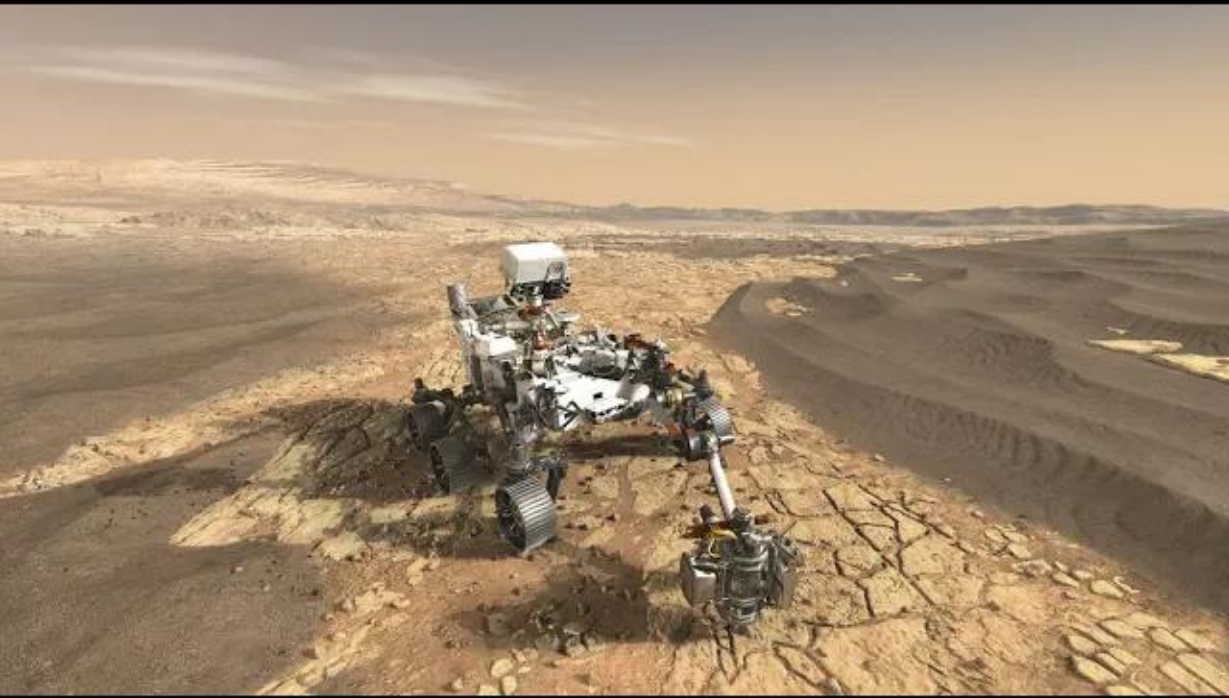

1
00:00:00,000 --> 00:00:03,250
(upbeat digital music)

2
00:00:05,290 --> 00:00:09,240
- Hi, I'm Doctor Ellen Stofan,
also known as Doctor E.

3
00:00:09,240 --> 00:00:11,890
- And I'm Thomas Zurbuchen,
also known as Doctor Z.

4
00:00:11,890 --> 00:00:15,680
- And we're here for another
episode of E.Z. Science.

5
00:00:15,680 --> 00:00:18,610
Today, we're at the Steven
F. Udvar-Hazy Center

6
00:00:18,610 --> 00:00:21,520
in Chantilly, Virginia,
which is the other part

7
00:00:21,520 --> 00:00:23,790
of the National Air and Space Museum.

8
00:00:23,790 --> 00:00:25,700
And this is one of my
favorite places because

9
00:00:25,700 --> 00:00:28,220
we have things like the
Space Shuttle Discovery.

10
00:00:28,220 --> 00:00:30,040
But we also have this exhibit,

11
00:00:30,040 --> 00:00:32,700
which has one of my favorite Mars landers.

12
00:00:32,700 --> 00:00:34,630
Thomas, do you know which lander this is?

13
00:00:34,630 --> 00:00:35,463
- Yeah, it's Sojourner, you know,

14
00:00:35,463 --> 00:00:37,800
I remember it from The Martian.

15
00:00:37,800 --> 00:00:40,550
- Pathfinder, with a
little Sojourner rover

16
00:00:40,550 --> 00:00:44,080
landed in 1997 on the surface of Mars.

17
00:00:44,080 --> 00:00:46,610
The stuff you see laying
around the ground here

18
00:00:46,610 --> 00:00:49,590
is actually an airbag
that helped it land safely

19
00:00:49,590 --> 00:00:50,423
on the surface.

20
00:00:50,423 --> 00:00:52,750
It literally landed like a bouncing ball.

21
00:00:52,750 --> 00:00:55,430
The airbag deflated and
then it could deploy

22
00:00:55,430 --> 00:00:58,910
the solar panels and then
this little Sojourner Rover

23
00:00:58,910 --> 00:01:01,215
could come out and down onto the surface.

