The Phoenix Mars mission uncovers possibilities for life on Mars.

By Alice Nguyen, LEAPS Scientist

Ranging from 36 to 250 million miles away from Earth, Mars stands to be the next great human exploration destination. From the first close-up picture of Mars in 1965, various spacecrafts to the Red Planet have uncovered a planet that seems to be fairly familiar to our own. Just like Earth, Mars has two polar ice caps, clouds, seasons, an atmosphere and some recognizable geologic features. These similarities have led to investigating the possibility of visiting Mars. To this end, the National Aeronautics and Space Administration (NASA) has dedicated a whole program to Mars exploration. The four goals of this program are: (1) to determine if life ever arose on Mars, (2) characterize the climate of Mars, (3) characterize the geology of Mars, and (4) prepare for human exploration of Mars. A precursor to whether there was ever life on Mars, scientists want to know if there is water on Mars.

NASA scientists launched its first Scout Program in August 2007, called the Phoenix Mars Mission. Though the project was spearheaded by NASA, it was an international collaborative effort. The spacecraft lander, Phoenix, was designed to study the history of water and habitability potential in Mars’ arctic region. It took scientists about four years to build, and test. Numerous instruments are mounted on the Phoenix to gather data that would hopefully address the goals of the Mars Exploration Program, such as clues to the origin of ice on the planet, Mars’ polar climate, and whether or not Martian dirt would be suitable for life. These instruments included a meteorological station (MET) built by the Canadian Space Agency, and a Thermal and Evolved Gas Analyzer built by scientists from the University of Arizona and the University of Texas, Dallas. The latter instrument analyzes soil samples for chemical compounds and other characteristics that are similar to current soil tests conducted by farmers to see what can grow in the soil. The science deck aboard the spacecraft was only 1.5 meters wide. However, the entire spacecraft, including the two solar panels, spanned 5.5 meters long, and weighed 350 kg.

Upon landing on the Red Planet on May 25, 2008, the Phoenix surpassed its forecasted life expectancy of 100 days. However, it remains to be seen if it lasted through the Martian winter. Among the many fascinating findings, the Phoenix spacecraft, have uncovered data which suggests that the substance found at the Martian polar cap is ice water! Although the Phoenix Mission has officially come to an end, NASA has plans to launch another spacecraft, the Mars Science Lab, to the Red Planet later this year. The Mars Science Lab is intended to be on the planet for a longer duration than past spacecrafts and will be collecting data to assess the biological potential of a target area as one of the objectives of the mission.
Featured Scientist:

Maria Mitchell

(1818-1889) First female American astronomer and educator.

5 things you didn’t know about her:

1. Her love for astronomy began when her father first taught her astronomy using his personal telescope.

2. She was first cousin, four times removed, of Benjamin Franklin.

3. She won a gold medal from King Frederick VI of Denmark in 1848 for discovering a comet in 1847 which was named “Miss Mitchell’s Comet” in her honor.

4. In 1848, she became the first woman elected to the American Academy of Arts and Sciences and the American Association for the Advancements of Science in 1850.

5. She made important discoveries about the nature of sunspots by taking daily photographs of the Sun.

Carbon Nanotube Speakers

Scientists create a new way of generating sound.

By Jimmy O’Dea, LEAPS Scientist

At Santa Barbara Jr. High’s FUSE II family science night, students and their families learned how to make audio speakers out of just a paper plate, magnets, and coil of wire. To the surprise of many attendees, these homemade speakers actually produced sound when hooked up to a boom box!

Creating a Buzz About the Universe

Dr. Neil deGrasse Tyson, Astrophysicist, director of the Hayden Planetarium, and host of NOVA scienceNOW.

