



MIRA 2019: Makerspaces for Innovation
and Research in Academics

Making Space for Discovery

Sara Bond
Christopher Dixon
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Jet Propulsion Laboratory
California Institute of Technology

The Jet Propulsion Laboratory



Credit: NASA Photojournal

- NASA funded, Caltech managed FFRDC
- 6,000+ employees
 - Scientist, engineers, technologists, business people
- World leader in robotic planetary exploration

About Us



Christopher Dixon
Information Science Specialist



Camille Mathieu
Information Science Specialist

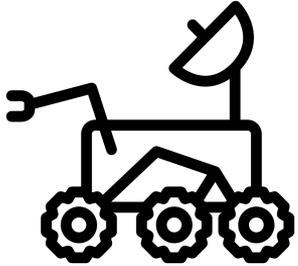


Sara Bond
Information Science Specialist

Learning Outcomes

- Learn what it means to function as a makerspace at a research institute
- Discover how facilitated communities of practice drive research and development
- Think about recognizing and acting on your community's unique access and experience gaps

Setting the Stage



**How do you make a makerspace
within a giant makerspace?**

Digital & Physical Space

- Work along the entire spectrum
- Spaces for community building and shared resources that are both digital and/or physical
- All makerspace efforts are creative and useful



The Hub



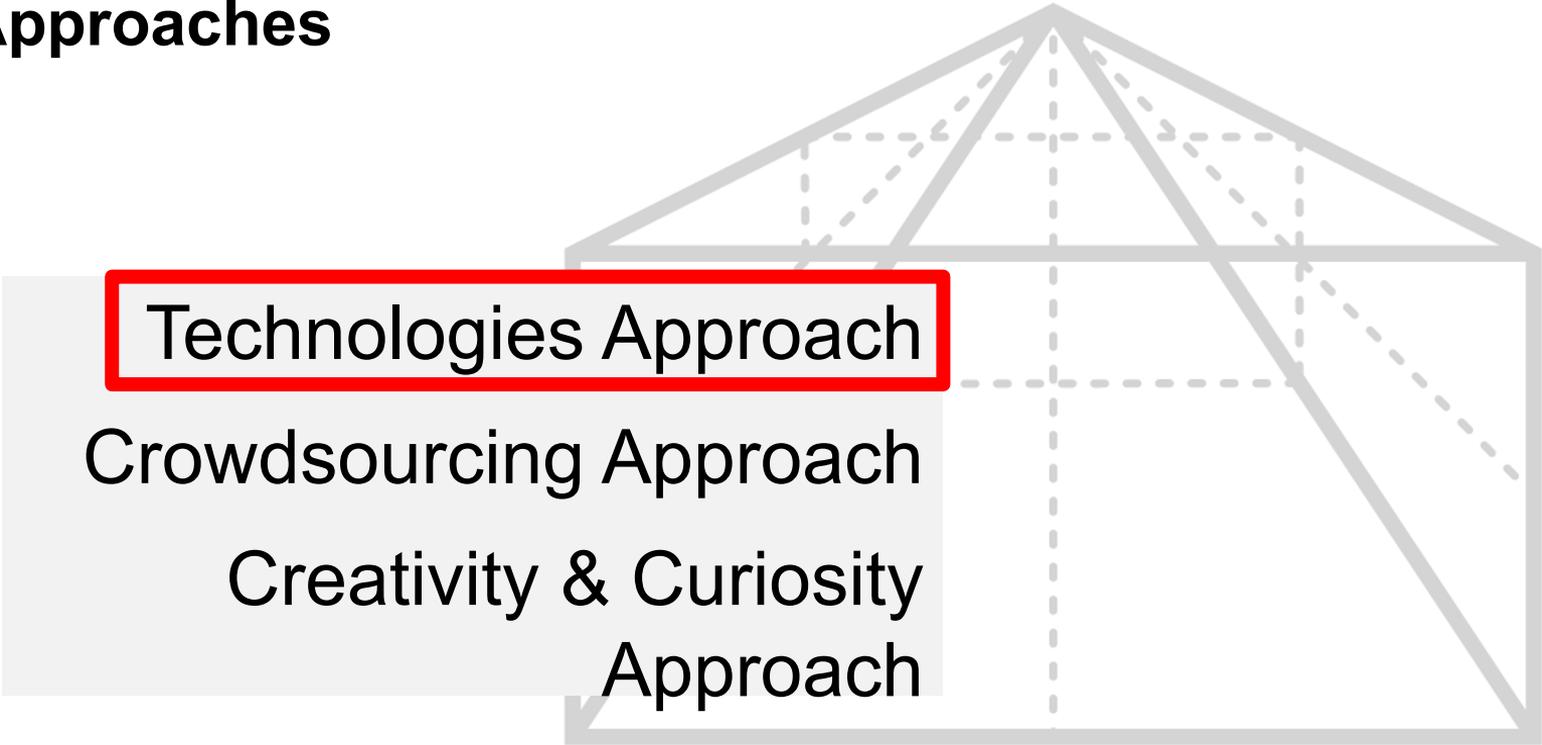
- Has no/few reservations, and no cost
- Fills a critical space need at JPL