24
00:01:01,215 --> 00:01:03,260
- The most exciting part, right,

25
00:01:03,260 --> 00:01:05,530
is to actually land there

26
00:01:05,530 --> 00:01:07,460
with something that can roll off.

27
00:01:07,460 --> 00:01:10,360
- So this robotic mobility
really set a path,

28
00:01:10,360 --> 00:01:13,320
literally, with Pathfinder and Sojourner

29
00:01:13,320 --> 00:01:15,620
to how we explore Mars today.

30
00:01:15,620 --> 00:01:18,250
It was followed by the
Spirit and Opportunity Rover

31
00:01:18,250 --> 00:01:19,970
and the Curiosity Rover.

32
00:01:19,970 --> 00:01:23,910
Because we realized, to really
explore the geology of Mars,

33
00:01:23,910 --> 00:01:25,940
we needed to get out
there and move around.

34
00:01:25,940 --> 00:01:28,550

Just landing in one
spot wasn't good enough.

35
00:01:28,550 --> 00:01:30,650
- What's so amazing to
me is how light it is.

36
00:01:30,650 --> 00:01:33,450
It's only 23 pounds, this entire vehicle.

37
00:01:33,450 --> 00:01:35,840
- Yeah and actually, this
mission really gave us

38
00:01:35,840 --> 00:01:37,790
some breakthrough science about Mars.

39
00:01:37,790 --> 00:01:39,850
We had known from orbital data that Mars

40
00:01:39,850 --> 00:01:42,000
had these huge channels carved into it

41
00:01:42,000 --> 00:01:44,200
that we thought were carved by water.

42
00:01:44,200 --> 00:01:46,870
But Pathfinder and the Sojourner Rover

43
00:01:46,870 --> 00:01:48,750
really gave us the first evidence that

44
00:01:48,750 --> 00:01:51,560
the rocks at the surface
showed a lot of signs of

45
00:01:51,560 --> 00:01:54,140
having been laid down
and modified by water.

46
00:01:54,140 --> 00:01:56,170
That gives you the knowledge
that it wasn't just

47
00:01:56,170 --> 00:01:58,320
an instant in time of water,

48
00:01:58,320 --> 00:02:00,370
that the water had to have persisted

49
00:02:00,370 --> 00:02:02,070
for tens of millions of years,

50
00:02:02,070 --> 00:02:04,642
if not hundreds of millions of years.

51
00:02:04,642 --> 00:02:06,600
- And of course it's that very insight

52
00:02:06,600 --> 00:02:09,530
that really has clarified many of the

53
00:02:09,530 --> 00:02:12,160
historic questions about Mars.

54
00:02:12,160 --> 00:02:15,350
You know, how three and
a half billion years ago

55
00:02:15,350 --> 00:02:17,000
did they become so different...

56
00:02:17,000 --> 00:02:18,470
- Yeah.
- Than the earth.

57
00:02:18,470 --> 00:02:21,620

We're making a mission ready right now

58
00:02:21,620 --> 00:02:23,944
from 23 pounds or so of a rover

59
00:02:23,944 --> 00:02:27,310
to a little bit under
twenty-five hundred pounds,

60
00:02:27,310 --> 00:02:28,510
Mars 2020.

61
00:02:28,510 --> 00:02:31,750
- To me, 2020 is really
this important next step

62
00:02:31,750 --> 00:02:35,170
where Pathfinder and Sojourner,
Spirit and Opportunity,

63
00:02:35,170 --> 00:02:37,490
Curiosity, will try and
answer the question,

64
00:02:37,490 --> 00:02:40,130
could Mars have been habitable?

65
00:02:40,130 --> 00:02:42,080
Were there environments on the surface

66
00:02:42,080 --> 00:02:44,540
in which life could have evovled.

67
00:02:44,540 --> 00:02:46,200
We know the answer to that question

68
00:02:46,200 --> 00:02:47,630
because of all the work we've done

69
00:02:47,630 --> 00:02:49,220
with these previous missions,

70
00:02:49,220 --> 00:02:51,530
the answer to that question is yes.

71
00:02:51,530 --> 00:02:53,100
- We know that where we're going to land,

72
00:02:53,100 --> 00:02:56,050
at Jezero Crater, it's
basically a river delta

73
00:02:56,050 --> 00:02:57,930
next to some craters, right?

74
00:02:57,930 --> 00:02:59,530
An ancient river delta.

75
00:02:59,530 --> 00:03:01,060
That's a place that we would wanna be

76
00:03:01,060 --> 00:03:03,240
if we would want to look for extinct life

77
00:03:03,240 --> 00:03:04,630
if there's such a thing.

78
00:03:04,630 --> 00:03:07,260
- Mars 2020 is really
pushing that issue of

79
00:03:07,260 --> 00:03:10,050
can we find evidence of past life on Mars.

80
00:03:10,050 --> 00:03:10,883
- That's right.

81
00:03:10,883 --> 00:03:13,730
That's why the instrumentation
is way more complex

82
00:03:13,730 --> 00:03:15,720
than pretty much any of
the other instruments

83
00:03:15,720 --> 00:03:16,640
that we've had there.

