

# To the Red Planet and Beyond: The Mars Rover Celebration

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Space and space exploration have long captivated adults. For elementary and junior high students, the siren call of our galaxy and beyond is no different. Luckily for Houston-area students, programs such as the Mars Rover Celebration feed their curiosity.

The Mars Rover Celebration is an educational program for third through eighth graders at public and private Houston-area schools. For the first time in their educational careers, students are let

loose and given the power to choose what they wish to study about Mars. Research is what they make of it—anything and everything goes. Teachers anchor the students' various research projects with specially prepared 5-E lessons that are space- or Mars-oriented that make up part of the Mars Rover Celebration curriculum. NASA approves and certifies a majority of these lessons. After students spend class time researching more on Mars, teachers instruct them to create a Mars rover of their own—one equipped to carry out any experiments or tests needed to answer the questions posed by their particular project.<sup>1</sup>

Eventually, mock-ups turn into real rovers made from everyday items found in and around the house. Some districts host large competitions where every student vies for one of the top coveted spots at the University of Houston Mars Rover Celebration event. Other schools choose their best students and send a select few. Still other schools enter every student they possibly can. On a given Saturday in January, hundreds of students, parents, teachers, and volunteers gather at the University of Houston main campus, which hosts the official event. The day is broken up into three parts—elementary judging, middle school judging, and awards.<sup>2</sup>

The elementary judging kicks off the Mars Rover Celebration event. Hundreds of third, fourth, and fifth graders set up tri-folds, posters, rovers, and other miscellaneous objects to aid them in their presentations. Working



*Solar-powered rovers have small solar panels attached to their frames and must move when a light is shined on them for the group to receive the maximum number of points.*

Photo courtesy of Dr. Edgar A. Bering III.

in groups with an average size of three people, students prepare to present their research and their model rover. They put on skits to showcase what they learned in a creative manner while they wait for the judging to commence. Some students wear costumes but they are not a requirement of the program.

With the announcement that judging is about to begin, organizers ask parents to leave the judging floor, and judges quickly review which tables they will visit during the next hour. Judges, who include University of Houston students, faculty, and various members of the Houston scientific community, have an hour to judge an average of four rovers.

Judges watch the skits and then ask a series of questions to try and find out how much the students know about Mars and whether the students found an answer to the queries that prompted their research. A great interest is taken in their conceptual designs for their rovers. Judges note the scores on a Scantron form and continue on to their next table. At the end of the hour, elementary students pack up their projects and empty the room, making way for the middle school students.<sup>3</sup>

The judging process for the sixth, seventh, and eighth graders is exactly the same as that for the younger students. However, older students' projects tend to be far more complex, and their questions often reflect a higher caliber of thinking than their younger counterparts. During free time, elementary and middle school students alike get to explore the University of Houston. Students go on tours of the campus, listen to speakers about various STEM (science, technology, engineering, and math) opportunities, and get a glimpse of college life. Parents can attend seminars on STEM, college education, and college readiness.<sup>4</sup>

After a long day of judging, presenting, and waiting, award ceremonies are held for both the elementary and middle school divisions. At the 2014 Mars Rover Celebration a representative from NASA brought a real extra-vehicular activity (EVA) space suit—the traditional big, white, puffy space suit one imagines astronauts wearing—and discussed current efforts at creating a new, more mobile and bendable suit. Former astronaut and head of the new University of



*Set-up for judging involves a flurry of activity as students, parents, and teachers scramble to get everything just right before judging commences.*

Photo courtesy of Dr. Edgar A. Bering III.

