



1  
00:00:16,270 --> 00:00:04,040  
(Music)

2  
00:00:16,290 --> 00:00:20,410  
SAM stands for the Sample Analysis at

3  
00:00:20,430 --> 00:00:24,590  
Mars instrument suite. It's really one of the most complex and analytical

4  
00:00:24,610 --> 00:00:28,620  
chemistry laboratories ever sent to the surface of the Red Planet. It's been

5  
00:00:28,640 --> 00:00:32,750  
miniaturized to fit right into the body of the Mars Science Laboratory

6  
00:00:32,770 --> 00:00:36,910  
Curiosity Rover. One of the major goals of the Mars Science Laboratory mission

7  
00:00:36,930 --> 00:00:40,950  
is to search for habitable environments in Gale Crater. And by by habitable

8  
00:00:40,970 --> 00:00:45,020  
environments, what I'm talking about are environments that could have supported life.

9  
00:00:45,040 --> 00:00:49,040  
(Music)

10  
00:00:49,060 --> 00:00:53,090  
So there are several pieces of big news that SAM has found.

11  
00:00:53,110 --> 00:00:57,180  
The first is the discovery of methane. Now methane has been

12  
00:00:57,200 --> 00:01:01,200  
found previously in the Martian atmosphere by both Earth-based telescopes

13  
00:01:01,220 --> 00:01:05,250

and space-borne orbiters. But this is the first time that we've actually

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00:01:05,270 --> 00:01:09,370

seen a sharp increase and decrease in the abundance of methane in the atmosphere

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00:01:09,390 --> 00:01:13,420

in Gale Crater. What this really means is that present day Mars is an active

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00:01:13,440 --> 00:01:17,500

environment. Now at this point we don't know the origin of this methane.

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00:01:17,520 --> 00:01:21,630

It could be biological, from maybe methanogenic bacteria

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00:01:21,650 --> 00:01:25,760

deep in the subsurface releasing methane. But there are non-biological explanations

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00:01:25,780 --> 00:01:29,780

as well - such as water-rock interactions in the subsurface that could also

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00:01:29,800 --> 00:01:33,840

produce the methane signals that we're seeing. The second exciting discovery

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00:01:33,860 --> 00:01:37,940

from SAM is the detection of Martian organic compounds.

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00:01:37,960 --> 00:01:41,960

We found several different types of organic molecules including chlorinated alkanes

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00:01:41,980 --> 00:01:46,030

and chlorobenzene - compounds that are not common on Earth - in a mudstone

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00:01:46,050 --> 00:01:50,130

that was deposited in an ancient lakebed environment in Gale Crater.

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00:01:50,150 --> 00:01:54,180

This is a really exciting discovery because we've been looking for organic compounds for decades

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00:01:54,200 --> 00:01:58,250

on the surface of Mars. And this is the first time that we've actually found

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00:01:58,270 --> 00:02:02,320

Martian organic material in the surface. Now, at

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00:02:02,340 --> 00:02:06,360

this point we don't have enough evidence to tell us whether or not the organics

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00:02:06,380 --> 00:02:10,500

we're finding are biological or non-biological in origin. There are

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00:02:10,520 --> 00:02:14,590

several viable non-biological explanations, including this organic

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00:02:14,610 --> 00:02:18,640

material could have come down from space - from meteorites or comets. Or,

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00:02:18,660 --> 00:02:22,770

organics can be formed by geological reactions in the rock itself.

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00:02:22,790 --> 00:02:26,800

Now what's exciting about this discovery is it gives us new hope

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00:02:26,820 --> 00:02:30,870

in the search for chemical evidence of life. We've found the organic material,

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00:02:30,890 --> 00:02:34,970

now the next step is trying to figure out what its origin is.

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00:02:34,990 --> 00:02:39,070

(Music)

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00:02:39,090 --> 00:02:43,120

So in addition to the measurements made by SAM on Mars, we've had

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00:02:43,140 --> 00:02:47,140

to do hundreds of laboratory experiments back on Earth to simulate

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00:02:47,160 --> 00:02:51,260

the conditions on the surface of the Red Planet in order to convince ourselves

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00:02:51,280 --> 00:02:55,400

that the organic material we were detecting by SAM was really Martian in origin

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00:02:55,420 --> 00:02:59,460

and not something that we had brought with us to Mars.

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00:02:59,480 --> 00:03:03,520

(Music)

43

00:03:03,540 --> 00:03:07,620

So although at this point in the mission we can't conclude that there was definitively life

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00:03:07,640 --> 00:03:11,650

on Mars, the SAM discoveries have really shown us that all of the basic

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00:03:11,670 --> 00:03:15,710

ingredients for life were there - including complex organic compounds,

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00:03:15,730 --> 00:03:19,830

the building blocks of life. Now with the detection of organics in Gale

47

00:03:19,850 --> 00:03:23,940

Crater, the probability that Gale Crater Lake could have supported life

48

00:03:23,960 --> 00:03:28,020

goes up.