Mars And Beyond: Human Spaceflight at the Museum of Science Boston

Joseph Paul Cohen at the University of Massachuestts Boston, and Julia Sable at the Museum of Science Boston, and Wei Ding at the University of Massachuestts Boston, and Ron Li at the Ohio State University, Tom Stepinski at the University of Cincinnati

Introduction

In the third year of this ongoing outreach project [1] [2] we had a greater emphasis on manned spaceflight than in previous years. This years Mars and Beyond event occurred on August 31^{st} and September 1^{st} at the Museum of Science in Boston Massachusetts which hosts more than 1.5 million visitors yearly.

This years event grew to include many speakers from the community and focused on the challenges to human spaceflight. In order to highlight the challenges of sending astronauts to Mars we focused on the Apollo and Orion missions, space suits, Mars settlement, and 3D printing (a technique for making needed tools during a space mission).

Approach

In 2012 [2] we emphasized the landing of Curiosity on Mars because that was hot news at the time. Robotic space explorers weren't in the news as much in the summer of 2013, so we wanted to try a different "hook" to capture people's imaginations. We chose manned spaceflight because there is real intent to send humans to Mars within the next generation. We also chose this topic because it appeals to both adults and children. Adults can recall the excitement of the Apollo missions and compare the newest technology with those historic achievements. Kids can picture themselves as astronauts.

A consistent theme in our events over the past three years has been a panel of NASA funded scientists discussing their work and answering questions from museum visitors. This year we organized the panelists so their research would progress through the different ways of studying Mars, from indirect to direct. We thought this would help provide perspective on how the different research is relevant and necessary for successful manned missions to Mars.

Figure 1: Mars and Beyond Panel: (left to right) Wei Ding, Joseph Paul Cohen, Sam Kounaves, Ron Li.

Indirect: Using artificial intelligence to map planetary surfaces. Wei Ding from the University of Massachusetts Boston presented the theory behind applying machine learning to analyzing remote sensed imagery. This was a visitor friendly version of [3] and [4].

Indirect: Studying remote sensed Martian imagery using computers. Joseph Paul Cohen from the University of Massachusetts Boston discussed how scientists go from remote sensed images to features that can be used in artificial intelligence algorithms [5] [6].

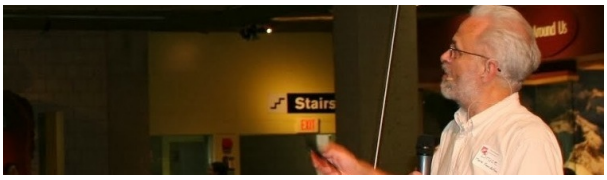
More direct: Sending robots to Mars. Sam Kounaves from Tufts University discusses his involvement as a Co-PI in the Phoenix Lander mission and how the results presented [7] [8] where a robot acted as a proxy for a human, taking samples and carrying out experiments.

Direct: Sending humans to Mars. Ron Li from The Ohio State University discussed his involvement in the development of astronaut localization methods for future human missions [9].

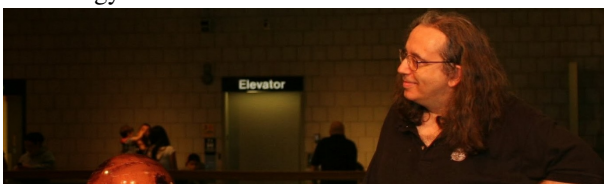
For this years event we had many talks throughout both days from members of the community. A few a presented next:

Jim Hand who is retired from Northrop Grumman worked on the Apollo Moon missions. He designed a star alignment system to get the coordinates of the shuttle after it left earth. He presented visitors with amazing stories of working closely with NASA and JPL to install and launch these systems.

Jack Mustard is the chairman of the Mars 2020 Science Definition Team and a professor at the Geological Sciences at Brown University. He discussed how geologic exploration of Mars can elude to signs of life.



Bruce Mackenzie from the Mars Foundation discussed a plan for Mars settlement describing all the technology we do and don't have.



Jonathan McDowell from Harvard-Smithsonian Center for Astrophysics gave a presentation about the invisible universe.

John Johnson from Harvard University discussed findings from the Kepler missions that indicate there are many warm planets around cool stars and his work to validate these findings.

The *Crater Seeker* 3D simulation video game designed by Joseph Paul Cohen allows visitors to imagine themselves as JPL driving the MER-B rover. Visitors are confronted with challenges that lead them to use tools such as false color DEM slope maps and ingress path planning. The best way to understand why tools are needed is to face the same challenges that require them. In the picture visitors have unlocked a secret rover modeled after a star wars land speeder.

Our outreach efforts had a high impact, connecting with many people in a short time. Our audience counts for the stage presentations totaled 635 for Saturday and 630 for Sunday. We counted the number of "engaged visitors" who did activities or interacted with presenters at tables during the event. We counted a total of 1887 engaged visitors over the course of the two days.

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