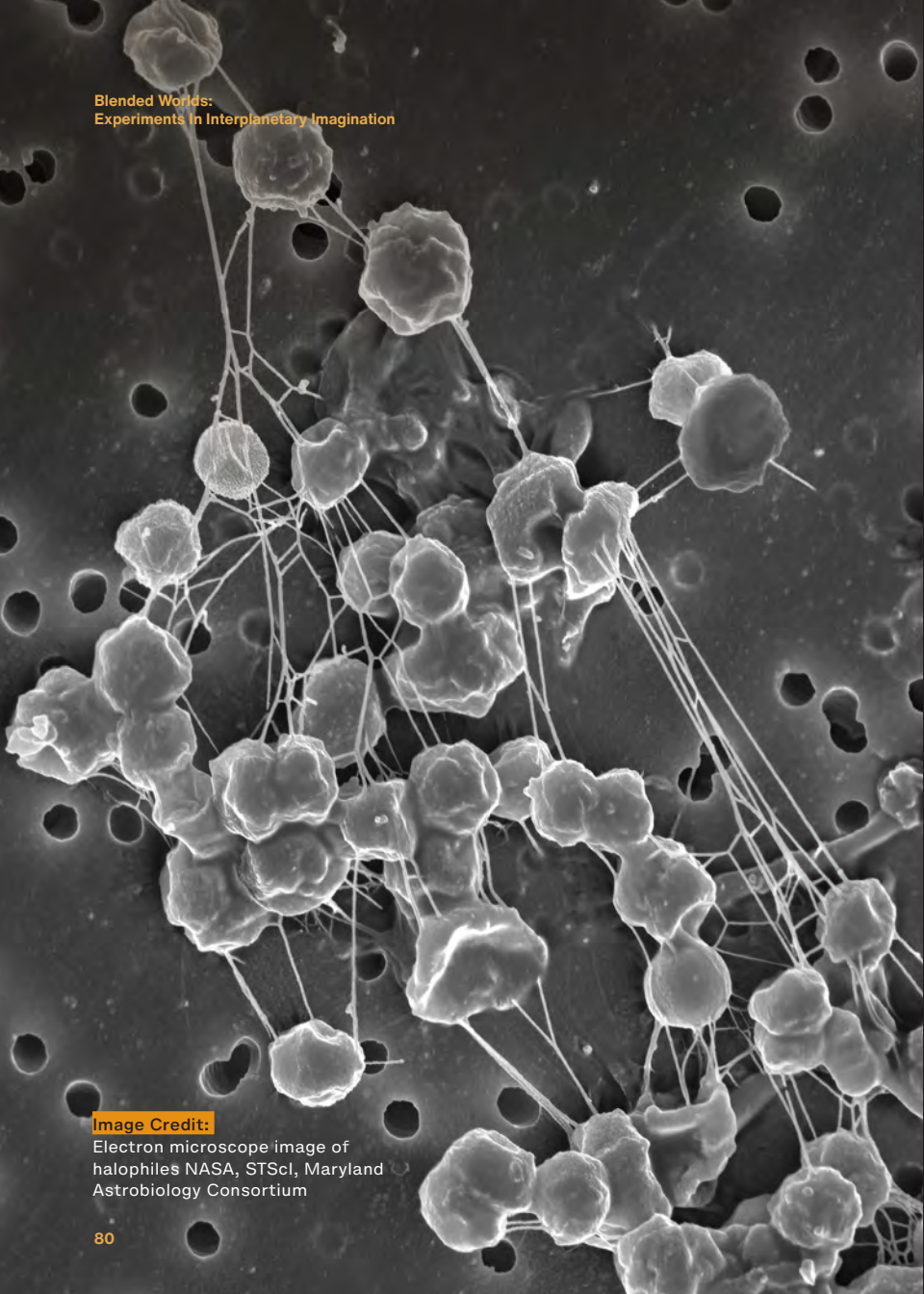


**Image Above:**

Annette Lee and Kevin Hand investigating materials at the Extraterrestrial Materials Lab, JPL

**Image Above:**

Hydrothermal Vent Chimney Rock—The study of hydrothermal vent ecosystems continues to redefine our understanding of the requirements for life. This hydrothermal vent chimney rock, composed of sulfur and a variety of heavy metals, was collected from a site called Snake Pit, 3.6 km



**Image Credit:**

Electron microscope image of halophiles NASA, STScI, Maryland Astrobiology Consortium

**“Humans and microorganisms should be on the same team, especially considering that there are more microorganisms in and on our body than human cells. They certainly have empathy for us and many of them work toward our survival.”**

→ Moogega Cooper | Planetary Protection Engineer, JPL

# Where do you begin? Where do you end?

## VITALIS ECSTASIS

“To feel empathy is to embody visual information. Both require us to be attuned and open to experiencing hyper-embodiment. Can we be vulnerable enough to feel such deep emotion?”

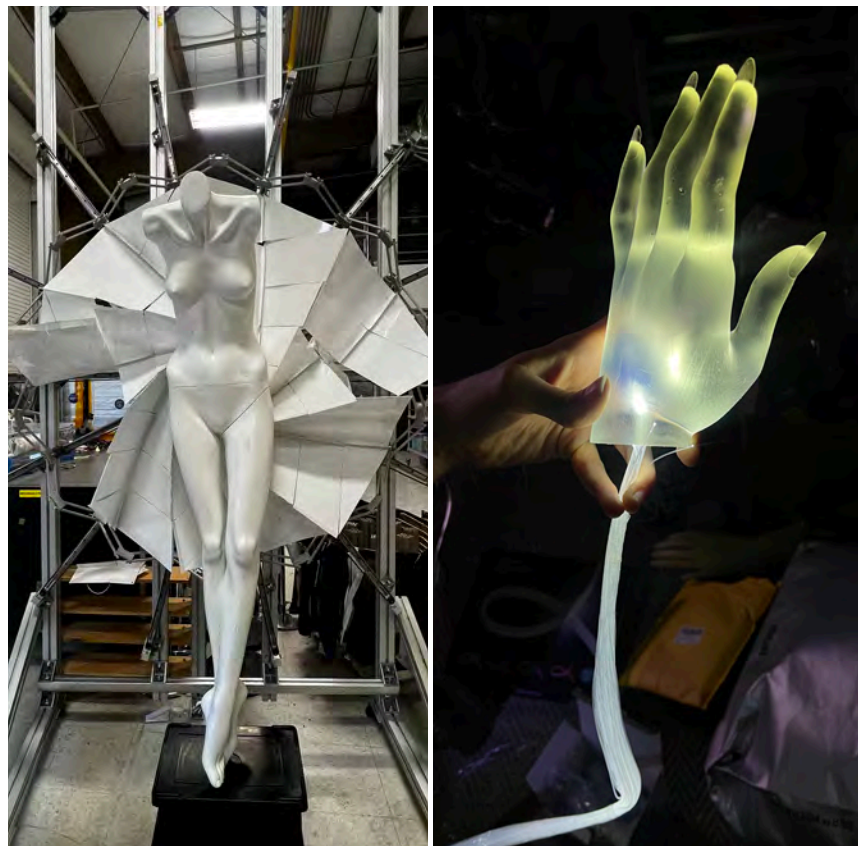
Viktoria Modesta | Lead Investigator

As we shape our interstellar destiny, consider for a moment that EVERYTHING IS REAL and everything is natural.

This experiment uses hyper-embodiment as a gateway to empathy, where elements seen and unseen, biological and created are forming the brushstrokes of our future identity. The symphony of organic and engineered forms is a deliberate act of exploration of the ‘self’ beyond the confines of three dimensions. What happens when separation no longer defines us, and the lines between human, nature, and technology blur beyond recognition?

The origami Starshade is a prototype technology that supports finding habitable planets in the universe.