Houston STEM Center, Dr. Bonnie J. Dunbar, attended the award ceremonies and helped present trophies to the winning teams.<sup>5</sup>

In 2002, the Celebration's first year, thirty teacher-training participants and 180 students took part. The years 2007 and 2011 had seventy teachers in teacher training, the highest numbers in the program's history. In 2013, thirty-six teacher-training participants and 674 students participated. The decline in teachers attending teacher training can be at-

tributed to the fact that once a teacher is trained in the program, they do not need training again. The greatest number of student participants came in 2011 with 708. Incidentally, the NASA Mars rover *Spirit* got stuck in 2010, right about the time many students began the Mars Rover lessons. As a result, many students that year had ideas of how to unstick *Spirit*. Twenty-seven Houston-area public elementary and middle schools from seventeen districts participated in the 2014 Mars Rover Celebration.<sup>6</sup>

Michelle Viotti, Thea Cañizo, and Larry Lebofsky created the Mars Rover Celebration teaching material in 2000 at the Jet Propulsion Lab (JPL) in La Cañada Flintridge, California. This program, meant to supply elementary and middle school teachers with the resources needed to teach comprehensive lessons about the red planet, was part of the Mars Millennium Project, a national initiative established in 1999 by First Lady Hillary Rodham Clinton, former secretary of education Richard Riley, honorary chairman John Glenn, and Mars Pathfinder mission chief Donna Shirley. Supported by the U.S. Department of Education, the National Endowment for the Arts, NASA and the Jet Propulsion Lab, and the J. Paul Getty Trust, along with the White House Millennium Council, the Mars Millennium Project was created originally to challenge students across the United States to "imagine establishing a village for 100 transplanted earthlings on the planet Mars in the year 2030."<sup>7</sup> As a Mars Millennium project, scientists created educational material that teachers could use to teach students about space and the planets.

The city of Houston adopted some of the Mars Celebration curriculum as part of its SPARK School Park Program, a mission started in 1983 to create more public



*Elementary students in the SDA or Science Discovery Association present their foil-covered freestyle rover. Freestyle rovers are judged on their creativity and do not have to complete any specific tasks, unlike the solar-powered or remote-controlled rover categories.*

All photos courtesy of author unless otherwise noted.



*Judges review approximately four rovers over the course of an hour, listening to students' skits and asking students about their results and what they learned about Mars to determine whether the group was sufficiently able to answer their research question.*

green spaces in the city by updating local elementary school playgrounds with new equipment and features and opening the renovated areas to the public. A fourth grade teacher, Ms. Margaret "Holly" Smith at Bendwood Elementary in Spring Branch ISD took the curriculum offered by the Mars Millennium Project, through the SPARK Park Program, and began having her class study Mars and create their own rovers in class.<sup>8</sup>

Dr. Edgar Bering III, a physics, electrical engineering, and computer-engineering professor at the University of Houston, took an interest in the project after his own children made rovers in their fourth grade science class with Ms. Smith at Bendwood Elementary.<sup>9</sup> Several years later, Dr. Bering became involved with the local organizing committee and was on the educational public outreach subcommittee for the 2002 World Space Congress, a meeting between the Committee On Space Research (COSPAR) and the International Astronautical Congress (IAC).<sup>10</sup> The 2002 World Space Congress was held in Houston, and the University of Houston helped with a multitude of tasks, including having the drama and athletic departments set up ticket booths, having the band meet attendees at the airport, and hosting a cocktail party at the campus's Hilton Hotel for the dignitaries in attendance. Due to lingering effects of 9/11, many international students who planned to attend the World Space Congress could not get into the country, and the number of registrations for the event was 5,000 fewer than planned.<sup>11</sup>

Organizers, including Dr. Bering, wanted a strong K-12 student presence, and they succeeded. Twenty thousand students toured the exhibit hall, under the direction of former

Johnson Space Center employee Mary Sanchez, where they saw things like rocket engines and received knickknacks like an "official U.S. Air Force World Space Congress plush toy." The University of Houston used the chance to host a space day on campus, which 8,000 students attended and saw presenters such as FIRST Robotics and FIRST LEGO League. Concerned by the lack of a program available for elementary students or at Title I at-risk schools, Dr. Bering suggested a city-wide face-off of the Mars Rover models he assumed all fourth graders made. After learning that the project his children had done in their fourth grade science class was not a part of the city-wide curriculum, Dr. Bering put together the Mars Rover Celebration program. For the first Celebration in 2002, he received \$5,000 from the UH provost. Today, Mars Rover gets its funds from a grant. Now the chair of the Mars Rover Celebration, Dr. Bering runs the overall event, trains teachers in special sessions, writes peer-reviewed

research papers on the Celebration, and makes sure that the Celebration continues to fulfill its grant requirements.<sup>12</sup>

