

# What's Happening

IN CALIFORNIA ?

BY LAWRENCE GABLE

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## JPL Makes it Happen in Space

**T**he National Aeronautics and Space

Administration (NASA) is America's space agency. When its rover Curiosity landed on Mars in August, it was not only NASA's success though. It was also a



success for another organization. The Jet Propulsion Laboratory (JPL) in Pasadena designs and builds spacecraft and tools for NASA.

JPL began in 1936. Three men in Pasadena tested a simple rocket engine. They failed four times on that day, but they succeeded a month later. A professor at the California Institute of Technology began helping them. In 1940 they found a new place nearby to test rockets. In 1943 they named it the Jet Propulsion Laboratory.

The first real support for projects at JPL came from the U.S. Army. That was just before the U.S. entered World II in December 1941. JPL developed small rockets that helped airplanes take off from short runways. After that JPL also made missiles for the Army.

After World War II the U.S. and Soviet Union distrusted each other. In October 1957 the Soviets put a satellite into orbit. Another soon followed, so the U.S. developed one too. JPL helped the Army make *Explorer 1* in January 1958. It was America's first successful space mission. In the next 15 years more than fifty satellites followed.

At that same time JPL's director wanted to

switch from weapons to space exploration. That opportunity came in December 1958 when the government formed NASA. In fifty years JPL's spacecraft have flown billions of miles

through the solar system for NASA. They have landed on or flown by the moon, Mercury, Venus, Jupiter, Saturn, Uranus and Neptune.

JPL also has built the Mars rovers. The first two, Spirit and Opportunity, landed in 2004. On August 6, 2012 the rover Curiosity also landed on Mars after an eight-month trip. It is the size of a small car. It can measure and sample more things than the other rovers could. JPL hopes it will find information about whether life ever existed on Mars.

JPL also reaches out to the public. Every May it has an open house. This year 38,000 people toured JPL. They talked with scientists and engineers. They also saw 3-D videos and live demonstrations of science and technology. Thousands of schoolchildren visit the lab every year too.

Two spots at JPL are now National Historic Landmarks. They show JPL's importance in American history. JPL is certainly an important place in the present too. It has several dozen spacecraft out in space right now. Every day they send information back to Earth, and their discoveries are bringing greater understanding of the entire solar system.

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## BIOGRAPHY

### TRACY NEILSON

#### FAULT PROTECTION DESIGNER, JET PROPULSION LABORATORY

Tracy Neilson took an unusual path to her career at Jet Propulsion Lab (JPL). She has been working there for 23 years. She has worked on many projects, including the recent the landing of the rover Curiosity on Mars.

As a girl Tracy read a lot. She lived only two blocks from the public library, so she always had books on loan. She did not do especially well in school though. In high school she hung around with friends who felt that being a good student was not cool. Sometimes Tracy even pretended that she did not know answers.

Things started to change after high school. For a while she worked as a secretary. Then she wanted to attend community college. In order to get away from her friends, she attended one that was not close to her home. There she took some math, science and engineering classes. Then she transferred to Cal Poly Pomona and earned a degree in Engineering.

In those same years Ms. Neilson worked as a secretary at JPL. As she learned engineering, she was right there to take a job when it opened. Her first work was on the Galileo Project. That spacecraft traveled 2.8 billion miles over 14 years before it disappeared into Jupiter's atmosphere.

Curiosity is not Ms. Neilson's first experience with rovers. In 2004 two rovers, Spirit and

Opportunity, landed on Mars. She does work called fault protection. Ms. Neilson gave those rovers the ability to fix their own problems that arose. Those rovers have been a huge success. They were supposed to work for three months.

Instead Spirit lasted for six years, and Opportunity is still going.

For a long time Ms. Neilson has been fascinated with space. She would have loved to become an astronaut, but she would not have liked the work. She knows about it from a friend who is an astronaut. It would make Ms. Neilson crazy to practice the same tasks over and over again.

