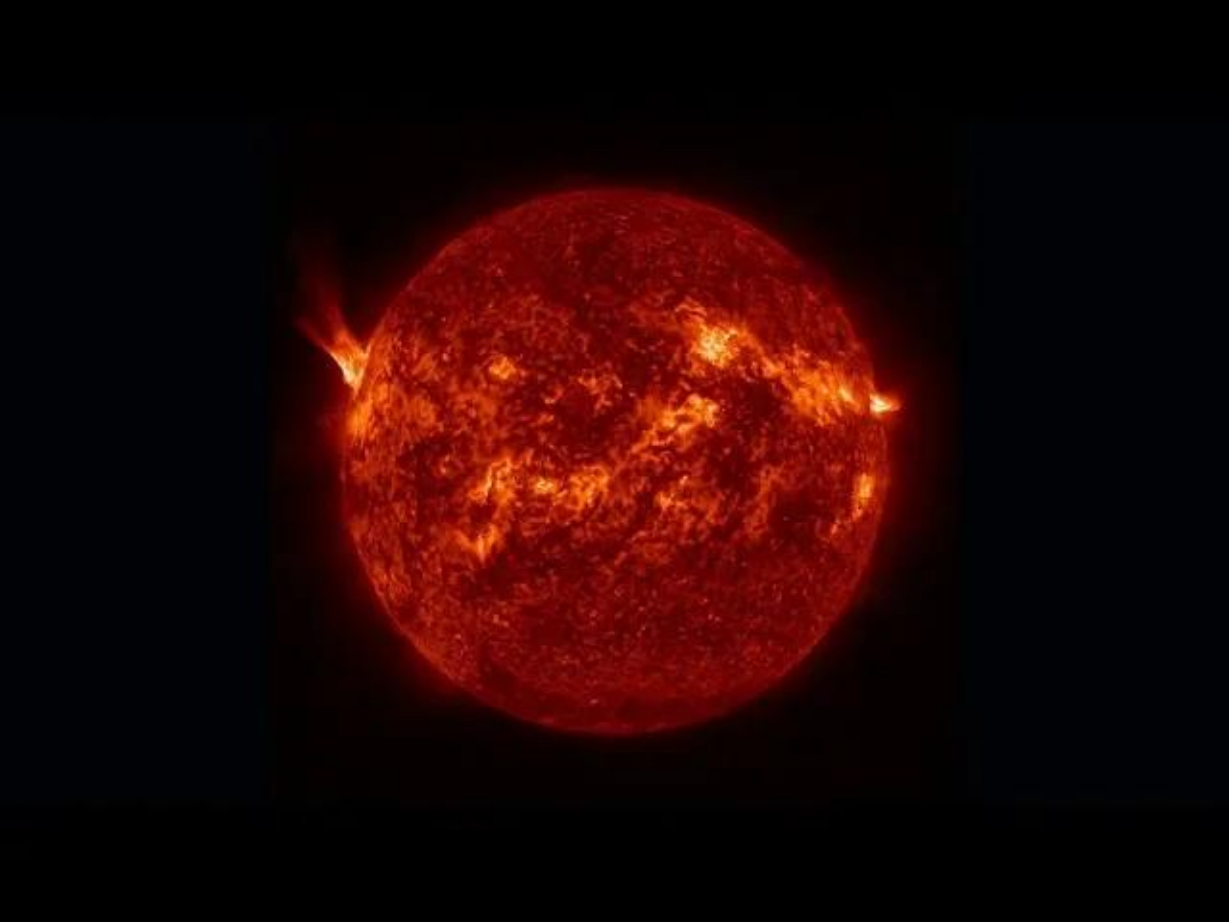

1
00:00:00,230 --> 00:00:02,730
(light music)

2
00:00:05,870 --> 00:00:07,320
- Hi, I'm Ellen Stofan,

3
00:00:07,320 --> 00:00:08,930
the John and Adrienne Mars Director

4
00:00:08,930 --> 00:00:11,670
of the Smithsonian's National
Air and Space Museum.

5
00:00:11,670 --> 00:00:14,540
I'm Doctor E and we're
here for another episode

6
00:00:14,540 --> 00:00:16,600
of E.Z. Science.

7
00:00:16,600 --> 00:00:18,040
- Hey, and I'm Thomas Zurbuchen,

8
00:00:18,040 --> 00:00:20,057
the Associate Administrator for Science

9
00:00:20,057 --> 00:00:22,800
at NASA also known as Doctor Z.

10
00:00:22,800 --> 00:00:25,370
- We're here today to talk
a little bit about something

11
00:00:25,370 --> 00:00:26,960
that people don't
probably think of as being

12
00:00:26,960 --> 00:00:28,340

that important in their lives

13
00:00:28,340 --> 00:00:31,230
but if for example you use some app

14
00:00:31,230 --> 00:00:33,032
to help you get to where
you were going today,

15
00:00:33,032 --> 00:00:36,650
you're actually relying on
NASA understanding the sun.