The Hub



- Use of space does not have to be work-related
- Lowest barrier of entry for a presentation space on Lab

Digital Approaches



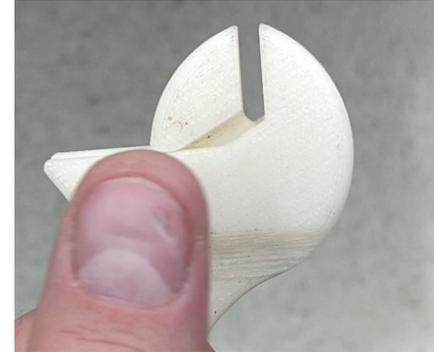
Technologies Approach

Crowdsourcing Approach

Creativity & Curiosity
Approach

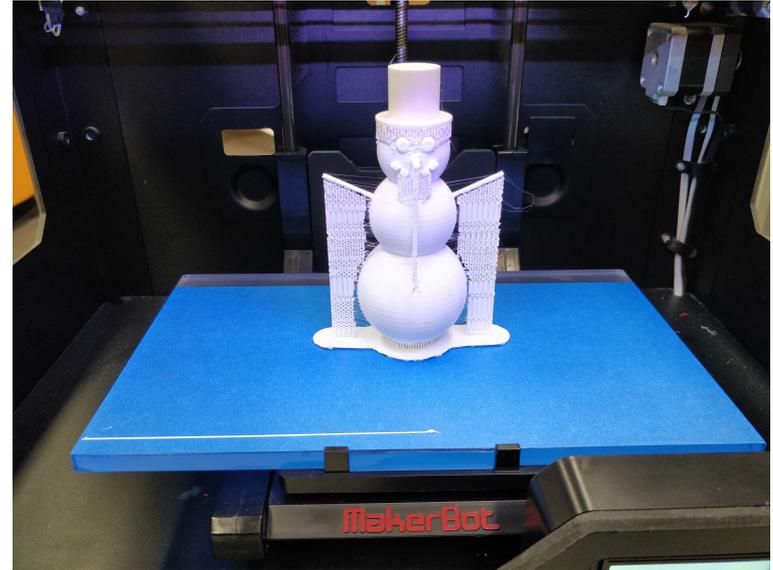
3D Printers

- The Hub offers 3D printing capabilities at no cost to the patron, making it a great place to prototype initial concepts before utilizing the fabrication shops which will charge a fee.

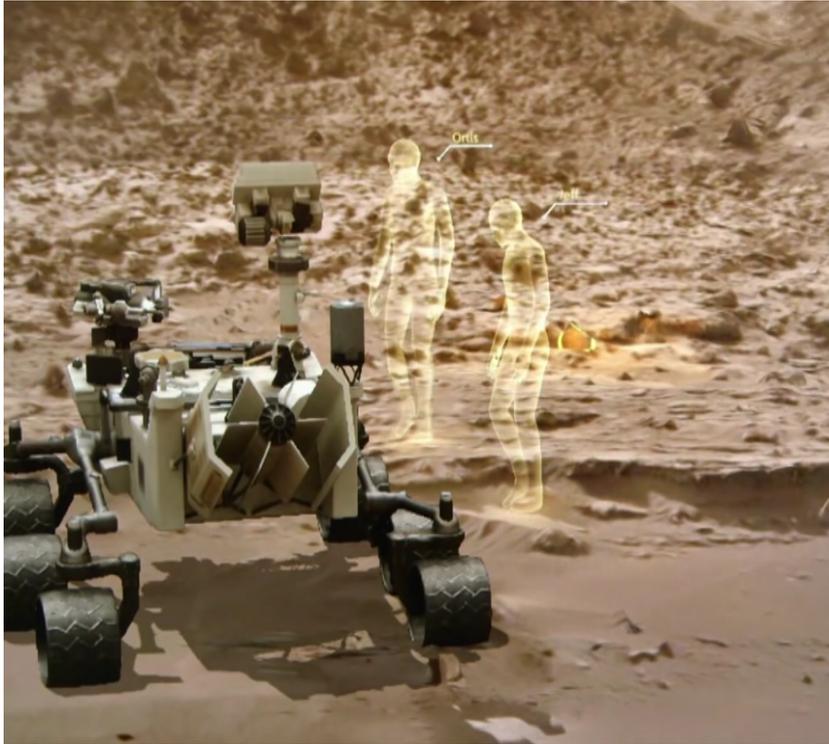


3D Printers

- 3D printing in the Hub is quite popular with the student interns as this is their first real world experience collaborating with others on a project that requires building parts. Many practical problems are first solved in the JPL library's makerspace.



