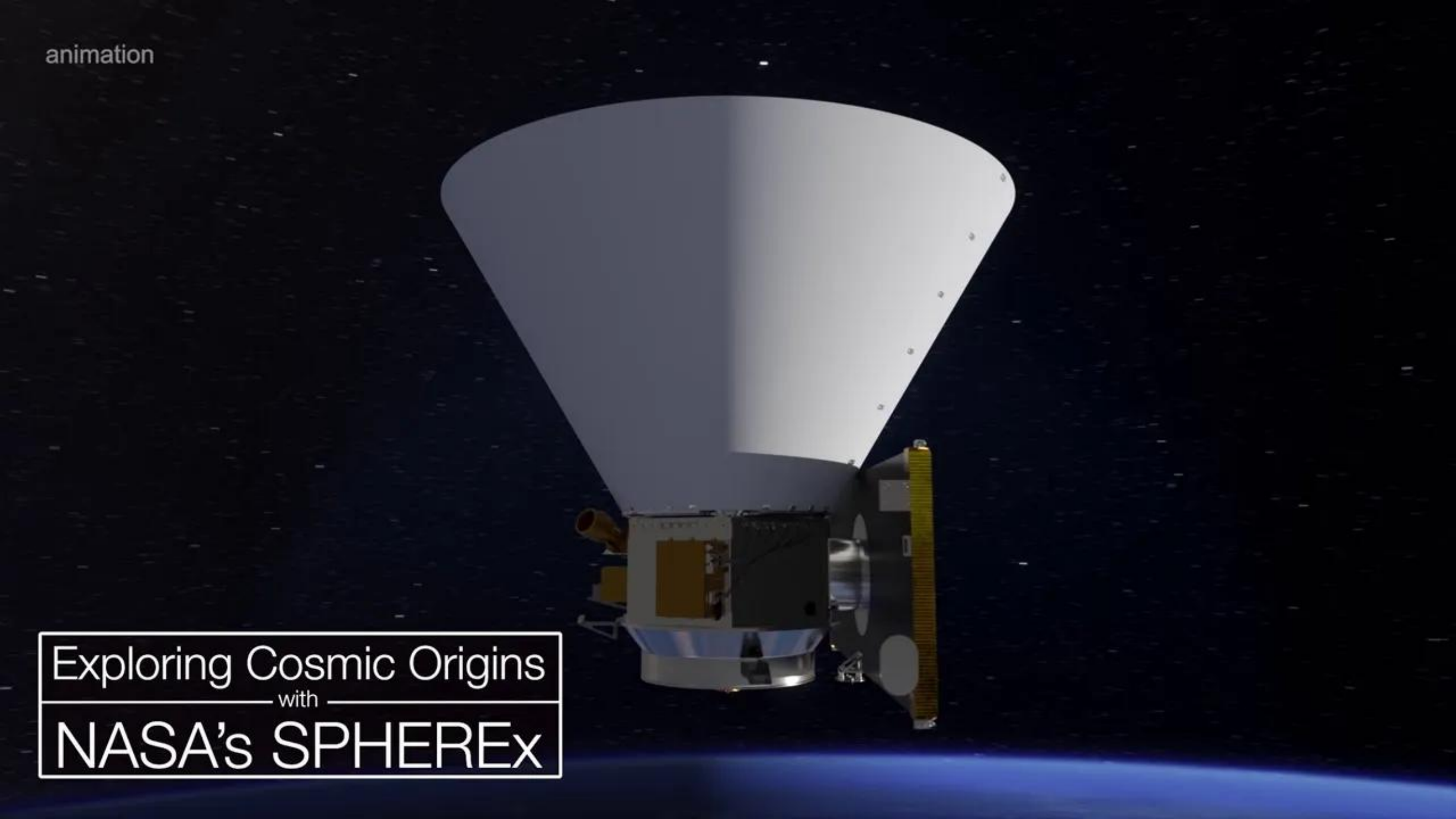
animation
Exploring Cosmic Origins
with
NASA's SPHEREx

1
00:00:07,829 --> 00:00:05,030
[Music]

2
00:00:10,230 --> 00:00:07,839
spherics is nasa's latest explorer

3
00:00:12,150 --> 00:00:10,240
mission in astrophysics it's a small

4
00:00:13,669 --> 00:00:12,160
telescope but it has this unique and

5
00:00:15,990 --> 00:00:13,679
powerful capability of doing

6
00:00:18,710 --> 00:00:16,000
spectroscopy everywhere we are going to

7
00:00:21,109 --> 00:00:18,720
survey the entire celestial sphere and

8
00:00:23,590 --> 00:00:21,119
collect a data set that will help us

9
00:00:25,269 --> 00:00:23,600
answer three fundamental science

10
00:00:27,910 --> 00:00:25,279
questions it's going to tell us about

11
00:00:30,710 --> 00:00:27,920
the origin of the universe the birth and

12
00:00:33,510 --> 00:00:30,720
formation history of galaxies and the

13
00:00:36,229 --> 00:00:33,520

abundance of essential molecules such as

14
00:00:38,470 --> 00:00:36,239
water in the early stages of star and

15
00:00:41,270 --> 00:00:38,480
planet formation the great thing about

16
00:00:42,709 --> 00:00:41,280
spherex is not only will we view the

17
00:00:44,869 --> 00:00:42,719
entire sky

18
00:00:47,350 --> 00:00:44,879
four times but we will see it in nearly

19
00:00:49,350 --> 00:00:47,360
a hundred near infrared colors and

20
00:00:51,029 --> 00:00:49,360
that's really never been done before

21
00:00:53,350 --> 00:00:51,039
[Music]