Lead Investigator:  
Artist: Viktoria Modesta

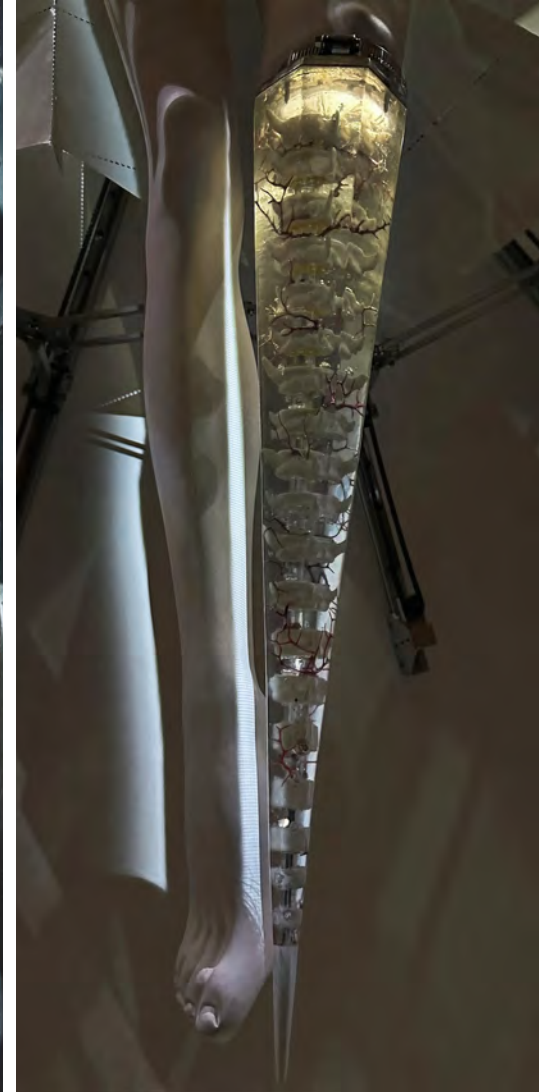
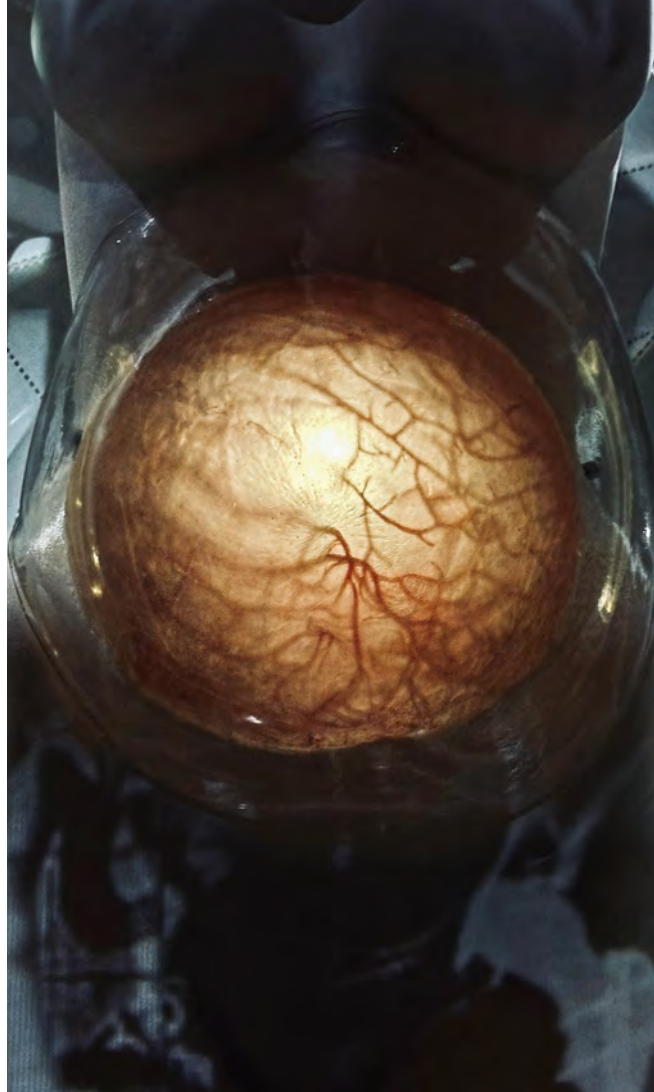


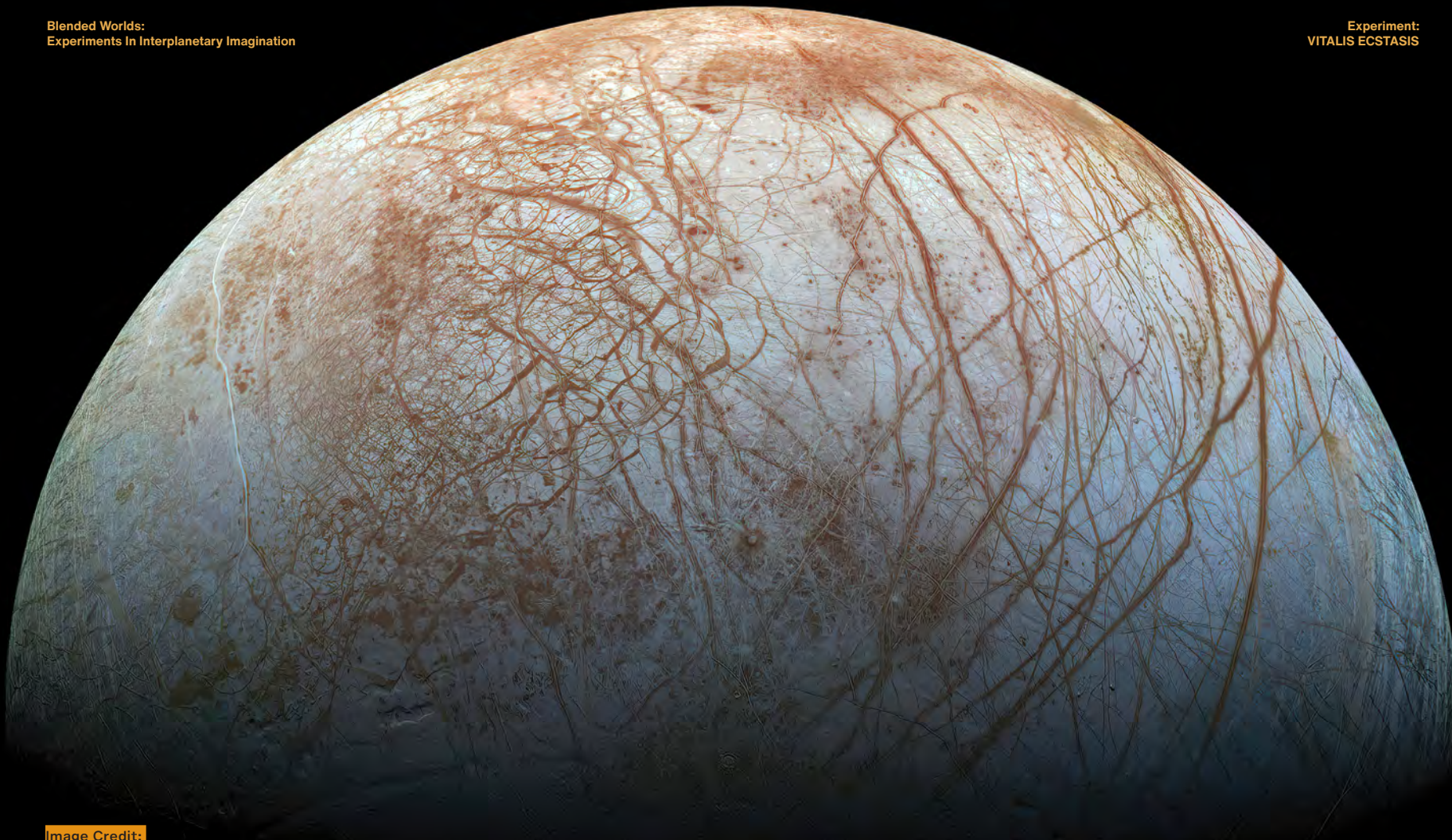
**Left:**  
Starshade model with mannequin attached during VITALIS ECSTASIS ideation

**Right:**  
3D printed hand test with light integration

“The passion I witnessed in extending the human senses with robotics and the patience and care the planetary protection put into understanding microbial life, that is a different type of energy that most people don’t associate with space exploration.”

