1
00:00:09,190 --> 00:00:05,749
[Music]

2
00:00:11,030 --> 00:00:09,200
i'm ellen stofan also known as dr e

3
00:00:14,390 --> 00:00:11,040
and i'm thomas surbuck and also known as

4
00:00:15,509 --> 00:00:14,400
dr z and here's another episode of easy

5
00:00:18,150 --> 00:00:15,519
science

6
00:00:20,230 --> 00:00:18,160
and we have a major milestone of one of

7
00:00:23,509 --> 00:00:20,240
our key missions coming up it's such an

8
00:00:24,950 --> 00:00:23,519
exciting mission nasa's first asteroid

9
00:00:27,830 --> 00:00:24,960
sample return mission the japanese

10
00:00:28,710 --> 00:00:27,840
stated earlier but this is nasa's first

11
00:00:30,870 --> 00:00:28,720
time

12
00:00:32,790 --> 00:00:30,880
a huge technological challenge but

13
00:00:34,389 --> 00:00:32,800

really critical because this sample is

14
00:00:37,190 --> 00:00:34,399
really a time capsule of the solar

15
00:00:40,150 --> 00:00:37,200
system you know dr z i was at nasa in

16
00:00:41,750 --> 00:00:40,160
2016 when osiris-rex launched incredibly

17
00:00:43,750 --> 00:00:41,760
exciting and it actually launched on a

18
00:00:45,750 --> 00:00:43,760
rocket that we have a model of here at

19
00:00:47,270 --> 00:00:45,760
the stephen f woodvar housing center

20
00:00:50,630 --> 00:00:47,280
it's the second one in the copper

21
00:00:53,350 --> 00:00:50,640
colored one there in atlas 5.