22
00:00:55,110 --> 00:00:53,360
according to our current understanding

23
00:00:56,310 --> 00:00:55,120
of the universe we think

24
00:00:58,150 --> 00:00:56,320
that in

25
00:01:00,389 --> 00:00:58,160
the very earliest times and i'm talking

26
00:01:02,389 --> 00:01:00,399
here a fraction of a second uh much less

27
00:01:04,469 --> 00:01:02,399
than a nanosecond the universe appeared

28
00:01:07,350 --> 00:01:04,479
to have gone through an accelerating

29
00:01:09,510 --> 00:01:07,360
expansion called inflation and this is

30
00:01:11,910 --> 00:01:09,520
really a profound

31
00:01:14,789 --> 00:01:11,920
idea and we're very interested to to

32
00:01:17,429 --> 00:01:14,799
test it and so one way to do this is to

33
00:01:19,670 --> 00:01:17,439
look at how matter is distributed over

34
00:01:22,230 --> 00:01:19,680
the universe we want to map hundreds of

35
00:01:23,990 --> 00:01:22,240
millions of galaxies in three dimensions

36
00:01:26,310 --> 00:01:24,000
what spherics does in addition to

37
00:01:28,230 --> 00:01:26,320
mapping out all these galaxies is we

38
00:01:30,630 --> 00:01:28,240

cover the whole sky so we can measure

39
00:01:32,469 --> 00:01:30,640
these galaxies over the largest part of

40
00:01:34,789 --> 00:01:32,479
the range we can see which is the entire

41
00:01:36,789 --> 00:01:34,799
sky and we want to cover the full range

42
00:01:39,510 --> 00:01:36,799
of distances from today to as far back

43
00:01:41,109 --> 00:01:39,520
as we we can see

44
00:01:44,389 --> 00:01:41,119
we know there are about 100 billion

45
00:01:46,310 --> 00:01:44,399
galaxies in the universe maybe more but

46
00:01:48,469 --> 00:01:46,320
we still don't have a good understanding

47
00:01:50,550 --> 00:01:48,479
how these galaxies came to be

48
00:01:53,350 --> 00:01:50,560
did they all form at the same time did

49
00:01:55,350 --> 00:01:53,360
they change in size and luminosity or

50
00:01:57,429 --> 00:01:55,360
brightness over time

51
00:01:58,709 --> 00:01:57,439
so the intent with spherex is for us to

52
00:02:01,270 --> 00:01:58,719
figure out

53
00:02:03,270 --> 00:02:01,280
the formation history of galaxies where

54
00:02:05,510 --> 00:02:03,280
do they exactly form and how do they

55
00:02:07,429 --> 00:02:05,520
grow over cosmic time and that

56
00:02:09,190 --> 00:02:07,439
information is crucial for us because

57
00:02:12,470 --> 00:02:09,200
that will allow us to

58
00:02:14,710 --> 00:02:12,480
separate various theories we right have

59
00:02:17,190 --> 00:02:14,720
right now on the formation and growth of

60
00:02:19,670 --> 00:02:17,200
galaxies

61
00:02:22,949 --> 00:02:19,680
every day we all

62
00:02:24,550 --> 00:02:22,959
pick up a bottle of water and we drink

63
00:02:25,350 --> 00:02:24,560

it without thinking

64
00:02:29,270 --> 00:02:25,360
but

65
00:02:31,030 --> 00:02:29,280
to scientists we still don't understand

66
00:02:32,869 --> 00:02:31,040
how this water

67
00:02:35,670 --> 00:02:32,879
arrived at earth

68
00:02:38,470 --> 00:02:35,680
where was it formed how did it get here

69
00:02:40,710 --> 00:02:38,480
and this is an area in which spherex

70
00:02:43,910 --> 00:02:40,720
will make major strides

71
00:02:45,589 --> 00:02:43,920
water molecules bounce around in

72
00:02:48,949 --> 00:02:45,599
interstellar space

73
00:02:52,309 --> 00:02:48,959
and every once in a while they will

74
00:02:55,270 --> 00:02:52,319
impact a small dust grain when a water

75
00:02:56,309 --> 00:02:55,280
molecule collides with one of these dust

76
00:02:58,869 --> 00:02:56,319
grains

77
00:03:01,270 --> 00:02:58,879
it freezes on the surface it doesn't

78
00:03:05,270 --> 00:03:01,280
leave the surface and these ice covered

79
00:03:07,910 --> 00:03:05,280
dust grains participate in the collapse

80
00:03:09,030 --> 00:03:07,920
to form regions where new planets are

81
00:03:12,149 --> 00:03:09,040
formed

82
00:03:14,309 --> 00:03:12,159
spherex for the first time will allow us

83
00:03:16,070 --> 00:03:14,319
to directly measure not just the

84
00:03:18,470 --> 00:03:16,080
location of

85
00:03:21,350 --> 00:03:18,480
these key ingredients but the abundances

86
00:03:24,309 --> 00:03:21,360
of these key ingredients

87
00:03:26,550 --> 00:03:24,319
we expect to have spectra of

88
00:03:28,630 --> 00:03:26,560

of order half a billion galaxies

89
00:03:31,509 --> 00:03:28,640
hundreds of millions of stars

90
00:03:34,229 --> 00:03:31,519
we will really see anything that is

91
00:03:37,030 --> 00:03:34,239
observable in your infrared and that's a

92
00:03:39,110 --> 00:03:37,040
lot of things and so we can expect some

93
00:03:40,789 --> 00:03:39,120
exciting and unusual discoveries that

94
00:03:43,110 --> 00:03:40,799
come from this

95
00:03:45,270 --> 00:03:43,120
spherics is a nice complement to future

96
00:03:47,589 --> 00:03:45,280
telescopes such as the james webb space

97
00:03:49,509 --> 00:03:47,599
telescope with the fantastic spatial and