Viktoria Modesta | Lead Investigator





**Image Credit:**

Europa is the fourth largest of Jupiter's 95 moons. Scientists believe a saltwater ocean lies beneath its icy shell, holding twice as much water as Earth's global ocean. It also may have the chemical elements that are key ingredients to life.

This view of Jupiter's icy moon Europa was captured by JunoCam, the public engagement camera aboard NASA's Juno spacecraft, during the mission's close flyby on Sept. 29, 2022.

Image data: NASA/JPL-Caltech/SwRI/MSSS  
Image processing: Kevin M. Gill CC BY 3.0

# How can water and wonder deepen our connection to ourselves and worlds beyond?

## In Praise of Mystery

“It is not darkness that unites us,  
not the cold distance of space,  
but the offering of water...”

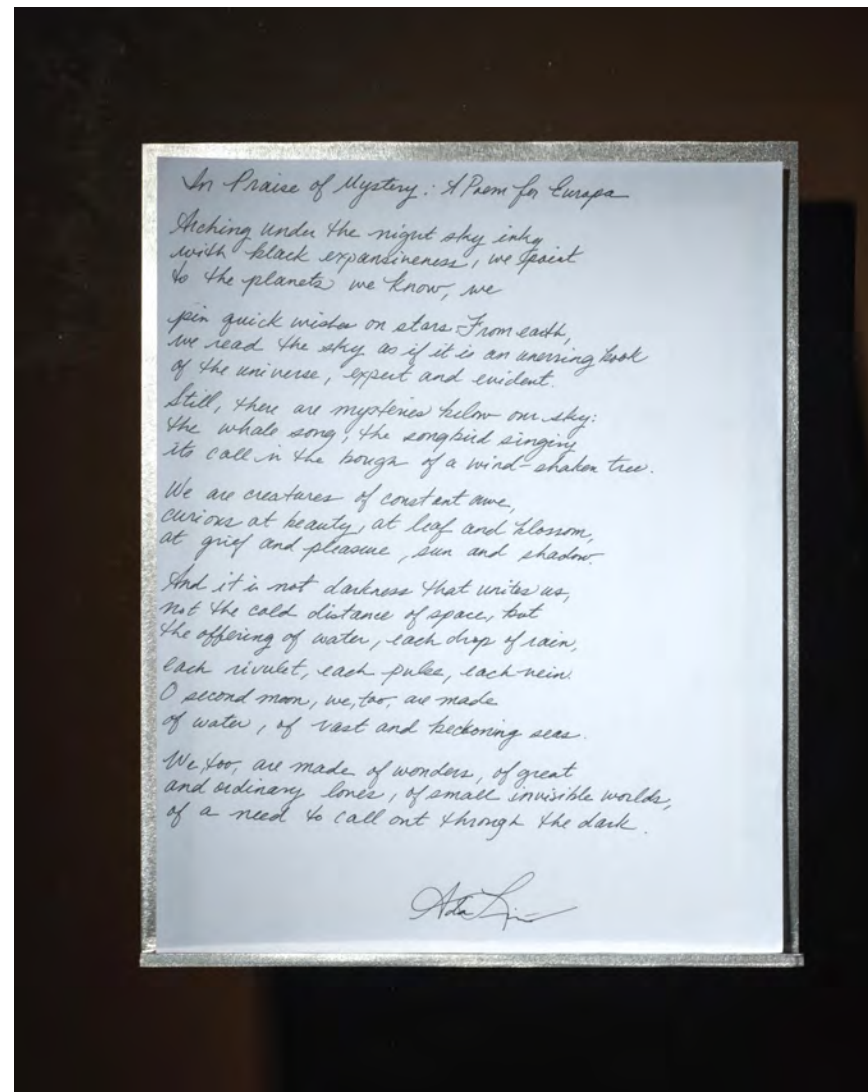
Ada Limón | Lead Investigator

U.S. Poet Laureate Ada Limón’s poem “In Praise of Mystery: A Poem for Europa” connects two worlds full of water—Earth and Jupiter’s moon Europa. Mounted alongside the poem is a microchip bearing the names of 2.6 million who signed on in the spirit of the poem. This poem will be carried aboard the Europa Clipper spacecraft as it explores Europa’s mysteries in search of places below the icy surface that could support life.

Lead Investigator:  
Poet: Ada Limón,  
U.S. Poet Laureate

**Right:**

Installation photo,  
hand-written poem  
*In Praise of Mystery*  
by Ada Limón



# Can waves representing human voices connect one water world to another across the cosmic sea?

## Water Words

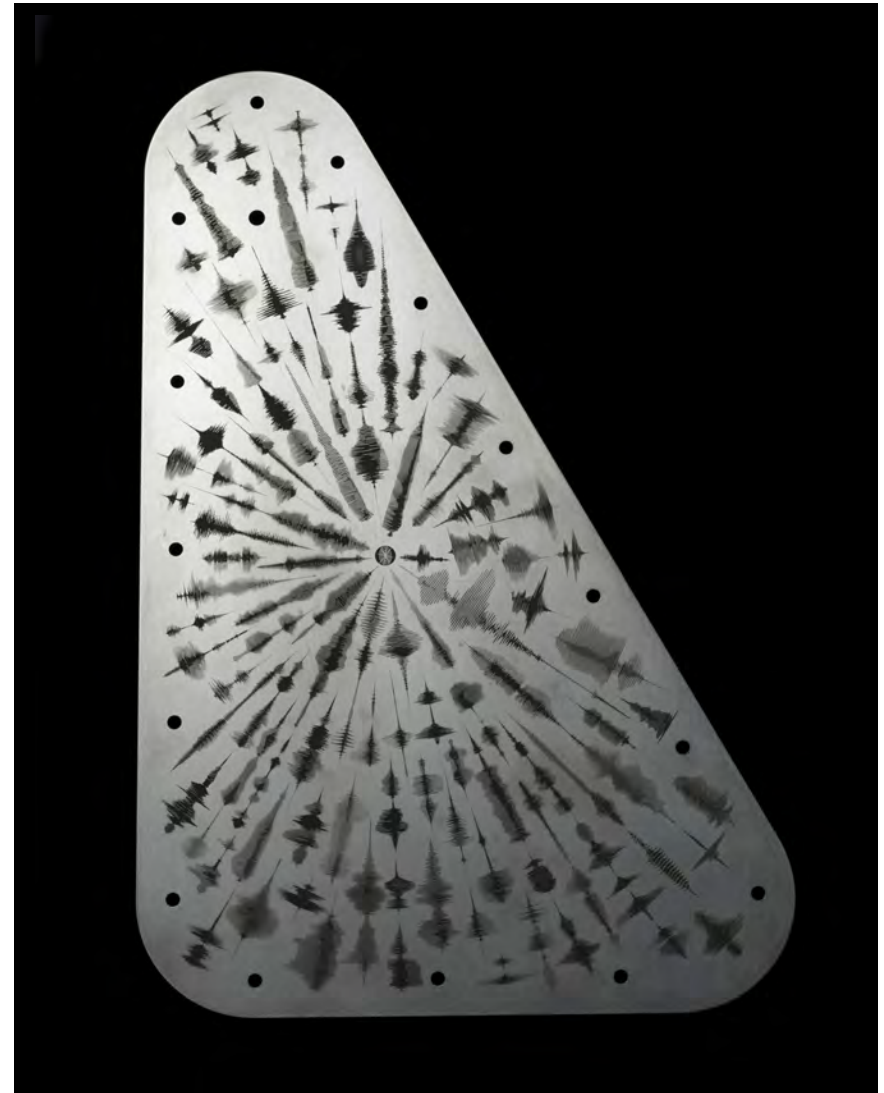
“The plate will journey from Earth to Jupiter’s moon Europa— one water world to another— attached to NASA’s Europa Clipper spacecraft. The piece represents the connections between us all, embodied in the spacecraft’s journey.”

