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NASA's Viking data lives on, inspires 40 years later

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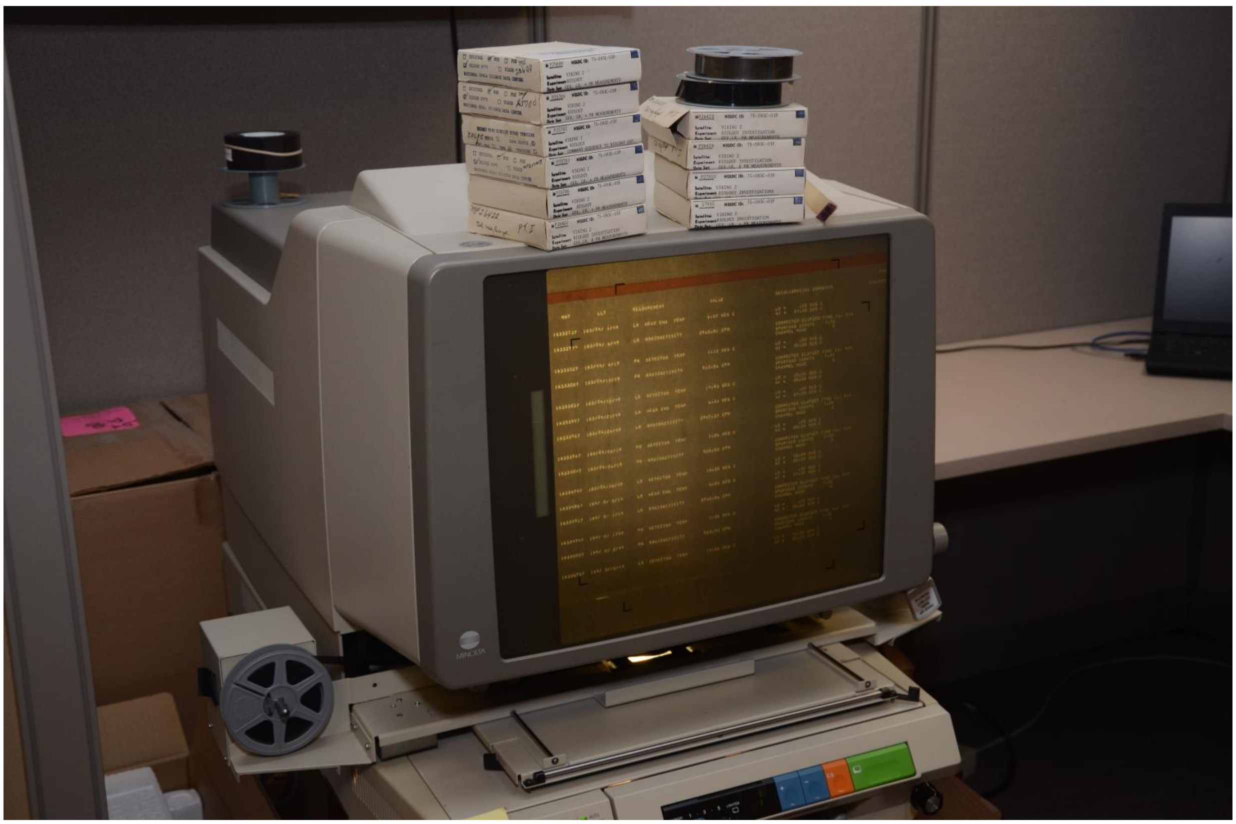

Data from the Viking biology experiments, which is stored on microfilm, has to be accessed using a microfilm reader. David Williams and the archive team are working to digitize the data to make it more accessible. Credit: David Williams

Forty years ago, NASA's Viking mission made history when it became the first mission to successfully land a fully operational spacecraft on

Mars. This mission gave us our first real look at the Martian surface, as well as the fundamental science that has enabled continued missions to the Red Planet, laying the foundation for NASA's Journey to Mars.

The spacecraft, dubbed Viking 1, touched down on the Martian surface July 20, 1976—its counterpart, Viking 2, followed suit and landed September 3 of that same year.

The mission objectives were carefully laid out: Obtain high-resolution images of the Martian surface, characterize the composition of the Martian surface and its atmosphere, and search for life.