22
00:00:56,389 --> 00:00:53,360
exactly right we built a spacecraft that

23
00:00:59,510 --> 00:00:56,399
was launched in 2016 got into orbit in

24
00:01:02,150 --> 00:00:59,520
2018 did a remote exploration of banu

25
00:01:04,869 --> 00:01:02,160
the size of the empire state building a

26
00:01:08,070 --> 00:01:04,879
rubble pile of history of the solar

27
00:01:10,950 --> 00:01:08,080
system and we looked at it and practiced

28
00:01:13,190 --> 00:01:10,960
and got ready to really go pick up a

29
00:01:15,429 --> 00:01:13,200
sample so we could bring it back to

30
00:01:17,910 --> 00:01:15,439
earth and analyze it

31
00:01:19,510 --> 00:01:17,920
october 20th for four and a half hours

32
00:01:20,950 --> 00:01:19,520
we're going to grab

33
00:01:23,990 --> 00:01:20,960
that sample it's going to be really

34
00:01:25,749 --> 00:01:24,000
really hard but the team is up for it so

35
00:01:27,670 --> 00:01:25,759
let's talk about why we're going to all

36
00:01:29,590 --> 00:01:27,680
this trouble obviously bennu is what's

37
00:01:31,830 --> 00:01:29,600
called an apollo asteroid it's an

38
00:01:33,910 --> 00:01:31,840

earth-crossing asteroid so its orbit

39
00:01:35,670 --> 00:01:33,920
intersects with the earth's orbit

40
00:01:37,350 --> 00:01:35,680
now obviously that's a problem right

41
00:01:39,190 --> 00:01:37,360
members of this family

42
00:01:41,749 --> 00:01:39,200
have hit the earth in the past in fact

43
00:01:43,109 --> 00:01:41,759
we know there was a small apollo that

44
00:01:44,950 --> 00:01:43,119
entered the earth's atmosphere and

45
00:01:47,749 --> 00:01:44,960
exploded over the russian city of

46
00:01:50,630 --> 00:01:47,759
chelyabinsk a few years ago and caused

47
00:01:54,389 --> 00:01:52,550
so these asteroids do

48
00:01:55,990 --> 00:01:54,399
this whole family presents a hazard to

49
00:01:58,230 --> 00:01:56,000
the earth that's right so within the

50
00:01:59,990 --> 00:01:58,240
next 200 years or so there's a one in 3

51
00:02:01,670 --> 00:02:00,000
000 chance that this one

52
00:02:03,270 --> 00:02:01,680
will hit the earth which is not very

53
00:02:05,590 --> 00:02:03,280
high if you think about it compared to

54
00:02:07,990 --> 00:02:05,600
other kind of risks but needless to say

55
00:02:11,110 --> 00:02:08,000
this is 500 meters you know five

56
00:02:13,350 --> 00:02:11,120
football fields in dimension and so it's

57
00:02:15,589 --> 00:02:13,360
a much bigger asteroid than the one we

58
00:02:17,430 --> 00:02:15,599
just talked about in siberia right and

59
00:02:20,150 --> 00:02:17,440
bennu is an important type of asteroid

60
00:02:23,350 --> 00:02:20,160
because it's a carbonaceous asteroid and

61
00:02:26,390 --> 00:02:23,360
we know these asteroids have amino acids

62
00:02:28,229 --> 00:02:26,400
in them and every living thing on earth

63
00:02:29,750 --> 00:02:28,239

is made up of amino acids so we know

64
00:02:31,670 --> 00:02:29,760
those are critical components of life

65
00:02:33,750 --> 00:02:31,680
the building blocks of life and we

66
00:02:35,509 --> 00:02:33,760
suspect that comets and asteroids

67
00:02:37,589 --> 00:02:35,519
brought those to earth very early in

68
00:02:40,229 --> 00:02:37,599
earth's history the other fascinating

69
00:02:42,550 --> 00:02:40,239
thing about these carbonaceous asteroids

70
00:02:44,229 --> 00:02:42,560
that i find really interesting is

71
00:02:46,309 --> 00:02:44,239
there's been recent work over the last

72
00:02:47,509 --> 00:02:46,319
several decades that these asteroids

73
00:02:49,430 --> 00:02:47,519
could have been critical in actually

74
00:02:51,589 --> 00:02:49,440
bringing water to the earth because

75
00:02:53,830 --> 00:02:51,599
they're actually water rich tied up in

76
00:02:56,710 --> 00:02:53,840
the rocks of the asteroid is actually a

77
00:02:58,149 --> 00:02:56,720
lot of h2o and our oceans in the water

78
00:02:59,509 --> 00:02:58,159
in our atmosphere came from somewhere

79
00:03:01,430 --> 00:02:59,519
and we think it was actually dominantly

80
00:03:03,430 --> 00:03:01,440
asteroids not actually comets what's

81
00:03:05,750 --> 00:03:03,440
also exciting about this particular body

82
00:03:07,830 --> 00:03:05,760
so we went there right and we found all

83
00:03:10,550 --> 00:03:07,840
these surprises it's a highly saturated

84
00:03:12,710 --> 00:03:10,560
surface it's a gravel pile we expect it

85
00:03:15,270 --> 00:03:12,720
from other asteroids that we've seen we

86
00:03:17,509 --> 00:03:15,280
have these sandy places with rocks there

87
00:03:19,750 --> 00:03:17,519
oh no it's rocks on rocks and rocks very

88
00:03:21,589 --> 00:03:19,760

few sandy places which of course is a

89
00:03:23,589 --> 00:03:21,599
huge challenge for our mission designers

90
00:03:26,070 --> 00:03:23,599
but also a challenge for our theorists

91
00:03:29,030 --> 00:03:26,080
in addition to that the asteroid is

92