Preston Dyches | Co-Lead Investigator

On Earth, water connects all life and all human cultures. NASA’s Europa Clipper mission seeks to determine if an abode for some form of life might also exist on Jupiter’s ice-covered ocean moon Europa. The design engraved on this tantalum plate – part of the spacecraft’s radiation shielding – highlights water’s universal significance. Audio waveforms of the word “water” in 100+ languages ripple outward like waves from an American Sign Language-inspired symbol. The design represents a collective shout rippling outward into the cosmos.

Lead Investigators:  
Producer: Preston Dyches, JPL  
Visual Strategist:  
Dan Goods, JPL

**Right:**  
Europa Clipper  
Vault Plate



**“How can we, both individually  
and collectively, illuminate new  
paths to freedom and peace for  
ourselves and others?”**

→ Ekene Ijeoma | Lead Investigator

**Image Credit:**

A Spitzer Space Telescope image revealing the stars  
of the crowded galactic center region of our Milky Way,  
NASA/JPL-Caltech/University of Wisconsin



# How can we become stars in the life saving constellation that is the Big Dipper?

## Lifesaver

“My work references both the scientific concept that our bodies are conductors of electrical energy and the more artistic concept that our bodies are also conductors of metaphorical energy.”

Ekene Ijeoma | Lead Investigator

*Lifesaver* is an ode to the collective efforts of the Underground Railroad conductors who used the Drinking Gourd, a coded song and map to guide tens of thousands of enslaved African Americans in the south to freedom. The chorus “Follow drinkin’ gourd” was code for follow the Big Dipper, an astrological constellation and celestial compass used to orient enslaved people towards the North Star, direct them above the Mason-Dixon Line and into free states. This interactive installation invites you to use your body as a conductor to energetically connect the light poles and collectively illuminate new paths to freedom.

Lead Investigator:  
Artist: Ekene Ijeoma



**Right:**  
Installation photo,  
*Lifesaver*



# Can you imagine?

## The Big Unknown

“Some people look at the hole and feel insignificant, but I hope they think about how incredibly special our home really is. This is all we’ve got for now.”

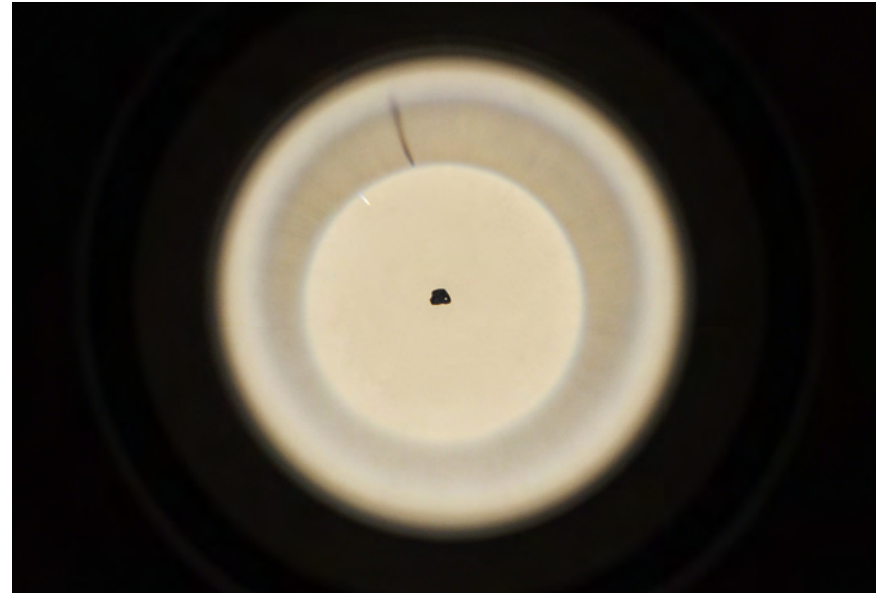
Dan Goods | Lead Investigator

By drilling a hole into a grain of sand in 2004, *The Big Unknown* offered us a snapshot, a humbling scale reference to contemplate our understanding of the universe. If our galaxy were the grain of sand, we could place all the planets known in 2004 within the hole. And while all the galaxies that we knew about in 2004 could fit within six (10 ft x10 ft x10 ft) rooms full of sand, we have now identified enough to fit into 60 rooms. Imagine the vast potential and possibilities held within what is still “the big unknown.”

Lead Investigator:  
Visual Strategist:  
Dan Goods, JPL

**Top Right:**  
Installation photo,  
grain of sand under a  
compound magnifying lens

**Bottom Right:**  
Hole drilled into  
grain of sand with  
a carbide drill bit



# How might musical theater help clarify and expand the vision of scientists and engineers?

## Earth Data: The Musical at the Alex Theatre

“We hope to provide a framework to consider action with respect for science and its ever developing schemes of survivability, thriving ecosystems, and our will for survival that drives our presence on earth.”

Brian Brophy | Lead Investigator

A portion of *Earth Data: The Musical* was performed at the Alex Theatre during the *Blended Worlds* evening of art and science. Written and performed by members of the JPL and Caltech community under the direction of Caltech Theater Director Brian Brophy, it blended climate science, community development, and personal growth. The performance made complex Earth science concepts engaging while helping performers reflect on the social, ethical and cultural challenges of their careers. The full musical was staged at Caltech on November 1–3, 2024 in Ramo Auditorium.

Lead Investigator:  
Creative Lead:  
Brian Brophy

**Right:**  
Performance from  
*Earth Data: The Musical*  
at the Alex Theatre



“We emphasize and illustrate the complete interconnectedness of all things on the planet—from the Arctic to LA—and the people that work in that space combining art and science.”

→ Kimberley Rain Miner | Climate Scientist & Science Systems Engineer, JPL

**Feature Image:**

Kimberley Rain Miner at Prudhoe Bay indexing barrels for inventory and assessment. The barrels originally used to create the jetty are slowly washing into the ocean.

# What seeds of the future can we find in the cutting-edge science and engineering of today?

## Library of Possibilities

“This work lends serious tangibility to playful what-ifs, which is a sort of recipe for blending worlds—as well as an opportunity to trouble some of our treasured false dichotomies: science vs. art, fiction vs. nonfiction, past vs. future, real vs. imaginary.”

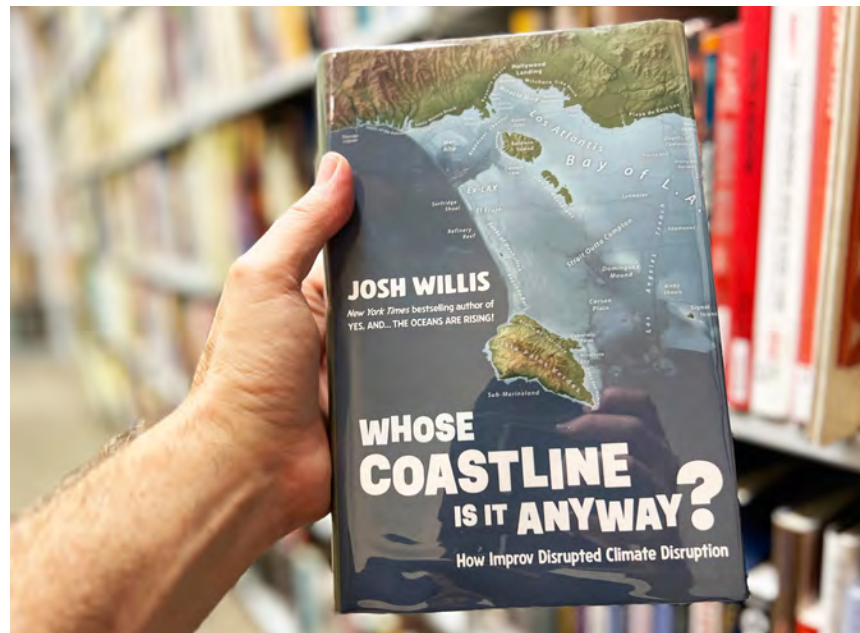
Stuart Candy | Lead Investigator

For the project *Library of Possibilities*, experiential futurist Stuart Candy conducted interviews with JPL and NASA scientists and engineers from diverse disciplines. He uses these to envision possible impacts of their research, distilled into book titles that might be published decades from now. The resulting book jackets will be smuggled throughout the Glendale Library system for readers of all ages to discover.