After years of imaging, measuring and experimenting, the Viking spacecraft ended communication with the team on Earth, leaving behind a multitude of data that scientists would study for the next several years.

As engineers and scientists planned for later missions to Mars, the rolls of microfilm containing the Viking data were stored away for safekeeping and potential later use. It would be another 20 years before someone looked at some of these data again.

NASA's Deep Archives

David Williams is the planetary curation scientist for the NASA Space Science Data Coordinated Archive at Goddard Space Flight Center in Greenbelt, Maryland. The archive houses much of NASA's planetary and lunar spacecraft data stored on microfilm and computer tapes, including the Viking data. Williams works to digitize all of the data so that it can be easily accessed from the web.

"At one time, microfilm was the archive thing of the future," Williams said. "But people quickly turned to digitizing data when the web came to be. So now we are going through the microfilm and scanning every frame into our computer database so that anyone can access it online."

In the early 2000s, Williams received a call from Joseph Miller, professor of pharmacology at the American University of the Caribbean School of Medicine, requesting data from the Viking biology experiments. But all that was left of the data was stored on microfilm.

"I remember getting to hold the microfilm in my hand for the first time and thinking, 'We did this incredible experiment and this is it, this is all that's left,'" Williams said. "If something were to happen to it, we would lose it forever. I couldn't just give someone the microfilm to borrow because that's all there was."

The results of the Viking biology experiments might have been controversial, but the mission helped paved the way for later missions to Mars. Credit: David

Williams

The archive team decided to tear open the boxes of microfilm and begin digitizing the data.

Lasting Knowledge

Miller wanted to analyze the data from Viking's biology experiments to see if the Viking science team had missed something in the original analysis. He concluded that one of the Viking biology experiments did, indeed, offer proof that life may exist on Mars.

In one of the experiments, known as Labeled Release (LR), the Viking landers scooped up soil samples and applied a nutrient cocktail. If microbes were present in the soil, they would likely metabolize the nutrient and release carbon dioxide or methane. The experiment did indicate metabolism, but the other two Viking experiments did not find any organic molecules in the soil. The science team believed the LR data had been skewed by a non-biological property of Martian soil, resulting in a false positive. While arguments continue, this remains the consensus view.

This was not the first time scientists disagreed about the results of the Viking biology experiments. Since the very first data analysis, scientists argued about whether the experiments proved that Mars really was harboring life.

"The data were very controversial," Williams said. "But, in a way, it helped push for continued Mars missions and landers. The very next missions were planned around what we found with Viking, and then the next group of missions built upon those. But even our most current Mars missions still refer back to Viking."

One such mission is Curiosity, which landed on Mars August 6, 2012. Equipped with an instrument suite known as Sample Analysis at Mars (SAM), the Curiosity rover is capable of searching for organic compounds on the Martian surface. SAM is able to detect a lower concentration of a wider variety of organic molecules than any other instrument sent to Mars, including those on Viking.

"We built SAM based on a lot of experience and heritage from Viking," said Danny Glavin, associate director for Strategic Science in the Solar System Exploration Division at NASA Goddard and former planetary protection lead for SAM. "The capabilities of the Viking landers and instruments were very advanced for the technology at the time. Just demonstrating that you could land a spacecraft on the Martian surface successfully was a huge feat."

Unlike Viking at the time, data from Curiosity's experiments are uploaded to the Planetary Data System for easy accessibility.

"Viking data are still being utilized 40 years later," Glavin said. "I know the same will be true for SAM. The point is for the community to have access to this data so that scientists 50 years from now can go back and look at it."

In 2016, the Viking legacy continues. Lessons learned from Viking technology blazed the trail for future Mars missions, which have vastly improved our understanding of the Red Planet. Today NASA has a fleet of orbiters and rovers on and around Mars, making key discoveries such as evidence of liquid water near the surface of Mars and paving the way for future human-crew missions. The Mars 2020 rover recently passed an important mission milestone toward launch in 2020, arriving on Mars in February of 2021. Its mission is to seek signs of past life and demonstrate new technologies to help astronauts survive on Mars, with the goal of sending humans to the Red Planet in the 2030s.

Provided by NASA