
OSIRIS-REx &
THE ORIGIN OF LIFE

1
00:00:00,000 --> 00:00:09,509
[Music]

2
00:00:12,230 --> 00:00:11,270
asteroids are remnants of the early

3
00:00:15,589 --> 00:00:12,240
solar system

4
00:00:17,029 --> 00:00:15,599
they are leftover pieces as the solar

5
00:00:19,109 --> 00:00:17,039
system was forming

6
00:00:21,349 --> 00:00:19,119
and around the same time that life was

7
00:00:23,750 --> 00:00:21,359
forming on the early earth or

8
00:00:25,429 --> 00:00:23,760
other bodies and so the same chemistry

9
00:00:26,870 --> 00:00:25,439
that was happening

10
00:00:29,830 --> 00:00:26,880
uh that could have influenced the urgent

11
00:00:32,709 --> 00:00:29,840
life is preserved on these relics of the

12
00:00:34,389 --> 00:00:32,719
solar system you know you can't have uh

13
00:00:36,069 --> 00:00:34,399

life on a planet unless you have a

14
00:00:37,910 --> 00:00:36,079
biosphere which means you have to have

15
00:00:39,590 --> 00:00:37,920
all the appropriate carbon oxygen

16
00:00:41,510 --> 00:00:39,600
hydrogen nitrogen all kinds of elements

17
00:00:43,030 --> 00:00:41,520
you need for life and so if those aren't

18
00:00:44,150 --> 00:00:43,040
delivered then you're not going to get

19
00:00:46,790 --> 00:00:44,160
anywhere

20
00:00:48,389 --> 00:00:46,800
obviously osiris-rex is visiting uh one

21
00:00:50,229 --> 00:00:48,399
of these objects and it's not just

22
00:00:52,229 --> 00:00:50,239
visiting any old asteroid it's uh

23
00:00:53,590 --> 00:00:52,239
visiting a really appropriate one for

24
00:00:54,069 --> 00:00:53,600
these questions about astrobiology

25
00:00:56,310 --> 00:00:54,079
because

26
00:00:58,150 --> 00:00:56,320
it's a class of asteroid which we

27
00:01:00,310 --> 00:00:58,160
believe is associated with type of

28
00:01:02,069 --> 00:01:00,320
meteorite called carbonaceous chondrites

29
00:01:04,070 --> 00:01:02,079
which are amongst the most

30
00:01:05,350 --> 00:01:04,080
richest meteorites in terms of their

31
00:01:06,710 --> 00:01:05,360
carbon abundance and also their

32
00:01:08,870 --> 00:01:06,720
molecular complexity

33
00:01:10,950 --> 00:01:08,880
so osiris-rex can then attack these

34
00:01:13,030 --> 00:01:10,960
various issues in several ways of course

35
00:01:14,789 --> 00:01:13,040
one is we have some instruments

36
00:01:17,910 --> 00:01:14,799
on board the spacecraft which will give

37
00:01:20,710 --> 00:01:17,920
us a global look at the asteroid

38
00:01:22,550 --> 00:01:20,720

on october 20th of this year osiris-rex

39
00:01:25,270 --> 00:01:22,560
will attempt its first touch and go

40
00:01:26,070 --> 00:01:25,280
or tag event this will be nasa's first

41
00:01:28,469 --> 00:01:26,080
ever attempt

42
00:01:29,830 --> 00:01:28,479
to sample an asteroid in space with the

43
00:01:33,190 --> 00:01:29,840
hopes of returning it

44
00:01:35,510 --> 00:01:33,200
to earth so for fun here is a lego

45
00:01:38,149 --> 00:01:35,520
version of the subject spacecraft

46
00:01:39,190 --> 00:01:38,159
it has articulated solar arrays a

47
00:01:41,910 --> 00:01:39,200
science that has

48
00:01:42,310 --> 00:01:41,920
return canister and this three meter

49
00:01:44,950 --> 00:01:42,320
long

50
00:01:45,910 --> 00:01:44,960
arm and the end of this is uh sort of

51
00:01:48,389 --> 00:01:45,920
like a

52
00:01:49,030 --> 00:01:48,399
old card air filter but of course uh

53
00:01:52,069 --> 00:01:49,040
bespoke

54
00:01:53,109 --> 00:01:52,079
design for this mission and for this

55
00:01:55,270 --> 00:01:53,119
asteroid

56
00:01:57,109 --> 00:01:55,280
to collect a sample of material and

57
00:01:59,270 --> 00:01:57,119
bring it back to earth by

58
00:02:02,630 --> 00:01:59,280
touching the surface of the asteroid

59
00:02:04,789 --> 00:02:02,640
collecting at least 60 grams as much

60
00:02:06,310 --> 00:02:04,799
kilograms of material go up measure the

61
00:02:07,830 --> 00:02:06,320
mass of the material

62
00:02:10,389 --> 00:02:07,840
and then stow it in the same return

63
00:02:12,150 --> 00:02:10,399

canister bring it back to earth

64
00:02:13,670 --> 00:02:12,160
so when we get these samples back we're

65
00:02:15,190 --> 00:02:13,680
going to be interested in these aspects

66
00:02:16,790 --> 00:02:15,200