Lead Investigator:  
Futurist:  
Stuart Candy

**Top Right:**  
Bookplates for the  
*Library of Possibilities*

**Bottom Right:**  
Placing a physical volume  
in the Brand Library



# How might the act of discovery unite us?

## Astroglyphs

“We use language to converse and write, and we send signals across the vastness of space. Astroglyphs draw on this ancient tradition but offer a modern approach to connecting us all.”

David Levine | Co-Lead Investigator

Leaving a mark on the world—a handprint on a cave wall, an arrangement of twigs, a stack of rocks—is a primal act affirming our existence.

*Astroglyphs* unite the JPL community by creating marks, or astroglyphs, that researchers leave behind to catalog their presence. These imprints in soil, snow, or dust are encoded with their location and a history of previous astroglyphs. These markings are cataloged and shared, celebrating an often-overlooked process and uniting a diverse community of researchers. *Astroglyphs* is a global, ongoing project with many future locations and collaborators.

Lead Investigators:  
Visual Strategist:  
David B. Levine, JPL  
Visual Strategist:  
Thomas Gottelier, JPL


**Right:**  
David Levine and  
Thomas Gottelier at the  
Goldstone Deep Space  
Communications Complex  
with Astroglyphs



“Working across disciplines has highlighted how similar the processes of discovery and invention can be.”

Tom Gottelier | Co-Lead Investigator





**“Discovery is incremental and the work is often done in challenging and remote environments... We envision Astroglyphs becoming a ritual that researchers across the world, the solar system and beyond can continue as we explore the Earth and the cosmos.”**

→ David Levine | Co-lead Investigator

**Feature Image:**  
Astroglyph stamp at  
Deep Space Communications Complex



# Can we assume intelligent lifeforms will understand us?

## The Golden Record Cover

“There is an argument—perhaps it is only a hope—that we might be able to communicate with representatives of such exotic civilizations, because they, like we, must come to grips with the same laws of physics and chemistry and astronomy.”

Carl Sagan | Lead Investigator

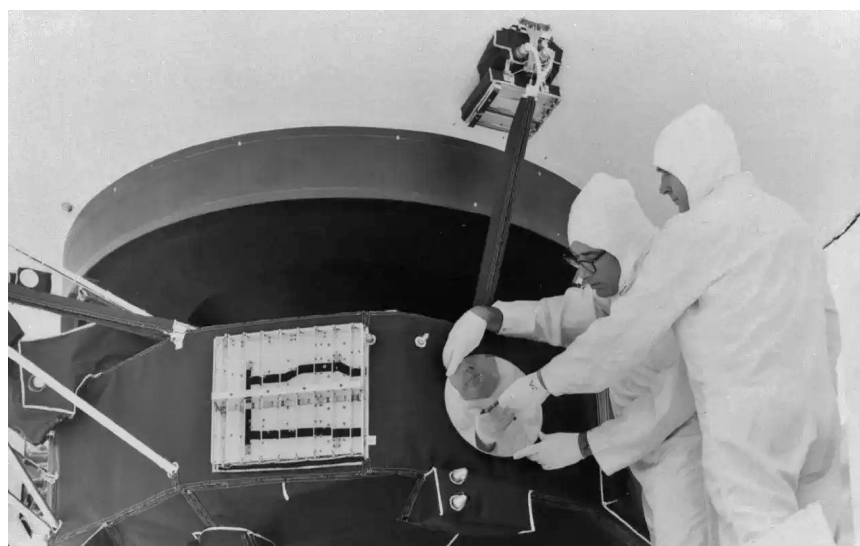
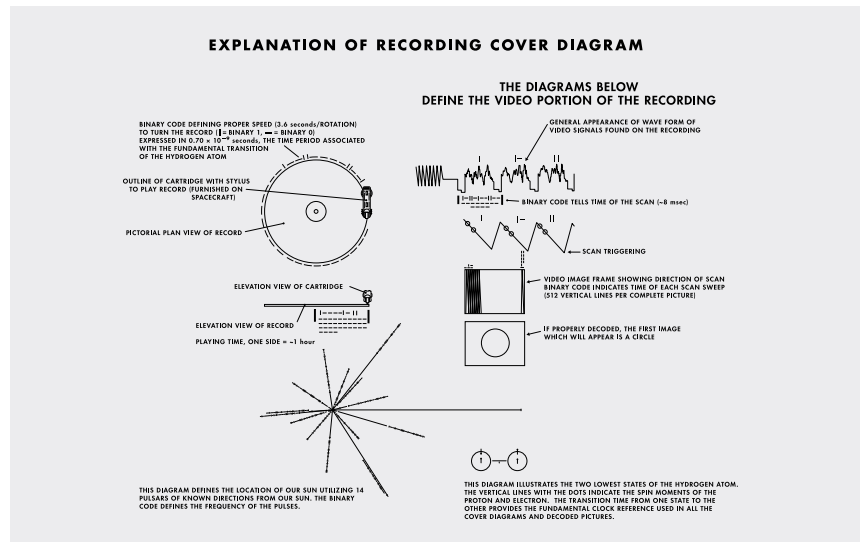
In an attempt to communicate the story of our world to extraterrestrials, NASA created a Golden Record, a 12-inch gold-plated copper disk, placed aboard the Voyager spacecraft, currently 12 billion miles away from Earth in interstellar space. It contains sounds, music, images, and greetings in 55 languages, showcasing Earth's diversity and culture, and serving as a message of peace and goodwill.

To assist intelligent lifeforms' access to the Golden Record, the protective cover includes detailed instructions for playing its contents—from technical specs of the phonograph to the binary arithmetic for the speed of the record's rotation. The master copy of the Golden Record, a priceless artifact, sits in an underground archive at JPL. Here, we show the cover with its extra-terrestrial instructions.

Lead Investigators:  
Astronomer: Carl Sagan  
NASA/JPL

**Top Right:**  
Diagram of Golden Record cover elements

**Bottom Right:**  
Mounting of the Voyager Golden Record in 1977  
NASA/JPL-Caltech





**Image Credit:**  
Installation photo,  
*The Golden Record Cover*

# How does improvisation inspire science & exploration?

## Alex Theatre Presents: Blended Worlds

“We had so many types of live experiences for the night we couldn’t describe it. So we just started saying—you will remember it for the rest of your life.”

Dan Goods | Co-Lead Investigator

What happens when you mix equal parts art, science, and wonder? You get *The Alex Theatre Presents: Blended Worlds*, a Getty PST event presented by the City of Glendale in collaboration with the Jet Propulsion Laboratory.

On October 5<sup>th</sup> 2024, Reggie Watts hosted a weird and wonderful collision of Art and Science on the historic Alex Theatre stage. This live event celebrated interplanetary imagination through explorations in music, multi-media performances, panel discussions, theater, and interactives intended for curious minds of all ages.

Lead Investigators:  
Visual Strategist:  
Dan Goods, JPL  
Visual Strategist:  
David Levine, JPL  
Producer: Tina Salmassi

**Right:**  
Reggie Watts on stage  
at the Alex Theatre







**ADA LIMÓN** is the author of six books of poetry, including *The Carrying*, which won the National Book Critics Circle Award for Poetry. Her most recent book of poetry, *The Hurting Kind*, was shortlisted for the Griffin Poetry Prize. She is the 24<sup>th</sup> Poet Laureate of The United States, the recipient of a MacArthur Fellowship, and a TIME magazine woman of the year. As the Poet Laureate, her signature project is called *You Are Here* and focuses on how poetry can help connect us to the natural world.

**ANNETTE S. LEE, DSc, PhD, MFA** is an award-winning artist, scientist, and civic engagement leader whose unique talents connect ideas across seemingly impossible divides. She holds advanced degrees in mathematics, physics, astrophysics, and fine arts from top universities, including Yale and Berkeley. Dr. Lee has consulted for UNESCO, curated exhibitions, and presented at global conferences. After two decades as a tenured professor and Planetarium Director at St. Cloud State University, she now works as an independent artist-scientist and is the Executive Director of Native Skywatchers. She continues as an Honorary/Adjunct Professor at the University of Southern Queensland. Annette is mixed-race Native American of Lakota, Irish and Chinese ancestry with Ojibwe community affiliation.