HoloLenses



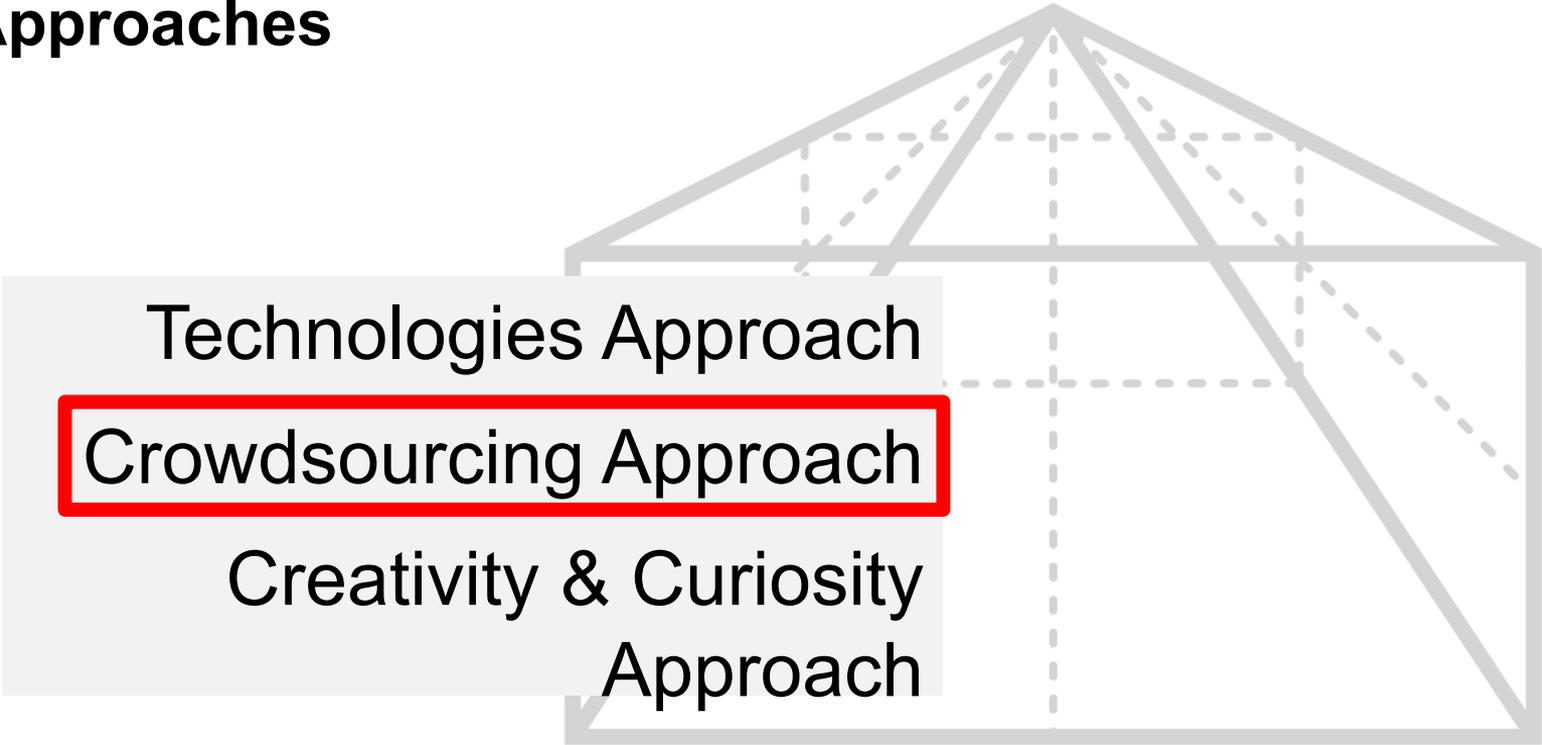
- The JPL OpsLab partnered with Microsoft to develop OnSight which is an augmented reality application where the user can explore the terrain of Mars on foot. The app takes real terrain data gathered from MRO & MSL and displays a virtual landscape complete with an MSL model.