As an engineer it is not Ms. Neilson's job to dream. There are plenty of others at JPL who dream. Her job is to design systems that make those dreams come true. For the rover Curiosity, for example,

it could have been something as simple as a wheel. She knew everything that a wheel has to do. Then she gave Curiosity the ability to fix that wheel if something goes wrong.

Working at JPL can be exhausting. Sometimes Ms. Neilson works 70 hours a week. Sometimes too she wakes up in the middle of the night with an idea, so she gets up and works on her computer. The hours are long, but the work is satisfying. She likes working closely with others. She also likes being part of the discoveries that Curiosity will make for years to come.



*"When Curiosity landed, I looked around at all the people who had worked to make that happen."*

# Background Information

JPL gets funds from the federal government. It is managed by the California Institute of Technology (Caltech) for NASA. It has 5,000 full-time employees and a few thousand more contractors who work on various projects. Its annual budget is approximately \$1.6 billion.

The Caltech professor who helped those men with their early rocket experiments was Theodore von Kármán. He became JPL's first director, and President Kennedy gave him the first National Medal of Science in 1963.

In the coming years one spacecraft from JPL will reach interstellar space where there are no stars.

JPL also develops technologies for uses on Earth in areas like public safety and medicine.

The tools JPL has developed for space exploration also have enabled scientists to make discoveries about Earth's atmosphere, climate, oceans and geology.

Curiosity's official name is the Mars Science Laboratory. Its mission is scheduled to last 23 months, but the nuclear-powered rover could last much longer, just as Spirit and Opportunity have. About 420 scientists and 300 engineers at JPL will continue to work on the mission.

Curiosity can communicate directly with the Earth only for a certain number of hours per day. It takes about 14 minutes for radio signals to travel the 154 million miles between JPL and Curiosity. Employees at JPL who are working on the mission must adjust their work hours to those times, whether day or night here.

A day on Mars lasts 24 hours and 39 minutes.

Curiosity became an instant sensation in social media. In the first week it had 910,000 followers on Twitter and nearly 250,000 on Facebook.

The location where Curiosity touched down is called Bradbury Landing. It is named for the author Ray Bradbury, who died in 2012.

JPL was among the first organizations to employ women mathematicians. In the 1940s and 1950s women worked there in an all-female computations group. In 1961 it hired its first woman engineer.

The Soviet Union's first satellite was named *Sputnik*.

## Topics for Discussion and Writing

### Pre-reading:

- Describe some of the things that spacecraft and astronauts do when they go into space.

### Comprehension:

- How did the Jet Propulsion Lab begin, and what did it do before it joined with NASA?

### Beyond the Text:

- Explain why you think the rovers got the names Spirit, Opportunity and Curiosity. Then find a name that you would give to a new rover, and explain why you chose it.
- Tell why you think people become astronauts, and explain why this is something that you would, or would not, like to become.
- Use the Internet to find out what the rover Curiosity is doing on Mars.

## Vocabulary

*Article-specific:* agency; rover; spacecraft; rocket; runway; missile; solar system; technology; landmark

*High-use:* success; to design; to develop; to distrust; satellite; orbit; mission; exploration; demonstration

## Sources

*Chicago Tribune* August 12, 2012

*Times of London* August 11, 2012

Jet Propulsion Laboratory [www.jpl.nasa.gov](http://www.jpl.nasa.gov)

## Core Curricular Standards

### Reading—Grades 5–12

Quote accurately from text / Cite textual evidence /  
Draw inferences / Determine central ideas /  
Analyze structure of text / Interpret words and phrases

## CA Curricular Standards (4–12)

### ELD—Intermediate and Advanced

Reading Vocabulary Development / Comprehension  
Writing Strategies and Applications  
Listening and Speaking

### Science

5.5; 8.2; 8.4  
Earth Sciences 1, 2, 4