**BRUCE MAU** is the Co-Founder and Chief Executive Officer of Massive Change Network (MCN), a global design consultancy in the Chicago Area. Bruce is a renowned designer, innovator, educator, author and artist. His love of thorny problems led him to create a holistic, systems-based methodology for life-centered design that serves as the foundation for the MCN process and practice. Across nearly 40 years of design innovation, he's collaborated with global brands and companies, leading organizations, heads of state, renowned artists and fellow optimists.

**DAREL CAREY** is a visual artist focusing on optical perception. His Optical Art (Op Art) includes immersive tape installations, painted murals, and digital art. Optical and spatial

perception are his main focus; he uses lines to shape and bend the perceived dimensions of a surface or a space. Darel sees a strong connection between his art and the patterns of nature, from the beginning of our known universe, to the birth of stars and galaxies, to biological life on Earth, to consciousness and artificial intelligence.

**DAVID BOWEN** is a studio artist and educator whose work has been featured in numerous group and solo exhibitions including ZKM Karlsruhe, Fundación Telefónica Madrid, Eyebeam New York, Ars Electronica Linz, BOZAR Brussels, Science Gallery Dublin, Itau Cultural, São Paulo, Laboral Centro de Arte y Creación Industrial Gijón, The Israel Museum Jerusalem, The Cranbrook Museum of Art Detroit, Intercommunication Center Tokyo and Centre for Contemporary Culture of Barcelona. He is a two-time recipient of a McKnight Visual Artist Fellowship and has received awards such as Grand Prize, Japan Media Arts Festival; Honorary Mention, Ars Electronica; and Third Prize, Vida Art and Artificial Life international competition. Bowen has been an artist in residence at Autodesk Pier 9, The Mattress Factory Museum of Contemporary Art, The Massachusetts Museum of Contemporary Art and The Arctic Circle.

**EKENE IJEOMA** is an artist, designer, researcher, and educator who lives and works between his studio in Brooklyn, NY, and his lab, Poetic Justice Group, at MIT in Cambridge, Massachusetts. He researches how social and political systems unjustly affect people and develops large-scale participatory, interactive, and data-driven installations, sculptures, performances, websites, and apps that poetically expose their inequalities or engage people in collaboratively changing them. Through his lab, he researches how art can scale to that of structural injustice by developing large-scale phone, web, and street-based works that are public, community-driven, multisite, and networked.

**MOON RIBAS** is a Catalan cyborg artist and choreographer best known for developing *the*

*Seismic Sense*, an online seismic sensor that allowed her to perceive earthquakes taking place anywhere in the planet through vibrations in real time in her body. In order to share her experience, she then translates her seismic sense on stage. Ribas transposes the earthquakes into either sound, in her piece *Seismic Percussion*; or dance, in *Waiting For Earthquakes*. In these performances the Earth is the composer and the choreographer; and Ribas, the interpreter.

**RAFFI JOE WARTANIAN** is a writer, musician, and educator who teaches writing at UCLA and serves as the inaugural Poet Laureate for the City of Glendale, California. His writing has appeared in The New York Times, University of Texas Press, The Baltimore Sun, The Los Angeles Press, and elsewhere. Raffi has taught writing to veterans at the Manhattan VA, incarcerated writers at Rikers Island, youth in Armenia, and undergraduates at Columbia University, where he earned an MFA in Writing. He is the recipient of grants and fellowships from The Fulbright Program, Eurasia Partnership Foundation, and Humanity in Action. As a musician, Raffi has released two albums of original compositions: *Critical Distance* and *Pushkin Street*.

**SASKIA WILSON-BROWN** is a Cuban-British-American artist based in Los Angeles. In 2012, Saskia created The Institute for Art and Olfaction (IAO), a social art practice devoted to access and experimentation in creative practices with scent. In 2013, she launched an international awards mechanism for independent perfumers called the Art and Olfaction Awards. In addition to running the IAO, Saskia produces and hosts a radio show and podcast called *Perfume on the Radio*, is writing a book to be released in 2025, and is working on her PhD exploring power relations in the contemporary perfume industry at University College Dublin's SmartLab.

**SHANE MYRBECK** is a sound artist, composer and acoustician based in Los Angeles. Shane's work explores the visceral and immersive nature

of sound through spatial audio systems and architectural form, and he engages its uncanny ability to transform and direct experience. His first memory is of a shipwreck. Many of Shane's pieces involve site-specific multi-channel audio installations. His work has been exhibited globally.

**VIKTORIA MODESTA** is a bionic artist, creative director, musician, and champion of future innovation. She has established herself as a "Sci-fi In Real Life" artist & creative leader—challenging modern identity with Avant-garde Performance, one-of-a-kind prosthetics, and multimedia collaborations that bridge science and pop culture her mission is to explore the outer limits of a technologically-enhanced human experience on Earth, space, and the metaverse.

## 26 THE TEXTURE OF EMERGENCE

Lead Investigator: Artist: Darel Carey  
Research Advisors: Section Technologist,  
Electronics Manufacturing and Packaging:  
Joseph Riendeau, JPL - Technical Staff  
Supervisor, Electronics Manufacturing and  
Packaging: R. Peter Dillon, JPL

## 28 TELE-PRESENT WIND

Lead Investigator: Artist: David Bowen

Collaborators: Scientist/Principal Investigator  
of the Mars Environmental Dynamics Analyzer  
(MEDA) on NASA's Perseverance Rover: Jose  
Antonio Rodriguez Manfredi, Centro de  
Astrobiología, Spain - Data Systems Architect:  
Rishi Verma, JPL

## 34 A LOVE LETTER TO THE XO PLANETS

Lead Investigators: Artist: Bruce Mau  
Fabricator: Adam Lowe and Factum Arte 2024  
Source: [bit.ly/BruceMauXO](http://bit.ly/BruceMauXO)

Acknowledgements: We express our gratitude  
to all manifesto contributors and, in addition,  
acknowledge the extraordinary contribution by  
Dr. Jane Goodall, DBE, founder of the Jane  
Goodall Institute, UN - Messenger of Peace.  
We express our appreciation for the contribution  
by Nelson Ole Reiyia, co-founder of Nashulai  
Maasai Conservancy, Kenya. - For the text by  
Albert Einstein, we acknowledge AEA 61-226  
© The Hebrew University of Jerusalem; with  
permission of the Albert Einstein Archives.

Planet 1: Mosaic Manifesto

Artist: Bruce Mau - Fabricator: Adam Lowe and  
Factum Arte 2024 - Source: [bit.ly/BruceMauXO](http://bit.ly/BruceMauXO)

Acknowledgements: We express our gratitude  
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© The Hebrew University of Jerusalem; with  
permission of the Albert Einstein Archives.

Planet 2: Memory, Reason, and Imagination

Artist: Bruce Mau - Fabricator: Adam Lowe  
and Factum Arte 2024

Exterior: Denis Diderot and Jean le Rond  
d'Alembert developed the figurative system  
of human knowledge, also known as the  
tree of Diderot and d'Alembert. The illustration  
appeared in their Encyclopédie, a work con-  
sisting of 17 volumes of text and 11 volumes  
of illustrations. - Source: Denis Diderot et Jean  
le Rond d'Alembert. *Système figuré des  
connaissances humaines*. Encyclopédie, ou,  
Dictionnaire raisonné des sciences, des arts  
et des métiers (1751-1772).

Interior: This contemporary map of science  
visualizes activity patterns based on nearly  
one billion worldwide user interactions with  
natural science, social science, and humanities  
journals, as recorded by web portals. Users'  
movements between journals reflect their  
cross-disciplinary explorations and surface  
the underrepresented connection of the social  
sciences and humanities to the natural sciences  
in traditional citation maps. - Source: Johan  
Bollen, Herbert Van de Sompel, Aric Hagberg,  
Luis Bettencourt, Ryan Chute, Marko A.  
Rodriguez, and Lyudmila Balakireva. (2009)  
Clickstream Data Yields High-Resolution Maps  
of Science. *PLoS ONE* 4(3): e4803. doi.  
[org/10.1371/journal.pone.0004803](https://doi.org/10.1371/journal.pone.0004803)

Planet 3: Deities of the Milky Way

Artist: Bruce Mau - Fabricator: Adam Lowe  
and Factum Arte 2024

Exterior: An image of the Milky Way, where  
our solar system orbits through space at  
an average speed of 720,000 kilometers  
per hour.