of the samples what are their bulk

67
00:02:18,869 --> 00:02:16,800
elemental abundances

68
00:02:20,790 --> 00:02:18,879
and also what kinds of specific

69
00:02:22,390 --> 00:02:20,800
compounds are present

70
00:02:23,830 --> 00:02:22,400
and what can they tell us about how they

71
00:02:24,550 --> 00:02:23,840
formed and where they formed and when

72
00:02:26,229 --> 00:02:24,560
they formed

73
00:02:27,910 --> 00:02:26,239
and in particular could any of these

74
00:02:30,390 --> 00:02:27,920
molecules have played a role

75
00:02:33,110 --> 00:02:30,400
in helping get life started on the earth

76
00:02:35,110 --> 00:02:33,120
or you know any other place

77
00:02:37,430 --> 00:02:35,120
one of the huge advantages of a sample

78
00:02:38,710 --> 00:02:37,440
return mission is that

79
00:02:40,470 --> 00:02:38,720
when you get the sample back to the

80
00:02:42,309 --> 00:02:40,480
earth you've effectively added all the

81
00:02:44,070 --> 00:02:42,319
world's analytical instruments to the

82
00:02:44,949 --> 00:02:44,080
payload of your spacecraft okay so you

83
00:02:47,110 --> 00:02:44,959
can afford to do

84
00:02:49,670 --> 00:02:47,120
analyses of the return samples that

85
00:02:50,869 --> 00:02:49,680
would never happen on the spacecraft

86
00:02:52,390 --> 00:02:50,879
some of the instruments we'll use to

87
00:02:53,509 --> 00:02:52,400
study the return samples are not just

88
00:02:54,949 --> 00:02:53,519

bigger than the spacecraft they're

89
00:02:56,070 --> 00:02:54,959
bigger than the launch pad the

90
00:02:59,589 --> 00:02:56,080
spacecraft

91
00:03:01,910 --> 00:02:59,599
left from that will allow us to

92
00:03:03,990 --> 00:03:01,920
take a portion of the asteroid and

93
00:03:06,550 --> 00:03:04,000
really dig deep into what's there

94
00:03:07,670 --> 00:03:06,560
and then because we have the global data

95
00:03:09,190 --> 00:03:07,680
from the in-situ

96
00:03:10,630 --> 00:03:09,200
instruments we can then put all that

97
00:03:12,550 --> 00:03:10,640
information in the context of the

98
00:03:16,149 --> 00:03:12,560
asteroid as a whole

99
00:03:17,910 --> 00:03:16,159
60 grams of sample isn't bounty

100
00:03:20,070 --> 00:03:17,920
if you look at say the stardust mission

101
00:03:21,190 --> 00:03:20,080
it's brought that maybe a milligram of

102
00:03:24,390 --> 00:03:21,200
material from

103
00:03:27,430 --> 00:03:24,400
comet float two that revolutionized our

104
00:03:31,190 --> 00:03:27,440
understanding of solar system dynamics

105
00:03:34,229 --> 00:03:31,200
and solar system formation so 60 grams

106
00:03:35,190 --> 00:03:34,239
which is our baseline is a huge bounty

107
00:03:38,550 --> 00:03:35,200
for the

108
00:03:40,149 --> 00:03:38,560
chemistry in astrology the most exciting

109
00:03:43,190 --> 00:03:40,159
aspect of this mission

110
00:03:46,070 --> 00:03:43,200
is that when we collect the sample

111
00:03:47,350 --> 00:03:46,080
75 of this is archived for future

112
00:03:50,070 --> 00:03:47,360
generation

113
00:03:50,789 --> 00:03:50,080

so samples will be studied by people not

114
00:03:53,910 --> 00:03:50,799
yet born

115
00:03:55,830 --> 00:03:53,920
using techniques not yet invented to

116
00:03:58,550 --> 00:03:55,840
answer questions not yet asked

117
00:03:59,509 --> 00:03:58,560
people who are in school now can make

118
00:04:01,429 --> 00:03:59,519
life choices

119
00:04:02,789 --> 00:04:01,439
to enable them to study the samples and

120
00:04:04,149 --> 00:04:02,799
ask questions that

121
00:04:06,390 --> 00:04:04,159
you just can't think of today or just

122
00:04:10,149 --> 00:04:06,400
don't have the ability to look at home

123
00:04:12,070 --> 00:04:10,159
it's just hard to overstate the power

124
00:04:14,149 --> 00:04:12,080
the scientific power you get out of this

125
00:04:17,509 --> 00:04:14,159
this is why missions like osiris-rex

126
00:04:19,749 --> 00:04:17,519
are just so powerful is because mission

127
00:04:21,110 --> 00:04:19,759
gives you a legacy that just extends on

128
00:04:24,510 --> 00:04:21,120
into the future

129
00:04:26,390 --> 00:04:24,520
and never really ends visit

130
00:04:28,070 --> 00:04:26,400
asteroidmission.org to learn more about

131
00:04:44,020 --> 00:04:28,080
the osiris-rex mission