By Lina Kim, LEAPS Scientist

Dr. Tyson’s passion for astronomy began at an early age after looking at the moon through a pair of binoculars. He fed his astronomical appetite by attending summer space camps and giving lectures at the tender age of 15. He received his B.A. in Physics from Harvard, a Master’s degree in Astronomy from the University of Texas at Austin, and finally a Ph.D. in Astrophysics from Columbia University. Dr. Tyson is not only a distinguished scientist, but is also an accomplished author, having published books in areas such as astronomy and astrophysics, among others. His research interest include but are not limited to the formation of stars, the structure of the Milky Way galaxy, and exploring dwarf galaxies. In 2001 and 2004, he was appointed by President Bush to serve on the Commission on the Future of the United States Aerospace Industry and the “Moon, Mars, and Beyond” commission, respectively. Dr. Tyson’s efforts to promote astronomy to the general public has not only gained him a lot of praise from his peers and the public but he has also been acknowledged by NASA by being awarded their Distinguished Public Service Medal which is the highest civilian honor bestowed by NASA.
By Aidan Hogge, 8th Grade Student

For the science fair my project was the Effect of Trebuchet Arm Length or Counterweight Mass on Projectile Distance. I had to build a miniature trebuchet (a type of catapult) and test different throwing arms and counterweights on how they affect how far the projectile goes. Building the trebuchet was fun and challenging, especially since I have no experience with building things with wood. Testing the arm lengths and counterweights was fun for a little while, but then it just got dull after doing it more than 5 times. I had to do 60 trials total. In the end, the heavier counterweights and longer throwing arms made the projectile go further.

Being in the county fair was nice but judging was boring. Getting to hang out with a few friends most of the day was fun though. We got a tour around a few of the labs at UCSB, some were quite interesting and strange like the sensory deprivation room. Tomorrow (May 18) I am going to the California State Science Fair in Los Angeles.

Let’s Explore!

Neutron Stars

By now, most of us know a lot about our Solar System but there are many other cool objects living outside of it. An example of such objects are neutron stars. As their name suggests, they are almost entirely composed of neutrons, which are subatomic particles that are roughly the same mass as protons but have no electrical charge. They are very hot but don’t glow since they are formed from burnt-out stars which are thought to start out to be 8-30 times the mass of our Sun. Scientists believe that neutron stars are formed during a supernova (a stellar explosion) in which the core of a massive star is compressed and collapses into a neutron star. They are very dense, spin very fast, and while typical stars are very big (remember, our Sun is only a middle sized star - its radius is 695,500 km), neutron stars are typically only 10-15 km in radius! In structure, a neutron star is more similar to a solid, miniature planet than an ordinary star since it has a densely-packed core of neutrons which is surrounded by a mantle topped by a crust. The crust is very hard and smooth; the tallest peaks, or surface irregularities, are only 5 mm tall! As a neutron star cools and shrinks, stress builds up in the crust such that it buckles, and this process is called a starquake, which are detected when the period changes from its usual oblate shape to a more spherical one. The estimated lifespan of a spinning neutron star (called a pulsar) is in the region of trillions of years and could remain forever unless they collide with another neutron star or a black hole. So, even though it’s not as bright as other stars, it’s one of the coolest objects living out in the Universe!
Scientist from UCSB came back to SBJHS to explore science together with students and their families, using simple everyday materials. During FUSE II, families rotated together through three different stations featuring physics, engineering and chemistry and made a souvenir from each one to take home.

At the physics station families learned how to create a vortex and make smoke rings. A large trash can, trash bag, bungee and fog juice was all that was needed to make giant smoke rings. Families later made individual smoke ring canisters out of paper cups, plastic bags and rubber bands. These could be used at home with incense to make smaller smoke rings.

At the engineering station families were able to make speakers using paper plates, plastic cups, and copper wire. After a short lesson on sound and vibration using wine glasses families got to work. Their speaker designs were tested out on a boom box with its original speakers removed. Families were surprised to hear songs coming from their paper plates!