Interior: Circles identify locations of exoplanets  
across the Milky Way. While we named the  
planets in our own solar system after gods,  
the first confirmed exoplanet was designated  
2M1207b. When we give planets code names,  
we make them meaningful only to a few and  
alienate everyone else. If the next generation  
of exoplanet discoveries are named after  
mythological deities, we would make them  
more accessible to us, fostering support  
for space exploration along with deeper  
appreciation for Earth. - Image source:  
SYSTEM Sounds (Matt Russo and Andrew  
Santaguida) - Text source: Our Sun: Facts.  
NASA. Accessed August 15, 2024.  
[science.nasa.gov/sun/facts/](https://science.nasa.gov/sun/facts/)

Planet 4: Planet Ocean

Artist: Bruce Mau - Fabricator: Adam Lowe  
and Factum Arte 2024

Exterior: When we make invisible landscapes  
visible, we reveal new ecosystems and oppor-  
tunities for sustaining life. Inspired by relief  
mapping and using current bathymetric data,  
we created an exaggerated topographical map  
of Planet Ocean, flattening the land and  
deepening the ocean. - Source: Adam Lowe  
and Factum Arte 2024

Interior: This visualization of global biomass  
distribution offers a true depiction of our place  
in the natural order. Humans comprise .01%  
of life on Earth, but we act as though we own it,  
dominating the other 99.99% of life. - Sources:  
Our spiral visualization is inspired by the data in:  
Hannah Ritchie. (2019) Humans make up  
just 0.01% of Earth's life — what's the rest?  
Our World in Data. Accessed July 2024.  
[ourworldindata.org/life-on-earth](https://ourworldindata.org/life-on-earth) Primary data  
source: Yinon M. Bar-On, Rob Phillips, and  
Ron Milo, (2018). The biomass distribution on  
Earth. *PNAS* 115 (25) 6506-6511. [pnas.org/  
content/115/25/6506](https://pnas.org/content/115/25/6506)

Planet 5: Islands of Intelligence  
in a Sea of Indifference

Artist: Bruce Mau - Fabricator: Adam Lowe  
and Factum Arte 2024

Exterior: The World Database on Protected  
Areas (WDPA) recorded 293,692 terrestrial  
and inland waters protected areas and marine  
protected areas in May 2024, still a tiny  
fraction of the ecosystems that sustain us.  
Source: UNEP-WCMC and IUCN (2024).  
Protected Planet: The World Database on  
Protected Areas (WDPA) Accessed July 2024.  
Cambridge, UK: UNEP-WCMC and IUCN.  
[protectedplanet.net](https://protectedplanet.net).

Interior: The visualization illustrates human  
pressures on Earth's surface. The Half-Earth  
principle, a concept introduced by E. O. Wilson,  
states that if we protect approximately half  
of Earth's surface, we can ensure the survival  
of a critical mass of species. - Source: Based  
on The Half-Earth Project Map, provided  
by Half-Earth Project. E. O. Wilson Biodiversity  
Foundation. HALF-EARTH PROJECT® is  
a trademark of E.O. Wilson Biodiversity  
Foundation, Inc. Used with permission.  
ALL RIGHTS RESERVED.

Planet 6: XO Planet 2M1207b

Artist: Bruce Mau - Fabricator: Adam Lowe  
and Factum Arte 2024 - Source: 2M1207b —  
First image of an exoplanet. Scientific  
Visualization Studio. NASA. Accessed July 2024.  
[science.nasa.gov/resource/2m1207-b-first-  
image-of-an-exoplanet/](https://science.nasa.gov/resource/2m1207-b-first-image-of-an-exoplanet/)

## 40 BURIAL OF A SENSE

Lead Investigator: Artist: Moon Ribas

## 46 SEISMIC PERCUSSION SCORE

Lead Investigator: Artist: Moon Ribas

Collaborators: Data Systems Architect: Rishi  
Verma, JPL - Seismologist and Associate  
Professor, Université Paris Cité, Institut de  
Physique du Globe de Paris/Collaborator on  
the NASA InSight Lander's Seismic Experiment  
for Interior Structure (SEIS) Instrument: Nobuaki

Fuji Lunar Seismologist, Research Scientist:  
Dr. Ceri Nunn, JPL

## 50 EARTH SPEAKS

Lead Investigators: Creative Technologist:  
Lizbeth B. De La Torre, JPL - Poet Laureate,  
City of Glendale: Raffi Joe Wartanian

Contributors: Chief Scientist, Earth Science  
and Technology Directorate: Duane Waliser, JPL  
Associate Scientist, Earth Sciences and  
Technology Directorate: Michelle Gierach, JPL  
Experience Designer: Sands Fish - Fabricator:  
Husler & Rose - Research Advisors: Principal  
Scientist/Oceanographer: Josh Willis, JPL  
Scientist/Carbon Cycle And Ecosystems: Kerry  
Cawse-Nicholson, JPL

## 56 WORDS FOR NAVIGATING BLENDED WORLDS

Lead Investigator: Craig Joiner

## 58 SENSORY MEMENTOS

Lead Investigators: Artist: Saskia Wilson-Brown  
Artist: Shane Myrbeck

Collaborators: Astrophysicist: Anjali Tripathi, JPL  
Mount Maker: Kamil Beski, Beski Projects  
Fabricator: McNICHOLS - Fabricator: Los  
Angeles Glassblowing - Fabricator: Saxon  
Industrial - Composer: Emily Shisko - Research  
Advisors: Artist: Carrie Paterson - Designer:  
Micah Hahn, AutumnSeventy

## 64 INTERSTELLAR SOUNDINGS

Lead Investigators: Artist: Shane Myrbeck  
Artist: Saskia Wilson-Brown

Collaborators: Astrophysicist: Anjali Tripathi, JPL  
Mount Maker: Kamil Beski, Beski Projects  
Fabricator: McNICHOLS - Fabricator: Los  
Angeles Glassblowing - Fabricator: Saxon  
Industrial - Composer: Emily Shisko - Research  
Advisors: Artist: Carrie Paterson - Designer:  
Micah Hahn, AutumnSeventy

## 68 GEOMAGNETIC SUNSETS ON K2-18 b

Lead Investigator: Visual Strategist:  
Chrissy Stevens, JPL

Collaborators: Principal Optical Engineer:  
Brian Monacelli, JPL - Creative Direction:  
Jaime Macias, Thought Process - Fabrication  
Oversight: Thought Process

Research Advisors: Astrophysicist: Tiffany  
Kataria, JPL - Astrophysicist: Anjali Tripathi,  
JPL - Principal Scientist: Joseph Lazio, JPL  
Astronomer + Artist: Robert Hurt, IPAC  
Cal Tech - Exoplanetary Scientist Associate  
Professor of Astronomy: Nikole Lewis, Cornell  
University - Exoplanetary Research Scientist:  
Jake Turner, Cornell University - Astrophysicist  
& Assistant Professor of Astronomy: Zachory  
Berta-Thompson, University of Colorado  
Boulder - Research Scientist, Laboratory for  
Atmospheric and Space Physics: J. Sebastian  
Pineda - Creative Director, Yves Peitzner,  
Studio TISH - Experiential Strategist, Jelena  
Gregov, Studio TISH

## 74 ANCIENT ECHOES: SOUNDSCAPES ACROSS WORLDS

Lead Investigator: Artist/Astrophysicist:  
Annette S. Lee

Collaborators: Fabricator: Kelly Carlton  
Technology Liaison/Creative Technologist:  
Eddy Vajarakitpongse - Scientist in Planetary  
Interiors and Geophysics: Corey Cochrane, JPL  
Anne Simonis, Underwater Acoustic Ecology