00:03:31,270 --> 00:03:29,040
emitting these softball-sized rocks they

93
00:03:33,270 --> 00:03:31,280
found them in a navigation camp cycles

94
00:03:36,070 --> 00:03:33,280
what is this like it's moving like you

95
00:03:38,309 --> 00:03:36,080
not expect that this body is active so

96
00:03:40,470 --> 00:03:38,319
yes it's really critical to our history

97
00:03:42,470 --> 00:03:40,480
to the history of the whole solar system

98
00:03:44,630 --> 00:03:42,480
but it's also as a world

99
00:03:47,430 --> 00:03:44,640
it's a really exciting and rough place

100
00:03:49,350 --> 00:03:47,440
to be at

101
00:03:51,430 --> 00:03:49,360
dr i can't let you go without talking

102
00:03:52,949 --> 00:03:51,440
about venus venus has been in the news

103
00:03:55,429 --> 00:03:52,959
so many times

104
00:03:56,630 --> 00:03:55,439
about life can you explain us

105
00:03:57,910 --> 00:03:56,640
sure and a lot of people might be

106
00:03:59,670 --> 00:03:57,920
puzzled about that they might know that

107
00:04:01,910 --> 00:03:59,680
venus has a runaway greenhouse

108
00:04:04,149 --> 00:04:01,920
atmosphere it's almost 900 degrees

109
00:04:05,750 --> 00:04:04,159
fahrenheit on the surface but you know

110
00:04:07,750 --> 00:04:05,760
back even to the early work of carl

111
00:04:10,229 --> 00:04:07,760
sagan it has been supposed that in the

112
00:04:12,470 --> 00:04:10,239
higher levels of the venus atmosphere

113
00:04:14,229 --> 00:04:12,480

where the temperatures are much cooler

114
00:04:16,710 --> 00:04:14,239
and the atmosphere is actually fairly

115
00:04:18,870 --> 00:04:16,720
stable which means clouds can persist

116
00:04:19,830 --> 00:04:18,880
for maybe thousands hugely long periods

117
00:04:23,270 --> 00:04:19,840
of time

118
00:04:25,030 --> 00:04:23,280
could you have some sort of life form

119
00:04:27,590 --> 00:04:25,040
living in the clouds of venus a lot of

120
00:04:29,270 --> 00:04:27,600
speculation never been able to determine

121
00:04:31,909 --> 00:04:29,280
if that's true or not

122
00:04:34,710 --> 00:04:31,919
so just recently a group of scientists

123
00:04:36,870 --> 00:04:34,720
detected a gas called phosphine in the

124
00:04:39,510 --> 00:04:36,880
atmosphere of venus now on the earth

125
00:04:41,189 --> 00:04:39,520
phosphine is associated with life but it

126
00:04:43,030 --> 00:04:41,199
also can be created through other

127
00:04:45,430 --> 00:04:43,040
processes for example you find it in the

128
00:04:48,150 --> 00:04:45,440
atmospheres of jupiter and saturn so

129
00:04:49,350 --> 00:04:48,160
this is an intriguing result there's not

130
00:04:51,110 --> 00:04:49,360
really a great reason why there should

131
00:04:51,830 --> 00:04:51,120
be phosphene in the atmosphere of venus

132
00:04:55,189 --> 00:04:51,840
so

133
00:04:57,350 --> 00:04:55,199
other cause

134
00:04:59,110 --> 00:04:57,360
so this is just one more reason that we

135
00:05:00,790 --> 00:04:59,120
need to get back to venus it's a planet

136
00:05:03,749 --> 00:05:00,800
the size of the earth it's gone through

137
00:05:05,510 --> 00:05:03,759
a very different geologic history and

138
00:05:08,310 --> 00:05:05,520

it's really helps us understand when we

139
00:05:10,230 --> 00:05:08,320
go to other solar systems to say why did

140
00:05:11,990 --> 00:05:10,240
you have one planet in our solar system

141
00:05:14,550 --> 00:05:12,000
that became earth became this lovely

142
00:05:16,150 --> 00:05:14,560
habitable planet that we all live on and

143
00:05:18,469 --> 00:05:16,160
you have venus that went down a very

144
00:05:20,710 --> 00:05:18,479
different evolutionary path yeah and in

145
00:05:22,870 --> 00:05:20,720
fact two of our four candidate missions

146
00:05:25,510 --> 00:05:22,880
in the discovery program will go to

147
00:05:28,230 --> 00:05:25,520
venus and look at various parts of venus

148
00:05:31,029 --> 00:05:28,240
if they get selected also io is one of

149
00:05:33,350 --> 00:05:31,039
the targets and trident the moon out

150
00:05:35,430 --> 00:05:33,360
there by neptune so i need to say

151
00:05:37,830 --> 00:05:35,440
there's many amazing targets in the

152
00:05:40,390 --> 00:05:37,840
solar system and venusaur system we see

153
00:05:42,310 --> 00:05:40,400
it in the sky many evenings it's more

154
00:05:44,390 --> 00:05:42,320
and more exciting to think of the signs

155
00:05:46,310 --> 00:05:44,400
that we could explore there

156
00:05:48,070 --> 00:05:46,320
in the meantime come visit us here at

157
00:05:49,749 --> 00:05:48,080
the stephen f woodvar housing center in

158
00:05:52,230 --> 00:05:49,759
chantilly virginia we're open for

159
00:05:54,469 --> 00:05:52,240
business you need a free timed entry

160
00:05:56,309 --> 00:05:54,479
pass come see the wonders that we

161
00:05:59,189 --> 00:05:56,319
display of the history of aviation and

162
00:06:04,600 --> 00:05:59,199
space flight and of course stay tuned