16
00:00:36,650 --> 00:00:39,890
- So we're looking at our
star, our favorite star,

17
00:00:39,890 --> 00:00:42,900
the sun and we see that the
star is a magnetic star.

18
00:00:42,900 --> 00:00:46,240
You see as the sun is
boiling at the surface

19
00:00:46,240 --> 00:00:50,010
because it's so hot it's
carrying with it magnetic fields.

20
00:00:50,010 --> 00:00:51,930
And like little arcs they're there

21
00:00:51,930 --> 00:00:55,070
and they're interacting with
each other liberating energy,

22
00:00:55,070 --> 00:00:58,740
UV energy of the type that
of course burns your skin,

23
00:00:58,740 --> 00:01:00,680
an x-ray like you see at the doctor.

24
00:01:00,680 --> 00:01:02,630
That kind of radiation
is coming from the sun

25
00:01:02,630 --> 00:01:04,269
and it's spreading around causing

26
00:01:04,269 --> 00:01:06,800
what we call space weather.

27
00:01:06,800 --> 00:01:09,980
Of course, as it's heating up,
that atmosphere, the corona,

28
00:01:09,980 --> 00:01:12,120
it's also blowing away it's atmosphere.

29
00:01:12,120 --> 00:01:14,490
It cannot hold on to it
and it's filling the space

30
00:01:14,490 --> 00:01:15,760
between the planets.

31
00:01:15,760 --> 00:01:16,770
- Now that space weather

32
00:01:16,770 --> 00:01:19,490
is what can disrupt our
communication satellites,

33
00:01:19,490 --> 00:01:20,790
our GPS satellites.

34
00:01:20,790 --> 00:01:22,504

For the astronauts up
on the space station,

35
00:01:22,504 --> 00:01:24,820
they even have to worry
about what's going on

36
00:01:24,820 --> 00:01:26,090
on the surface of the sun.

37
00:01:26,090 --> 00:01:27,910
- Exactly right and when they're leaving

38
00:01:27,910 --> 00:01:29,553
to go to the moon or to Mars,

39
00:01:29,553 --> 00:01:31,010
that is even more important

40
00:01:31,010 --> 00:01:31,843
because now we're away

41
00:01:31,843 --> 00:01:34,860
from the magnetic protection of our Earth.

42
00:01:34,860 --> 00:01:38,280
- Now NASA has a lot of
spacecrafts studying the sun,

43
00:01:38,280 --> 00:01:40,972
and they get as close
to the sun as they can,

44
00:01:40,972 --> 00:01:43,110
but right now we have
a spacecraft up there

45
00:01:43,110 --> 00:01:45,400
that's doing something pretty special.

46
00:01:45,400 --> 00:01:47,270
Can you tell us about
the Parker Solar Probe?

47
00:01:47,270 --> 00:01:50,150
- It's really the first
spacecraft to touch the sun,

48
00:01:50,150 --> 00:01:53,470
to fly through that corona,
through that atmosphere,

49
00:01:53,470 --> 00:01:56,800
and sample it in a way
that we've never seen.

50
00:01:56,800 --> 00:01:59,730
So in fact it just
completed its third orbit

51
00:01:59,730 --> 00:02:02,660
by the sun and it's collecting data

52
00:02:02,660 --> 00:02:04,080
and sending it back to Earth.

53
00:02:04,080 --> 00:02:05,770
So we're learning about this atmosphere

54
00:02:05,770 --> 00:02:08,350
in a way we've never seen before just now.

55
00:02:08,350 --> 00:02:09,780
- I think a lot of people don't recognize

56
00:02:09,780 --> 00:02:11,910
that when NASA does
things like go to a planet

57
00:02:11,910 --> 00:02:13,542
or get really close to the sun,

58
00:02:13,542 --> 00:02:16,416
we have to push technology in ways

59
00:02:16,416 --> 00:02:18,610
that you just don't normally have to do

60
00:02:18,610 --> 00:02:21,750
which then spins off and
benefits us right here on Earth.

61
00:02:21,750 --> 00:02:22,583
- Absolutely.

62
00:02:22,583 --> 00:02:24,840
A lot of these materials
that are being developed

63
00:02:24,840 --> 00:02:27,220
right here for Parker Solar
Probe and we're developed

64
00:02:27,220 --> 00:02:29,370
in the last decade or so are materials

65
00:02:29,370 --> 00:02:31,790
that are very much
applicable in other systems

66
00:02:31,790 --> 00:02:33,110
like energy systems

67
00:02:33,110 --> 00:02:35,291
or even fire fighting type of applications

68

00:02:35,291 --> 00:02:38,580
where those kind of
materials matter for example.

69
00:02:38,580 --> 00:02:41,330
- Now we did get a question
that someone sent in

70
00:02:41,330 --> 00:02:42,950
to E.Z. Science, so don't forget

71
00:02:42,950 --> 00:02:46,120
about sending your questions
in for future episodes.