Research Advisors: Carmen Gavin Vanegas and  
boys, Water Honoring Song (Ojibwe, Dakota,  
English & Romanian) - Biologist, Mequon Nature  
Preserve: Gary S. Casper - Author, Naturalist,  
Wildlife Photographer: Stan Tekiela - Nathan  
Ziegler, Minnesota Cold - PI/Director, Ocean  
Worlds Lab: Kevin Hand, JPL

## 82 VITALIS ECSTASIS

Lead Investigator: Artist/Creative Director:  
Viktoria Modesta

Collaborators: Planetary Protection Engineer:  
Moogega Cooper, JPL - Robotics Engineer:  
Kalind Carpenter, JPL - Creative Lead & Project  
Manager: Nina Hawkins, Liliium Labs - Digital  
Creator & Mechatronics Assistant: Sage Morei,  
Horizon Lab - Art Handler & Technical Producer:  
Ian Christie, Anchor Arts - Lead Fabricator &  
Prosthetist: Alex Freire C.P - Assistant Producer:  
Nate Mohler - Creative Manufacturing  
Technologist: Nader Shokair

Research Advisor: PI/Director, Ocean Worlds  
Lab, Kevin Hand, JPL

## 88 IN PRAISE OF MYSTERY

Collaborators: Laureate Program Coordination:  
Brett Zongker, Library of Congress  
- Producers: Laurance Fauconnet & Heather  
Doyle, JPL - Concept: Preston Dyches, JPL

## 90 WATER WORDS

Lead Investigators: Producer: Preston Dyches,  
JPL - Visual Strategist: Dan Goods, JPL

Collaborators: Designer: Debbie Millman  
Linguists: Sheri Wells-Jensen, Laura Welcher,  
and Doug Vakotch; METI International  
Sign Language Symbol: Larry Guterman &  
Arthur Salvetti - Fabrication: Rudy Herrera, JP

## 94 LIFESAVER

Lead Investigator: Artist: Ekene Ijeoma

## 98 THE BIG UNKNOWN

Lead Investigator: Visual Strategist:  
Dan Goods, JPL

Collaborators: Machinist: Peter Bruneau, JPL

Research Advisor: Program Manager for  
the NASA Exoplanet Exploration Program:  
Gary Blackwood, JPL

## 100 EARTH DATA: THE MUSICAL AT THE ALEX THEATRE

Lead Investigators: Creative Lead: Brian Brophy  
- Composer: Emily Sisko - Writer: Cole Remmen -  
Art Director: Barbie Inusa

Research Advisors: Climate Scientist & Science  
Systems Engineer: Kimberley Rain Miner, JPL -  
Research Scientist: Bradley Gay, JPL

## 104 LIBRARY OF POSSIBILITIES

Lead Investigator: Artist: Stuart Candy

Collaborators: Scientists/Interviewees:  
Moogega Cooper, Chris Lindensmith,  
Shin Shimojo, Nicole Stott, Vandi Verma,  
Josh Willis - Co-designer: Ceda Verbakel -  
Co-explorers: Otter, Claude, Midjourney -  
Co-conspirators: David Delgado; Maryl Fleisher  
and the Glendale Libraries team - Thanks to  
cartographer Jeffrey Linn for his Los Angeles  
Sea Rise map, used with permission

## 106 ASTROGLYPHS

Lead Investigators: Visual Strategist: David  
B. Levine, JPL - Visual Strategist: Thomas  
Gottelier, JPL

Collaborators: Mission Science, Surface,  
Biology and Geology (SBG): Charles Miller,  
JPL - Senior Research Scientist: Marc Simard,  
JPL Scientist, Analysis of Algae Blooms on  
the Greenland Ice Sheet, Niklas Bohn, JPL  
- Technologist and Geospatial Researcher:  
Brenna Hatch, JPL - Optical Engineer: Holly  
Bender, JPL - Creative Director: David Rager,  
NASA - Universe Public Engagement: Kaitlyn  
Soares, JPL - Robotics Mechanical Engineer:  
Stephen Gerdts, JPL - Business Administrator:  
Keiana Samoy, JPL - And a growing list  
of future Field Researchers at JPL,

Research Advisors: Chief Scientist, Earth  
Science and Technology Directorate:  
Dr. Duane Waliser, JPL - Earth System  
Scientist: Dr. Dana Chadwick, JPL

## 112 THE GOLDEN RECORD COVER

Lead Investigators: NASA/JPL



**“The potential of  
what we could become  
gives us hope.”**

→ David Delgado | Lead Investigator



**Alex Theatre Presents: Blended Worlds**

Lead Investigators:

Dan Goods, David Levine, Tina Salmassi

Collaborators: Speakers: Adam Stelzner, Kalind Carpenter, Morgan Cable, Moo Cooper, David Delgado, Neil Harbisson, Moon Ribas, Viktoria Modesta, Ada Limón, Reggie Watts.

Crescenta Valley High School: Nathan Akrraratana, Samantha Boyer, Julian Duaybis, Fernando Diaz, Jimmie Jenkins, Danny La France, Madeline Greenwood, Oliver Gough, Mila Popovic, Ian Park, Joshua Stone, Mathew Schick, Nathan Schick, Josh Solis, Milan Tei Lee, Nicole Stephan, Leland Elmes.

Earth Data: The Musical at the Alex Theatre: Jocelyn Argueta, Boyuan Chen, Max Gorbachev, Anya Janowski, Eric Smith, Jessica Kilgore, Joony Kim, Julian Wagner, Armin Kleinboehl, Cai Tong Ng, Damian Reeve Wilson, Solvin Sigurdson, Emily Shisko, Joey Jefferson.

Drummer: Stephen Perkins

DJ: King Britt

AeroVironment: Joey Beckman, Matthew Keennon, Brigid Morrissey, Paulina Ridland.

Alex Theatre: Miles Williams  
Telescopes: Michael Saing, Michael McFall

Research Advisor: Theodore Tzanetos

Special Thanks

Creative Direction: Travis Broyles  
Getty PST: Olivia Foss, Zach Kaplan, Heather MacDonald, Lu Spriggs, Joann Weinstein

Glendale Library, Arts & Culture: Jennifer Fukutomi-Jones  
Roland: Mar Keith Meloncon and Matt Wechsler

YAMAHA MOTOR Co.,Ltd.: Takashi Suegami and Kip Washio

**Blended Worlds: Experiments In Interplanetary Imagination:  
Research & Exhibit Development**

Lead Investigator: David J. Delgado

Collaborators:

Creative/Curatorial: Brian Brophy, Kareem Collie, Lizbeth B. De La Torre, Dan Goods, Craig Joiner, David Levine, Chrissy Stevens, Rishi Verma  
Design: Thomas Gottelier, Carolina Uscategui  
Curatorial Advisors: Stuart Candy, Lois Rosson  
Production: Juell Diaz, Celeste Hoang, Rebecca Buck Silva  
Education: Paula Goodman  
Catalog Interior Design: Stefan G. Bucher for 344 Design  
Creative Technology: Eddy Vajarakitpongse  
Glendale Library, Arts & Culture: Jennifer Fukutomi-Jones  
Brand Library & Art Center: Stephanie Sherwood

Research Advisors:

Refik Anadol, Kalind Carpenter, Amy Crawford, Moogega Cooper, Rachel Etheredge, Josh Goldblum, Kevin Hand, Joseph Harris, Glenn Kaino, Lois Kim, Danielle Krettek Cobb, Chris Lindensmith, Prathima Muniyappa, Shane Myrbeck, Katherine Park, Paul Propster, David Rager, Evgenya Shkolnik, Shinsuke Shimojo, Seth Shostack, Nathan Smith, Nicole Stott, Marco Tempest, Steve Tidball, Anjali Tripathi, Vandi Verma, Victoria Vesna, Reggie Watts, Saskia Wilson-Brown, Josh Willis, Liam Young, Dave Zaboski

Special Thanks:

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Glendale Library, Arts & Culture Trust: Jane Viar, Joan Zierhut • Keck Institute for Space Studies (KISS): Michele Judd, Tom Prince • The ACE Agency: Ashley Patterson, Gabriella Silva, Hanya Bruner, Katri Randall • Individuals: Devon Baur, Erica Bernhard, Marshall Birnbaum, Audrey Murty

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