HoloLenses

- In the library has two HoloLenses available for checkout and gives demos to visitors to the lab. The JPL library also encourages patrons to develop additional apps using the HoloLens platform.



Digital Approaches

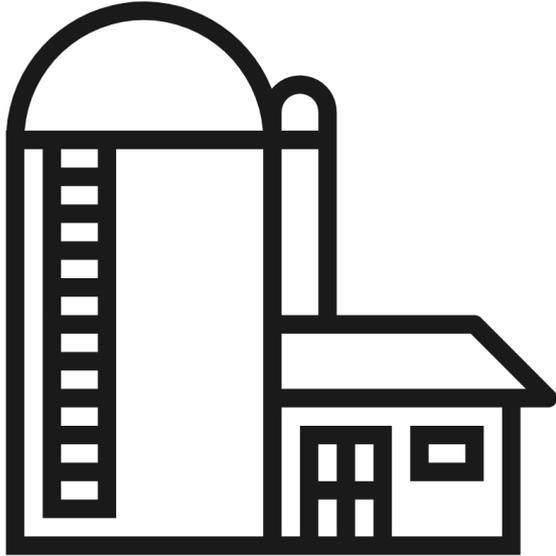


Technologies Approach

Crowdsourcing Approach

Creativity & Curiosity
Approach

Crowdsourcing for Knowledge Management



- Official knowledge management efforts are top-down
- There is a gap in knowledge capture for day-to-day, unofficial processes
- Foreign National access to content is extremely limited

Crowdsourcing with Wikis

Dashboard

Edit Save for later Watching Share ...

Tutorials for Wired
Wired Tutorial: [Contributing Content](#)



JPL's encyclopedia (*and more!*) that **you can edit!**

Create New Article

Latest Updates

Recently Updated

- [Adding Testbed Calendars to Outlook](#)
5 minutes ago • updated by Michael O Lashore • view change
- [Topology Optimization: Installing solidThinking Inspire](#)
25 minutes ago • created by Ryan T Watkins
- [Overhanging Cam Pawl Latch](#)
35 minutes ago • updated by Robert K van Ness • view change
- [Sample Project Landing Page](#)
about 2 hours ago • updated by Mitch S Goldstrom • view change

Welcome Interns!

Check out the [Hitchhiker's Guide to JPL](#) for an overview of how JPL works.

Wired Portals

Wired portals are collaboration spaces for editors within communities of practices based on Wikipedia's [Portals](#) and [WikiProjects](#). Go to [List of All Portals](#) to view all portals.

Technical Discreet. This document has been reviewed and determined not to contain export controlled technical data.
JPL/Caltech Proprietary Business Discreet. Caltech Record. Not for Public Distribution.

Dashboard

Edit Save for later Watching Share ...



JPL's wiki knowledge library for Foreign National access.

Latest Updates

Recently Updated

- [Beginnings of the Space Age](#)
yesterday at 2:22 PM • created by Rebecca M Townsend
- [PubSpace: NASA's Open Access Repository](#)
yesterday at 2:18 PM • created by Rebecca M Townsend
- [Commuting by Bicycle](#)
yesterday at 2:13 PM • updated by Rebecca M Townsend • view change
- [Commuting by Bus](#)
yesterday at 2:12 PM • created by Rebecca M Townsend
- [When Something Goes Wrong](#)

Something missing?

[Suggest additional content for FN-Cosmos here.](#)

About FN-Cosmos

Cosmos contains a variety of content created across Lab that is shared here to provide access to foreign national employees of JPL. This resource is read-only, but users are encouraged to leave comments.

Crowdsourced, Communal Knowledge Sharing

The screenshot shows a web page from JPL Wired. At the top, it says 'Dashboard / JPL Wired' and has navigation links for 'Save for later', 'Watch', and 'Share'. Below that is the breadcrumb '/ Hardware Assembly and Testing'. The main title is 'Flight Technicians Guide to Building Hardware', created by Kenneth Muse on Mar 12, 2019. A progress bar shows 'Confidence Level 2'. A yellow highlighted box contains a 'Want to contribute?' section with instructions and a list of tasks with assigned experts. At the bottom, there is a 'Table of Contents' with three items: '1 Assembly Test and Launch Operations (ATLO)', '2 Mechanisms', and '3 Thermal Blanket Fabrication and Installation'.

Dashboard / JPL Wired

/ Hardware Assembly and Testing

Flight Technicians Guide to Building Hardware

Created by Kenneth Muse, last modified on Mar 12, 2019

Confidence Level 2

Want to contribute?

