1
00:00:07,780 --> 00:00:04,340
I was an optimist from the very

2
00:00:12,020 --> 00:00:07,790
beginning and that I knew the Rovers

3
00:00:14,690 --> 00:00:12,030
were well built and that as long as we

4
00:00:25,040 --> 00:00:14,700
survive landing that we had a very good

5
00:00:27,410 --> 00:00:25,050
chance of an extended mission for

6
00:00:29,900 --> 00:00:27,420
opportunity things went well from the

7
00:00:32,870 --> 00:00:29,910
very beginning when we landed right

8
00:00:34,670 --> 00:00:32,880
within a short distance of the rover was

9
00:00:37,190 --> 00:00:34,680
exposed bedrock or when the scientists

10
00:00:38,740 --> 00:00:37,200
examined that bedrock in detail they

11
00:00:41,299 --> 00:00:38,750
determined that it was laid down in

12
00:00:43,130 --> 00:00:41,309
water some three-and-a-half to four

13
00:00:46,400 --> 00:00:43,140

billion years ago so this was the first

14
00:00:49,880 --> 00:00:46,410
evidence of ancient surface water on

15
00:00:51,260 --> 00:00:49,890
Mars it's something that the scientists

16
00:00:53,779 --> 00:00:51,270
were looking for and it was right there

17
00:00:55,810 --> 00:00:53,789
where they landed so they couldn't have

18
00:00:58,540 --> 00:00:55,820
asked for a better spots

19
00:01:01,690 --> 00:00:58,550
I think the greatest accomplishment of

20
00:01:04,869 --> 00:01:01,700
Eagle crater was they saw things that

21
00:01:08,550 --> 00:01:04,879
look like blueberries and these are

22
00:01:11,410 --> 00:01:08,560
things that are little tiny balls of

23
00:01:14,020 --> 00:01:11,420
material that looked like something that

24
00:01:15,900 --> 00:01:14,030
was produced in the presence of water

25
00:01:19,090 --> 00:01:15,910
and so this was one of the first

26
00:01:21,640 --> 00:01:19,100
indications that there had been water on

27
00:01:26,760 --> 00:01:21,650
Mars in the past and so I think that was

28
00:01:32,020 --> 00:01:29,950
craters are great or the geologist

29
00:01:33,999 --> 00:01:32,030
because they're like time tunnels there

30
00:01:35,620 --> 00:01:34,009
are big holes in the ground and by going

31
00:01:37,359 --> 00:01:35,630
down into the crater you're essentially

32
00:01:39,450 --> 00:01:37,369
going back in time because you know the

33
00:01:42,010 --> 00:01:39,460
older rocks or towards the bottom

34
00:01:44,639 --> 00:01:42,020
opportunity is the crater exploring

35
00:01:47,980 --> 00:01:44,649
rover on this side of the planet

36
00:01:50,080 --> 00:01:47,990
endurance was exciting because this is

37
00:01:51,910 --> 00:01:50,090
the first big crater we had entered

38
00:01:53,560 --> 00:01:51,920

that's something we never thought we

39
00:01:56,050 --> 00:01:53,570
would ever do with a roamer because it

40
00:01:57,310 --> 00:01:56,060
was considered too dangerous so we

41
00:02:01,149 --> 00:01:57,320
actually had to do some additional work

42
00:02:03,429 --> 00:02:01,159
here on earth to verify that it was safe

43
00:02:04,990 --> 00:02:03,439
not only to go down into the crater but

44
00:02:07,539 --> 00:02:05,000
that we could get back out again at

45
00:02:09,669 --> 00:02:07,549
times we breach slopes about 30 degrees

46
00:02:12,310 --> 00:02:09,679
and slightly higher it's actually hard

47
00:02:15,340 --> 00:02:12,320
for people to walk on 30-degree slopes

48
00:02:17,080 --> 00:02:15,350
we had a lot of close calls where you

49
00:02:18,940 --> 00:02:17,090
know we'd be driving a particular

50
00:02:21,160 --> 00:02:18,950
location we'd start sliding then we try

51
00:02:22,420 --> 00:02:21,170
to go back up and we'd slide and there's

52
00:02:24,430 --> 00:02:22,430
a certain point for if you keep on

53
00:02:27,340 --> 00:02:24,440
sliding you know you may never get out

54
00:02:29,170 --> 00:02:27,350
it was a little nerve-wracking but they

55
00:02:30,850 --> 00:02:29,180
determined it was worth going in there

56
00:02:34,240 --> 00:02:30,860
because scientifically was so

57
00:02:38,259 --> 00:02:34,250
interesting our big crater was Victoria

58
00:02:40,059 --> 00:02:38,269
a half mile diameter crater that took us

59
00:02:43,479 --> 00:02:40,069
about two years to

60
00:02:46,420 --> 00:02:43,489
to reach and it was excited because we'd

61
00:02:49,420 --> 00:02:46,430
never been to crater quite that large

62
00:02:51,489 --> 00:02:49,430
and we had to find at first a safe place

63
00:02:53,140 --> 00:02:51,499

to go into this crater well for us

64
00:02:55,270 --> 00:02:53,150
actually it was a little scary to be

65
00:02:57,369 --> 00:02:55,280
perfectly honest imagine going to the

66
00:02:59,319 --> 00:02:57,379
edge of the Grand Canyon and looking

67
00:03:01,660 --> 00:02:59,329
over and then here you are your

68
00:03:04,059 --> 00:03:01,670
commanding of over to go to the very

69
00:03:05,740 --> 00:03:04,069
edge and it's a mission manager you're

