



1  
00:00:05,329 --> 00:00:02,810  
scientists expected the Mars rovers

2  
00:00:08,000 --> 00:00:05,339  
spirit and opportunity to run for three

3  
00:00:10,370 --> 00:00:08,010  
months three years later the hardy

4  
00:00:12,980 --> 00:00:10,380  
Rovers are still operating on opposite

5  
00:00:19,870 --> 00:00:12,990  
sides of the Red Planet this is

6  
00:00:22,640 --> 00:00:19,880  
opportunities story opportunity was

7  
00:00:24,950 --> 00:00:22,650  
blessed with good fortune right from saw

8  
00:00:26,839 --> 00:00:24,960  
one all right from the first day because

9  
00:00:28,550 --> 00:00:26,849  
when we landed and we took that first

10  
00:00:31,040 --> 00:00:28,560  
images from the lander who looked around

11  
00:00:33,200 --> 00:00:31,050  
we were in this tiny little crater we

12  
00:00:36,280 --> 00:00:33,210  
call an Eagle crater but there was

13  
00:00:39,110 --> 00:00:36,290

exposed bedrock it was just this flat

14

00:00:46,369 --> 00:00:39,120

sand filled with with a little curb of

15

00:00:49,400 --> 00:00:46,379

outcrop rock everybody was stunned we

16

00:00:52,810 --> 00:00:49,410

found bedrock we found Rock attached to

17

00:00:56,330 --> 00:00:52,820

the planet we went to meridiani planum

18

00:00:57,709 --> 00:00:56,340

based on a clue of hematite hematite a

19

00:00:59,930 --> 00:00:57,719

mineral that on earth forms in the

20

00:01:01,580 --> 00:00:59,940

presence of water liquid water and to

21

00:01:03,560 --> 00:01:01,590

see it in these blueberries in these

22

00:01:05,030 --> 00:01:03,570

round sphere yol's strewn across the

23

00:01:06,500 --> 00:01:05,040

surface that that was the nature of the

24

00:01:09,320 --> 00:01:06,510

phenotype I don't think anybody

25

00:01:11,830 --> 00:01:09,330

predicted ahead of time next opportunity

26  
00:01:14,330 --> 00:01:11,840  
set a course for endurance crater

27  
00:01:17,929 --> 00:01:14,340  
engineers on earth had to teach her to

28  
00:01:20,359 --> 00:01:17,939  
drive down hill taking grindings along

29  
00:01:23,179 --> 00:01:20,369  
the way they would drive down a few

30  
00:01:25,640 --> 00:01:23,189  
meters do a rat hole in the outcrop Arak

31  
00:01:27,859 --> 00:01:25,650  
and analyze it for chemicals and so they

32  
00:01:30,260 --> 00:01:27,869  
were able to see how the mineral

33  
00:01:32,330 --> 00:01:30,270  
composition of the rocks changed as as

34  
00:01:35,660 --> 00:01:32,340  
you went further down Mars did have a

35  
00:01:37,249 --> 00:01:35,670  
watery past it was episodic and that

36  
00:01:39,649 --> 00:01:37,259  
sometimes it was wet and sometimes it

37  
00:01:44,609 --> 00:01:39,659  
was drawing you know not unlike the

38  
00:01:52,029 --> 00:01:48,399

we knew six kilometres to the south was

39

00:01:55,149 --> 00:01:52,039

his giant crater called Victoria Wow six

40

00:01:58,809 --> 00:01:55,159

kilometres away could we get there take

41

00:02:01,690 --> 00:01:58,819

this Rover kind of laborious ly work our

42

00:02:03,370 --> 00:02:01,700

way through this huge maze of ripples to

43

00:02:05,350 --> 00:02:03,380

get ourselves South to the scientific

44

00:02:07,800 --> 00:02:05,360

promised land all of a sudden we got to

45

00:02:13,000 --> 00:02:07,810

one day where we drove over dude and

46

00:02:16,030 --> 00:02:13,010

stopped for weeks opportunity sat in a

47

00:02:18,400 --> 00:02:16,040

sand trap engineers rated hardware

48

00:02:21,250 --> 00:02:18,410

stores to buy materials to simulate a

49

00:02:23,110 --> 00:02:21,260

Martian sand dune they created a

50

00:02:27,220 --> 00:02:23,120

technique of maneuvering a few

51  
00:02:30,750 --> 00:02:27,230  
centimeters at a time to extract her the

52  
00:02:35,259 --> 00:02:30,760  
next big challenge that hit us is the

53  
00:02:38,229 --> 00:02:35,269  
robotic arm on opportunity developed a

54  
00:02:40,660 --> 00:02:38,239  
degradation and one of its joints now

55  
00:02:42,190 --> 00:02:40,670  
when we drive opportunity we have to be

56  
00:02:43,720 --> 00:02:42,200  
sure that wherever we're driving her to

57  
00:02:46,059 --> 00:02:43,730  
she's going to end up in a place where

58  
00:02:48,039 --> 00:02:46,069  
it's safe to take the arm back out even

59  
00:02:55,660 --> 00:02:48,049  
with the aging Rovers we've been able to

60  
00:03:02,050 --> 00:02:58,360  
after a stop to examine more layered

61  
00:03:05,320 --> 00:03:02,060  
outcrops at URI vez greater opportunity

62  
00:03:08,680 --> 00:03:05,330  
reached the promised land Victoria I

63  
00:03:11,170 --> 00:03:08,690

think we've gone from Mars being a place

64

00:03:14,160 --> 00:03:11,180

that star like that's otherworldly of

65

00:03:18,190 --> 00:03:14,170

the realm of astronomers to a place that

66

00:03:20,800 --> 00:03:18,200

geologists and climatologists Rome where

67

00:03:24,460 --> 00:03:20,810

it's a world that works sort of like our

68

00:03:26,830 --> 00:03:24,470

world as opportunity explores Victoria