72
00:02:46,120 --> 00:02:47,830
Parker has gathered some information

73
00:02:47,830 --> 00:02:51,090
about why the sun's corona
is hotter than its surface.

74
00:02:51,090 --> 00:02:54,370
Tell us a bit about what
it's found in its first year.

75
00:02:54,370 --> 00:02:57,070
- What we're learning about
is that the near corona

76
00:02:57,070 --> 00:02:59,730
like right down there by the sun

77
00:02:59,730 --> 00:03:03,580
is a lot more turbulent,
a lot more interactive

78
00:03:03,580 --> 00:03:04,870
than we thought before.

79
00:03:04,870 --> 00:03:05,990
- This is a spacecraft

80
00:03:05,990 --> 00:03:07,890
that was named for a living scientist

81
00:03:07,890 --> 00:03:09,710
and can you tell us why we did that?

82
00:03:09,710 --> 00:03:12,980
- Eugene Parker is so important
for that entire field.

83
00:03:12,980 --> 00:03:15,760
He's the guy who predicted
that the solar atmosphere

84
00:03:15,760 --> 00:03:18,070
would be blown off into
super sonic stream,

85
00:03:18,070 --> 00:03:19,230
the solar wind.

86
00:03:19,230 --> 00:03:21,600
Highly controversial and
of course he was right.

87
00:03:21,600 --> 00:03:25,090
In fact, there is something
like 35 spacecraft

88
00:03:25,090 --> 00:03:27,940
in all of NASA's inventory
that are dealing with things

89
00:03:27,940 --> 00:03:30,739
that Parker predicted
and I will never forget

90
00:03:30,739 --> 00:03:32,930
how Parker looked and his family

91
00:03:32,930 --> 00:03:35,450
when the rocket went into the sky with him

92
00:03:35,450 --> 00:03:38,163
seeing his spacecraft leave the Earth.

93
00:03:41,640 --> 00:03:43,130
I'm going to ask you the second question

94
00:03:43,130 --> 00:03:46,970
that is how does the research
in space help prepare humans

95
00:03:46,970 --> 00:03:49,410
on a journey to future Artemis missions

96
00:03:49,410 --> 00:03:51,290
to the moon, Mars, and beyond?

97
00:03:51,290 --> 00:03:53,020
- So the more that we can monitor the sun,

98
00:03:53,020 --> 00:03:54,470
the more that we can understand

99
00:03:54,470 --> 00:03:56,050
and predict what's happening at the sun,

100
00:03:56,050 --> 00:03:58,900
the better we can do with
protecting the astronauts.

101
00:03:58,900 --> 00:04:00,810
Now if we know there's a solar flares

102
00:04:00,810 --> 00:04:03,880
of particles coming towards
them, they can go into areas

103
00:04:03,880 --> 00:04:04,800
that are shielded.

104
00:04:04,800 --> 00:04:06,940
And those are some of the
technologies we work on

105
00:04:06,940 --> 00:04:10,530
is how do we protect astronauts
from this space radiation

106
00:04:10,530 --> 00:04:13,960
both from the sun but also
from galactic cosmic rays.

107
00:04:13,960 --> 00:04:15,470
We're gonna be able to do that research

108
00:04:15,470 --> 00:04:17,240
even better on the surface of the moon

109
00:04:17,240 --> 00:04:18,807
outside of our magnetic field

110
00:04:18,807 --> 00:04:20,760
where as Thomas said the astronauts

111
00:04:20,760 --> 00:04:22,150
are much more vulnerable.

112
00:04:22,150 --> 00:04:24,560
Now Thomas, some of the
surface science from Artemis

113
00:04:24,560 --> 00:04:26,646
is also gonna help us
eventually get to Mars.

114
00:04:26,646 --> 00:04:27,510
- Of course.

115
00:04:27,510 --> 00:04:30,340
As we're sampling the surface of the moon,

116
00:04:30,340 --> 00:04:32,040
what we also will be able to do

117
00:04:32,040 --> 00:04:34,040
is look at the components
that are in there,

118
00:04:34,040 --> 00:04:36,770
especially water, that
we may be able to use

119
00:04:36,770 --> 00:04:39,370
both on the moon and Mars over time

120
00:04:39,370 --> 00:04:42,350
to live off but also make fuel out of it.

121
00:04:42,350 --> 00:04:43,820
So it's really exciting.

122
00:04:43,820 --> 00:04:45,330
- Well I'm afraid we're out of time

123
00:04:45,330 --> 00:04:47,410
and thank you, this
has been incredibly fun

124
00:04:47,410 --> 00:04:49,290

to talk about our favorite star.

125
00:04:49,290 --> 00:04:51,730
- And I really want to encourage everybody

126
00:04:51,730 --> 00:04:53,080
to send questions again,

127
00:04:53,080 --> 00:04:54,160
questions that we'll answer