70
00:03:07,990 --> 00:03:05,750
responsible for this health and safety

71
00:03:09,699 --> 00:03:08,000
of this Rover and so the scientists say

72
00:03:11,559 --> 00:03:09,709
go closer go closer because we want to

73
00:03:13,270 --> 00:03:11,569
see what's at the very edge you have to

74
00:03:15,429 --> 00:03:13,280
be very careful about getting as close

75
00:03:19,479 --> 00:03:15,439
to the edge as you can we're not falling

76
00:03:22,689 --> 00:03:19,489
over the greatest threat to

77
00:03:24,459 --> 00:03:22,699
opportunities survival was a global

78
00:03:27,580 --> 00:03:24,469
Martian dust storm and these are massive

79
00:03:29,740 --> 00:03:27,590
storms I mean they block out the Sun it

80
00:03:31,420 --> 00:03:29,750
was quite a surprise because you know we

81
00:03:35,259 --> 00:03:31,430
hadn't seen anything of that magnitude

82
00:03:37,119 --> 00:03:35,269
before and so it was it was very

83
00:03:39,099 --> 00:03:37,129
stressful at that time and we at that

84
00:03:42,009 --> 00:03:39,109
was actually right before we started our

85
00:03:43,780 --> 00:03:42,019
ingress into victoria crater that was

86
00:03:46,420 --> 00:03:43,790
very scary because during that period

87
00:03:48,849 --> 00:03:46,430
you know the cloud got very dark and

88
00:03:51,369 --> 00:03:48,859

since we're a solar powered vehicle our

89
00:03:52,569 --> 00:03:51,379
power got very low so there was about a

90
00:03:54,909 --> 00:03:52,579
two-week period where it was

91
00:03:56,559 --> 00:03:54,919
touch-and-go every day and we didn't

92
00:03:59,409 --> 00:03:56,569
know whether we'd come in the next day

93
00:04:01,240 --> 00:03:59,419
and the road would still be there but it

94
00:04:09,590 --> 00:04:01,250
rode out the storm it got through it the

95
00:04:14,400 --> 00:04:11,880
opportunity will be leaving Victoria

96
00:04:17,670 --> 00:04:14,410
crater and heading to an even larger

97
00:04:19,890 --> 00:04:17,680
crater this is called endeavour and it's

98
00:04:23,370 --> 00:04:19,900
20 kilometers in diameter so it's about

99
00:04:25,290 --> 00:04:23,380
12 miles in size and it's about 20

100
00:04:27,030 --> 00:04:25,300
kilometers away so you know another 12

101
00:04:29,880 --> 00:04:27,040
miles in distance so it's actually

102
00:04:32,040 --> 00:04:29,890
further away that all the driving that

103
00:04:34,920 --> 00:04:32,050
opportunity has done in the past five

104
00:04:36,930 --> 00:04:34,930
years so it's a very distant objective

105
00:04:39,090 --> 00:04:36,940
it's a very ambitious objective but

106
00:04:42,570 --> 00:04:39,100
scientifically that's the direction to

107
00:04:45,900 --> 00:04:42,580
head even if we don't reach this a new

108
00:04:48,330 --> 00:04:45,910
larger giant crater the science that we

109
00:04:50,610 --> 00:04:48,340
can do along the way will add to the

110
00:04:52,890 --> 00:04:50,620
Martian history books it will extend our

111
00:04:58,260 --> 00:04:52,900
our historical understanding of the

112
00:05:00,720 --> 00:04:58,270
geology on Mars I think the the great

113
00:05:03,690 --> 00:05:00,730

contribution that these Rovers have made

114
00:05:06,630 --> 00:05:03,700
is that they have made Mars a familiar

115
00:05:07,770 --> 00:05:06,640
place the images that we take are taken

116
00:05:09,630 --> 00:05:07,780
very much with a human perspective

117
00:05:12,180 --> 00:05:09,640
because the cameras on the rover write

118
00:05:14,760 --> 00:05:12,190
up about eye level for a person standing

119
00:05:16,260 --> 00:05:14,770
on Mars and so you get the the

120
00:05:18,560 --> 00:05:16,270
perspective as if you were the air

121
00:05:21,630 --> 00:05:18,570
yourself looking over these great vistas

122
00:05:23,909 --> 00:05:21,640
with five years of operation for both

123
00:05:25,920 --> 00:05:23,919
Rovers and all the images thing of the

124
00:05:29,250 --> 00:05:25,930
over 40 million images that have been

125
00:05:32,760 --> 00:05:29,260
returned have really made Mars seem like

126
00:05:35,670 --> 00:05:32,770
our neighborhood it's no longer an 8 a-4

127
00:05:38,010 --> 00:05:35,680
nor alien or distant world it's now a

128
00:05:41,250 --> 00:05:38,020
familiar place that has earth-like

129
00:05:44,100 --> 00:05:41,260
characteristics we love the rover's as

130
00:05:45,810 --> 00:05:44,110
if they're our own children because it's

131
00:05:47,700 --> 00:05:45,820
gone through so much it's accomplished

132
00:05:50,670 --> 00:05:47,710
so much it's gone through hardships it's

133
00:05:52,800 --> 00:05:50,680
gone through incredible victories and so

134
00:05:55,320 --> 00:05:52,810
you know we love the rumors we care

135
00:05:57,120 --> 00:05:55,330
about them we worry about them we're

136
00:06:07,540 --> 00:05:57,130
excited whether it meets new discoveries