Please include a general overview, do's and donts, general practices, JPL reference specs.
▼ Here's how you can help

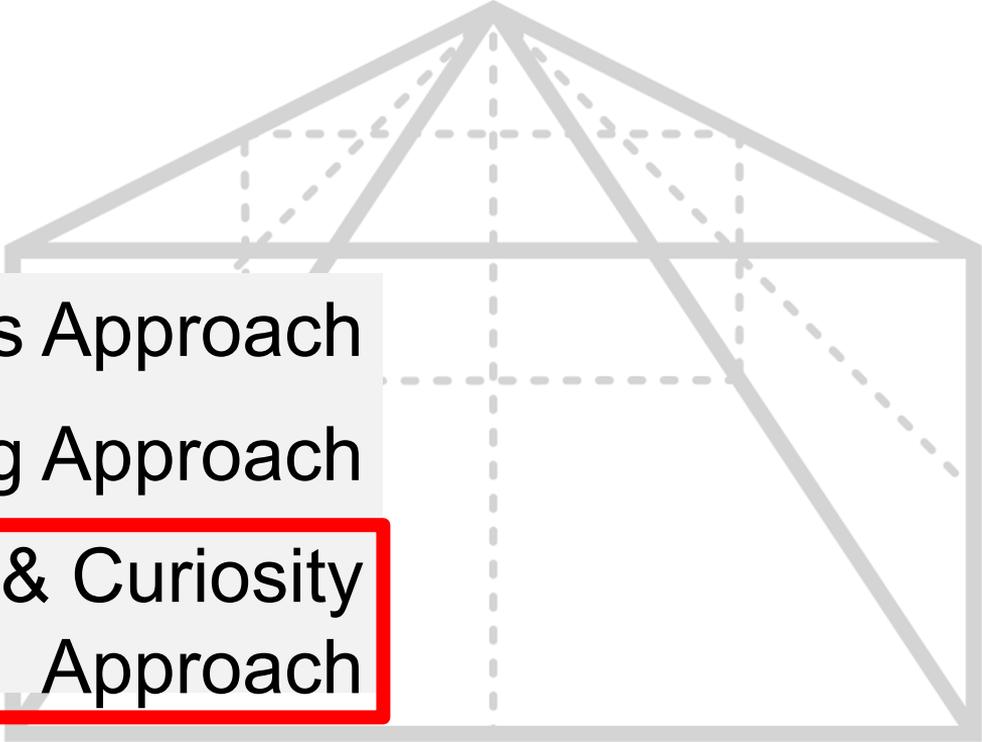
- @Michael A Ilharreguy Mr. ATLO
- @Lack Clonts Mechanisms
- @Richard S Frisbee Jr Thermal Blanket Fabrication and Installation
- Mechanical Ground Support Equipment (MGSE) @Mark White
- Proof Testing @Mark White
- Thermal Coating (Paint) @John P Campanella
- Pyro Testing and Installation @William A Gavid
- Critical Flight Lifts and Moves @Chuck E Morris
- Structural Bonding @Lawrence S Harma (james threw you under the bus)
- Engraving services @Timothy John B Garcia
- Remote site support @Michael A Ilharreguy Mr.
- Launch pad operations @Christopher S Tippit
- General oversight @Pim W Vosse

Flight Technicians Guide to Building Hardware is meant to be used as a reference for new technicians or technicians performing tasks they are not familiar with. Each section will have an Subject Matter Expert (SME) assigned to be a point of contact for the specific field.

Table of Contents
1 Assembly Test and Launch Operations (ATLO)
2 Mechanisms
3 Thermal Blanket Fabrication and Installation

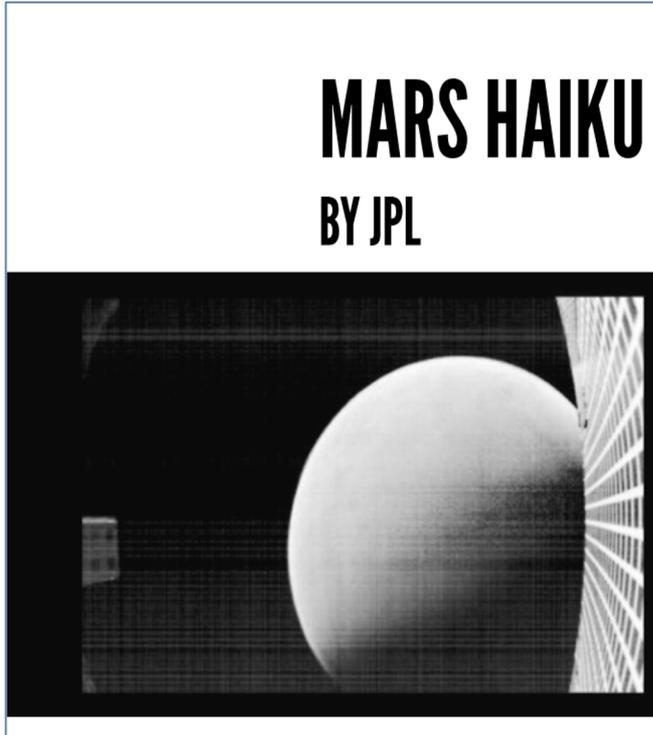
- Wiki content generation and organization is dependent upon bringing together communities of practice for edit-a-thons
- Librarian serves as facilitator to increase cohesion and offer tech support