At the chemistry station families explored polymers (gak) and non-newtonian fluids (oobleck) once again using simple materials. When liquid glue is poured into a borax-water solution, it polymerizes into a rubbery substance called gak. Gak is a stretchy bouncy polymer similar to plastic. Oobleck is non-newtonian fluid that contracts when a stress is applied, such as hitting it. Oobleck is simply cornstarch and water in a roughly 4 to 1 ratio. The military is exploring the use of oobleck as flexible body armor so families had a chance working with cutting edge technology. Another great time was had by all!

Constructing a Trebuchet

By Anne Wrigley, LEAPS Scientist

When science club members set out to design and build a trebuchet this Spring, they were not thinking small. For the first time at the LEAPS after-school science program, UCSB club leaders and junior high students are in the process of building a 5-foot tall, 8 foot-wide counterweight trebuchet, which will be capable of launching objects – well – really far.

Originally used in the Middle Ages as a siege engine to break down walls and barricades or throw projectiles over them, the trebuchet is far more accurate than a catapult. The LEAPS trebuchet uses the physics principle of leverage to launch objects. Unlike a simple catapult, which uses a spring-system to unload the object, the trebuchet operates when a counterweight is pulled to the ground by the force due to gravity. A lever arm, then, swings and launches the projectile towards its target with great force. It’s all fun and games until someone smashes a watermelon. Then it just gets better.

The club members have been working hard for a few weeks, and they are anxious for the final product, set to launch on Tuesday, May 19. It will also be featured in the seventh grade Renaissance Fair, so many will have the chance to check out the science club members’ new pride and joy. The machine will remain at SBJHS for the years to come and to make eighth grade physical science even more exciting.

Many thanks to the theatre department at SBJHS, students have been able to saw and drill into the wood themselves, taking ownership of the trebuchet construction.
### Ribbit: Which planet would you most like to visit and why?

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<thead>
<tr>
<th>Picture</th>
<th>Name</th>
<th>Answer</th>
</tr>
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<tbody>
<tr>
<td><img src="image" alt="Chris Newton" /></td>
<td>Chris Newton</td>
<td>Mars because there seems to be like a lot of possibilities.</td>
</tr>
<tr>
<td><img src="image" alt="Yesenia Botello" /></td>
<td>Yesenia Botello</td>
<td>Saturn, to walk on the rings.</td>
</tr>
<tr>
<td><img src="image" alt="Marisela Vasquez" /></td>
<td>Marisela Vasquez</td>
<td>Saturn, to see the rings.</td>
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<tr>
<td><img src="image" alt="Evan Smith" /></td>
<td>Evan Smith</td>
<td>Mars, it would be cool like Earth, we could put stiff on it to turn it into as second Earth.</td>
</tr>
<tr>
<td><img src="image" alt="Francis Grafton" /></td>
<td>Francis Grafton</td>
<td>Jupiter, because it is the biggest and hardest to live on. It is so big and there are so many moons to visit.</td>
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<td><img src="image" alt="Diego Perez" /></td>
<td>Diego Perez</td>
<td>Mars, because it is red and not gray like the other planets.</td>
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<td><img src="image" alt="Michael Grossman" /></td>
<td>Michael Grossman</td>
<td>Mars, because it is the only one we believe could support life.</td>
</tr>
<tr>
<td><img src="image" alt="Taryn Briggs" /></td>
<td>Taryn Briggs</td>
<td>That is hard because some are too hot or too cold, but I think Saturn because of the rings and meteors to see.</td>
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</table>

### Fun Facts

- The Hubble Space Telescope has a mass of 10,896 kg, is 13.1 m long, and cost $2.1 billion to originally build.
- A large sunspot can last about a week.
- The largest meteorite crater in the world is in Winslow, Arizona (1265 m across, 46 m deep).
- Skylab, the first American space station, fell to the Earth in thousands of pieces in 1979, mostly over the ocean.
- The cosmos contains approximately 50 billion galaxies.
- The Earth's average velocity orbiting the Sun is 107,220 km/h.
- The Moon is 1 million times drier than the Gobi desert.
- Sunlight takes about 8.33 mins. to reach the Earth at 299,792 km/s.
- The Moon is 27% the size of the Earth.