Beginning with lessons on space implemented by local elementary and junior high science teachers, the program takes students through the process of identifying a scientific question and finding the answer. Teachers give students data and ask them to develop their own questions based on the data. Their questions on Mars range from what craters should be explored to where can water be found and where would be the best location to build a mud spa. The students then divide into various categories based on the way they build their rovers. For example, students can create solar-powered rovers with mini solar panels. These rovers must

*Winning first place in freestyle in the elementary division for their rover Zuver, students from Rizzuto Elementary pose with former astronaut and director of the UH STEM Center Dr. Bonnie Dunbar.*





*Mars Rover Celebration participants create a skit to creatively showcase what they have learned. These middle school students acted like contestants and an announcer of a game show.*

move on their own when a light source is shined on them. Other options include radio remote-controlled rovers and freestyle rovers, the latter of which do not have to move. “The kids start with the data, not a hypothesis,” Dr. Bering said. “They work in teams, not by themselves, and the budget cap kills the impetus of helicopter parents.”<sup>13</sup>

One of the goals of the Mars Rover Celebration is to get young Houstonians interested in the STEM field by showing them it is a fun and rewarding path to pursue. The Celebration strives to interest and include students who are generally not well represented in the STEM field. “We have a lot of girls in this program,” Dr. Bering said. “We’re all so happy about that.” Many students enjoy that they are in control of what they study, since they determine their own research projects. “From the standpoint of the educational excitement, the only thing that comes close [to space] to generating kid excitement is dinosaurs,” Dr. Bering said. “And dinosaurs, I hate to say it, are not the future.”<sup>14</sup>

The range of schools represented run the gamut from areas economically well-off to schools with 95% of their students considered economically disadvantaged (ED), 71% English Language Learners (ELL), and 84% at-risk of not passing.<sup>15</sup> The Mars Rover Celebration allows students from disadvantaged areas to obtain additional STEM education they may not normally receive.

As we live in a technologically advanced world that shows improvement every day, it is important that schools emphasize science and technology. Not only does it represent a great source of economic power within the United States, but it also keeps the country in the forefront of a very competitive global market. The shifting of the U.S. economy to an “idea factory” rather than a manufacturer of the ideas puts the nation at a disadvantage compared to other countries. “Per capita, China is out-producing the U.S. four to one in engineers,” Dr. Bering said. “So the naked economic reality is we’ve got to start producing more engineers.”<sup>16</sup>

Younger students in particular are much more open to areas of study like science and mathematics, before they de-

cide it is “too hard,” they are not smart enough, or are told it is too difficult of a subject for them to do well. If teachers can stop this line of thinking, then many more scientific and engineering minds can be tapped. “If they are under fifth grade [and do not understand math] that is the teacher,” Dr. Bering said. “But what happens when they hit puberty, if they haven’t been engaged doing math, then the circuits decay—neurophysiologists call it pruning. So the high school senior who hasn’t done math may very well be unable to do math.”<sup>17</sup>

Nothing is quite like the Mars Rover Celebration program, especially since the celebration is so strongly grounded with its lesson plans, teacher training, and an educational backing. Currently, Dr. Bering holds teacher-training workshops across the country, and Mars Rover Celebration lessons are used in New Mexico, Colorado, and New Hampshire. While lesson usage spreads far, no other city has been able to replicate the contest itself. Efforts to spread to San Antonio have been impeded by difficulty in finding a suitable site to hold the competition.<sup>18</sup>

As scientists make further discoveries about the creation of our universe and the particles that make it up, the only place they have to go for more information is space. Only through a well-developed space program with a significant



*Standing next to a real extra vehicular activity (EVA) space suit from NASA, UH professor and Mars Rover Celebration chair Dr. Edgar Bering addresses a crowd of students, teachers, parents, and volunteers to kick off the 2014 award ceremony.*

space exploration component will scientists discover the answers to many of the questions they are asking one another today. Additionally, space exploration opens up whole new worlds of resources and information; they just have to reach out to get it.

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