Digital Approaches



Technologies Approach
Crowdsourcing Approach
**Creativity & Curiosity
Approach**

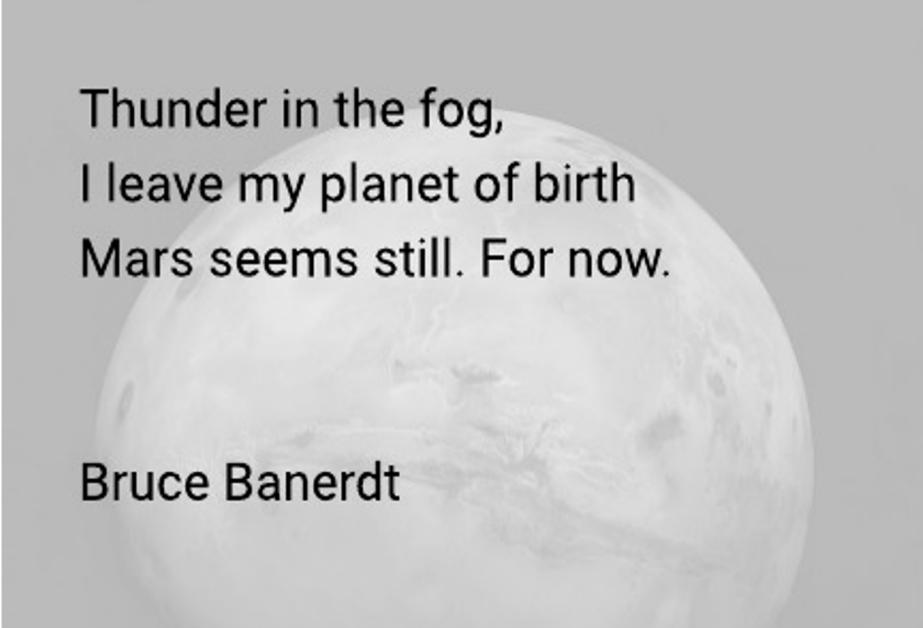
Sparking Creativity



Received over 80 submissions from people all over the Lab: interns, contractors, children of employees, business admin, scientists, engineers, and more

- “It was fun – thanks for the diversion!”
- “So cool that you guys are doing this :-D. No idea how many we are allowed to submit... here are a handful (I got carried away, ha)”
- “I hope the lab will do something similar when Europa Clipper arrives at its destination :-)”
- “I wrote haikus in college. Some were published. Nice to revisit”