84
00:03:16,640 --> 00:03:20,040
For example, we have
ways to really analyze

85
00:03:20,040 --> 00:03:22,350
in much more detail, even the morphology,

86
00:03:22,350 --> 00:03:25,250
the looks of samples before we put them

87
00:03:25,250 --> 00:03:28,640
in the sample flask, hopefully
to bring them back later on.

88
00:03:28,640 --> 00:03:30,650
- So if it launches in July of 2020,

89
00:03:30,650 --> 00:03:32,550
when does it actually get to Mars

90
00:03:32,550 --> 00:03:34,560
and when will we start
seeing that first data

91
00:03:34,560 --> 00:03:35,770
after the landing?

92

00:03:35,770 --> 00:03:39,420
- It's gonna be there in
February of the next year, of 21,

93
00:03:39,420 --> 00:03:42,810
coming down, and pretty much within days,

94
00:03:42,810 --> 00:03:44,470
we'll get the first data.

95
00:03:44,470 --> 00:03:46,090
What I'm really excited about is during

96
00:03:46,090 --> 00:03:47,160
entry, descent, and landing,

97
00:03:47,160 --> 00:03:49,950
we have way more cameras
than we've ever had.

98
00:03:49,950 --> 00:03:51,610
We're gonna see it go down,

99
00:03:51,610 --> 00:03:53,970
and we're gonna see the look up too.

100
00:03:53,970 --> 00:03:56,630
And of course we're also
bringing a small helicopter.

101
00:03:56,630 --> 00:03:59,110
- Sojourner was
record-breaking in it's time.

102
00:03:59,110 --> 00:04:01,650
This little rover that
was gonna explore Mars.

103
00:04:01,650 --> 00:04:04,890

Now you're moving beyond
surface exploration

104
00:04:04,890 --> 00:04:07,900
into aerial exploration

105
00:04:07,900 --> 00:04:10,620
with the helicopter
technology demonstration.

106
00:04:10,620 --> 00:04:11,670
- Exactly right.

107
00:04:11,670 --> 00:04:14,064
Close to 500 years after the death of

108
00:04:14,064 --> 00:04:17,220
Leonardo da Vinci who actually
made the first drawing

109
00:04:17,220 --> 00:04:18,830
of a helicopter,

110
00:04:18,830 --> 00:04:21,990
we're gonna bring such a
vehicle to a distant world.

111
00:04:21,990 --> 00:04:23,660
It will be the first controlled flight

112
00:04:23,660 --> 00:04:24,960
in a distant world.

113
00:04:24,960 --> 00:04:29,940
- And because 2020 is so much
heavier than Pathfinder here,

114
00:04:29,940 --> 00:04:31,980
we really have to use

a much more complicated

115
00:04:31,980 --> 00:04:33,000
landing system.

116
00:04:33,000 --> 00:04:36,220
So retrorockets fire,
parachutes come out to

117
00:04:36,220 --> 00:04:38,540
slow it down as it enters the atmosphere,

118
00:04:38,540 --> 00:04:40,530
but then the spacecraft
is actually lowered

119
00:04:40,530 --> 00:04:42,610
to the surface on what's
called the sky crane.

120
00:04:42,610 --> 00:04:45,397
And it's what the folks
out of JPL have termed,

121
00:04:45,397 --> 00:04:47,740
"Seven Minutes of Terror" as it starts

122
00:04:47,740 --> 00:04:48,970
from the top of the atmosphere

123
00:04:48,970 --> 00:04:50,430
all the way to the surface.

124
00:04:50,430 --> 00:04:51,263
- Exactly right.

125
00:04:51,263 --> 00:04:53,350
It's a very tough time to sit there

126
00:04:53,350 --> 00:04:56,470
until you hear from the
surface that, "I'm okay."

127
00:04:56,470 --> 00:04:57,390
Risky time.

128
00:04:57,390 --> 00:05:00,880
It's 50 percent or so likelihood
of success statistically

129
00:05:00,880 --> 00:05:03,980
for humanity to land or go to Mars.

130
00:05:03,980 --> 00:05:05,360
- Well, especially this summer,

131
00:05:05,360 --> 00:05:07,170
we're gonna come back
to you on E.Z. Science

132
00:05:07,170 --> 00:05:09,470
and talk more about Mars 2020

133
00:05:09,470 --> 00:05:11,040
as we get close to the launch.

134
00:05:11,040 --> 00:05:12,560
- Yeah, really appreciate that,

135
00:05:12,560 --> 00:05:14,000
what an exciting exhibit.

136
00:05:14,000 --> 00:05:16,050
An exhibit that points
forward to something

137
00:05:16,050 --> 00:05:16,883

that's going to happen.

138
00:05:16,883 --> 00:05:19,550
Thank you so much for
all of this discussion.

139
00:05:19,550 --> 00:05:21,160
- And thanks for coming and joining us