### Lunch with Scientists

**March winners**
- Brandon Alvarez
- Danielle Carter
- Stephen Gallivan
- Ava Gore
- Michael Grossman
- Chris Newton
- Brenda Santana
- Yesenia Botello

**April winners**
- Elizabeth Bottoms
- Hailey Hall
- Taryn Briggs
- Gavin Koehn
- Max Davis
- Sarah Sims
- Matthew Figueroa
- Brendan Smyth

**May winners**
- Alesia Aceves
- Ana Perez
- Sophia Alvarez
- Alex Petersen
- Mitchell Barrett
- Guillermo Pineda
- Jazmin Duarte
- Alexandra Real
- Joanna Flores
- Daisy Torres
- Brennen Libhart
- Marisela Vasquez
- Ripkyn Murphy
- Henry Vo
LEAPS Scientists of the Month

Ms. Kim

Why did you decide to become a mechanical engineer?

Since I was a kid, I’ve had a fascination with building things. I used to make cool constructions out of ordinary things. I liked finding out how things work and growing up, my goal was to build roller-coasters for a living, so for me, it was natural to study mechanical engineering.

How did you end up working on turbulence and chaos?

In college, I took a fluid dynamics course and one of the main topics was turbulence. One day, my professor asked us a simple question: “How many of you payed attention to the water flowing out of your faucets?” His point was that when you on your faucet very slowly, the water will flow out in a smooth and orderly manner but once turn it on fully, the flow was no longer smooth but rough and turbulent. For over a century, scientists have been trying to figure out the mechanism behind this transition, and this is what got me hooked, the idea that I could be working on a project that will help us try to solve one of the most important and outstanding problems in classical physics.

Do you think turbulence will be solved at some point?

I hope so! Many scientist are currently making very good progress in trying to solve the mystery of turbulence, but realistically, it is going to take a very long time, which means that in the mean while, we will have tons of fun trying to come up with a plethora of methods to help us understand this problem.

Ms. Wrigley

Why did you choose UCSB?

UCSB has quite a reputation in science and engineering. When I applied, I had hopes to collaborate with these departments as I began focusing my studies in how we can improve science teaching. I was fortunate to get a teaching job in the physics department, and eventually work with the CNSI and LEAPS! I also grew up in the Northeast where temperatures often reach negative-ville in the Winter. So, of course, Santa Barbara weather had quite a draw!

What do you think is the best part about your job?

Being able to work with science students of all ages: graduate students, undergraduates, junior high and elementary students. I get to revisit all my favorite science experiments and demo's from when I was in school and think about ways to make them even more exciting for kids.

What got you interested in science in the first place?

I remember the exact day I knew I wanted to study physics in college and beyond: it was the day my 11th grade physics teacher had a target painted on his bald head in an effort to teach us about projectile motion. As he paced back-and-forth just outside the building, we had to calculate the exact moment to hit him with a water balloon from three stories up. I hope I can inspire students in the same way (and stay dry!).

About LEAPS

Let’s Explore Applied Physical Science (LEAPS) engages UCSB graduate and undergraduate Fellows as instructors and mentors for inquiry-based science in Grade 8 classrooms. By establishing collaboration between Fellows, science teachers, and UCSB scientists in school classrooms, the LEAPS project implements hands-on, minds-on learning experiences in physical science.

LEAPS offers after school clubs at junior high sites, including Santa Barbara Junior High School. The Fellows also help younger students to prepare for Family Science Nights that foster community interest to science education and opportunities.

Scientists

Aubrey Cano
Lina Kim
Alice Nguyen
Jimmy O’Dea
Anne Wrigley

Teachers

Marilyn Garza
Julie Kluss

UCSB Participants

Beth Gwinn
Fiona Goodchild
Wendy Ibsen

Send questions or comments to msgarza@msgarza.com or jkluss@sbsdk12.org

Visit www.leaps.ucsb.edu