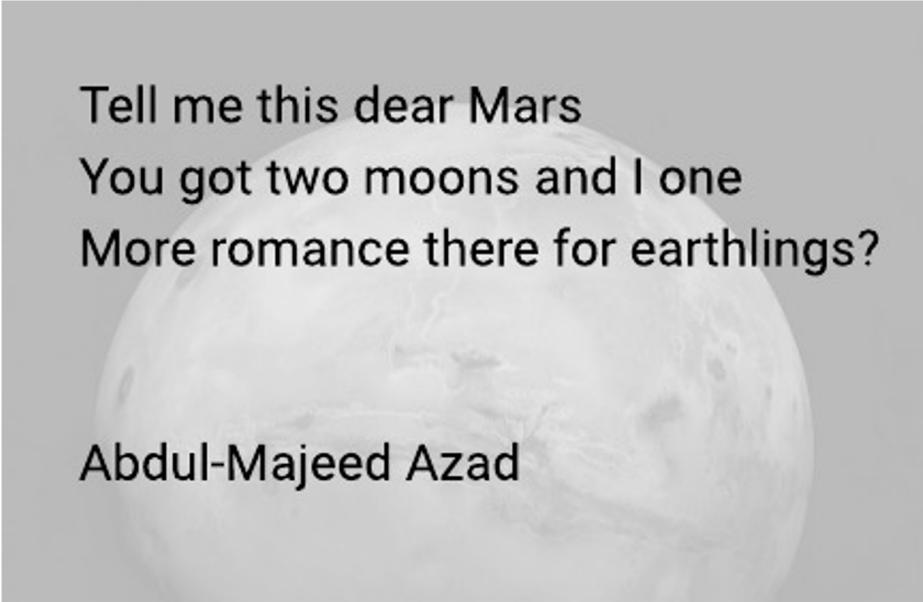
Mars Haiku Examples



Thunder in the fog,
I leave my planet of birth
Mars seems still. For now.

Bruce Banerdt

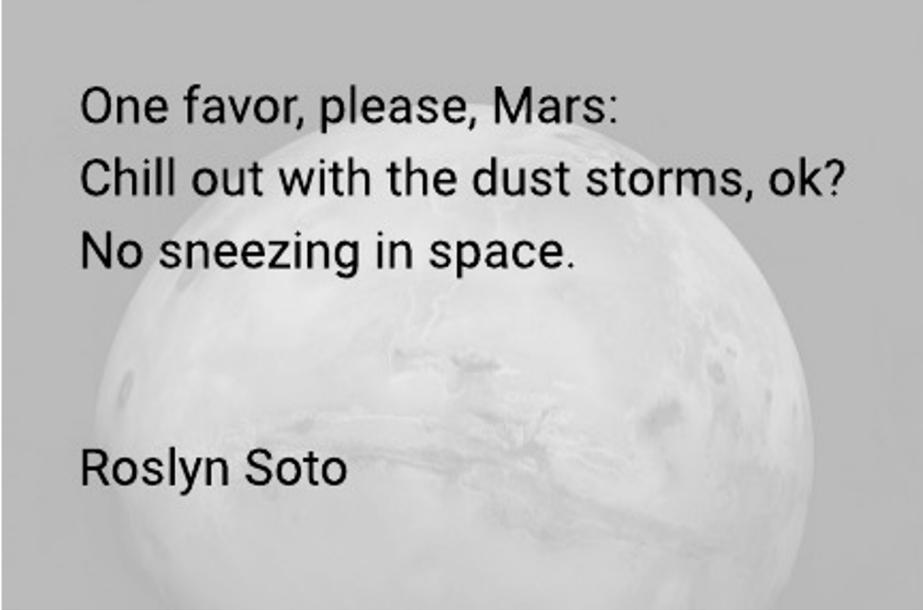
Mars Haiku Examples



Tell me this dear Mars
You got two moons and I one
More romance there for earthlings?

Abdul-Majeed Azad

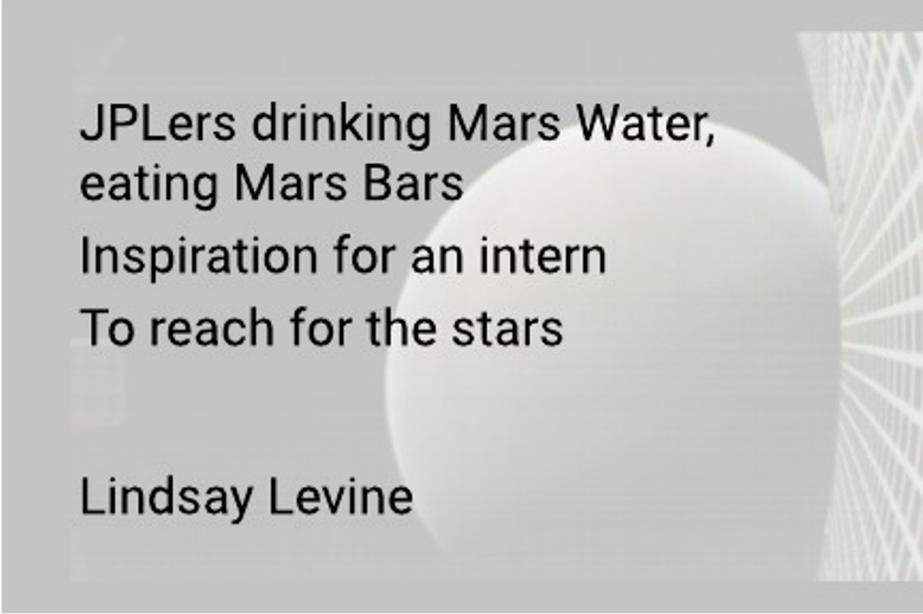
Mars Haiku Examples



One favor, please, Mars:
Chill out with the dust storms, ok?
No sneezing in space.

Roslyn Soto

Mars Haiku Examples



JPLers drinking Mars Water,
eating Mars Bars
Inspiration for an intern
To reach for the stars

Lindsay Levine

Mars Haiku Examples

1. Watching from Blue Earth

Closer InSight becomes Go!

InSight has landed

2. Rusty, red planet

InSight goes to discover

Hooray! InSight beeps

3. To the core of Mars

Thump, thump. Collecting samples

Probing through and through, InSight

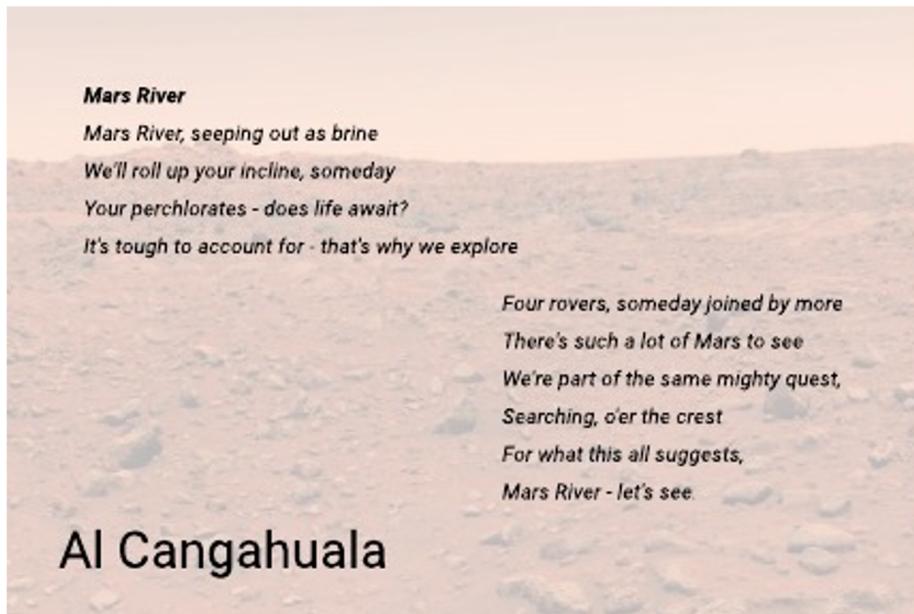
4. Lightly shooting up

Closer to destiny's light

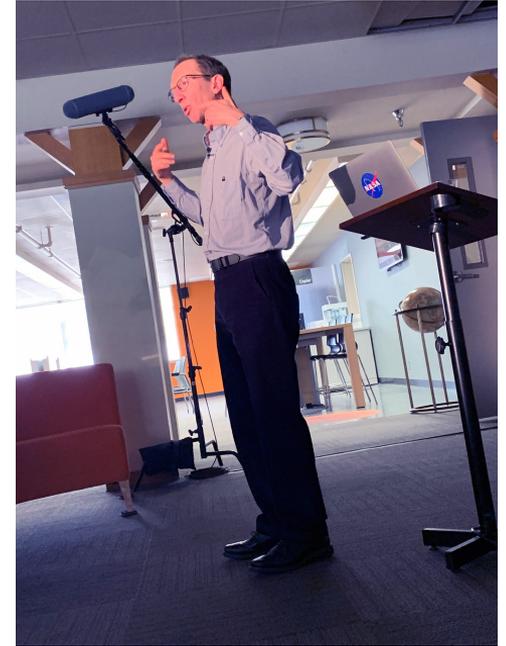
Gently landing on Mars

Leila, 5th grade

Mars Haiku Examples



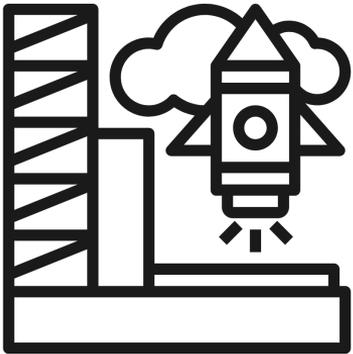
JPL Stories as Space for Discovery



- Inspired by organizational storytelling research
- Emphasis on personal storytelling and communication of personal and first-hand experience.

Concluding Thoughts

- Access is key; find the gaps, and meaningfully fill them
- Be transparent
 - Make the technology/system work for you and your users
 - Break down silos, black boxes, and anxieties
- Evaluate honestly both user needs and makerspace successes
- Make spaces (digital & physical) with the intent to inspire and enable discovery





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California Institute of Technology

jpl.nasa.gov