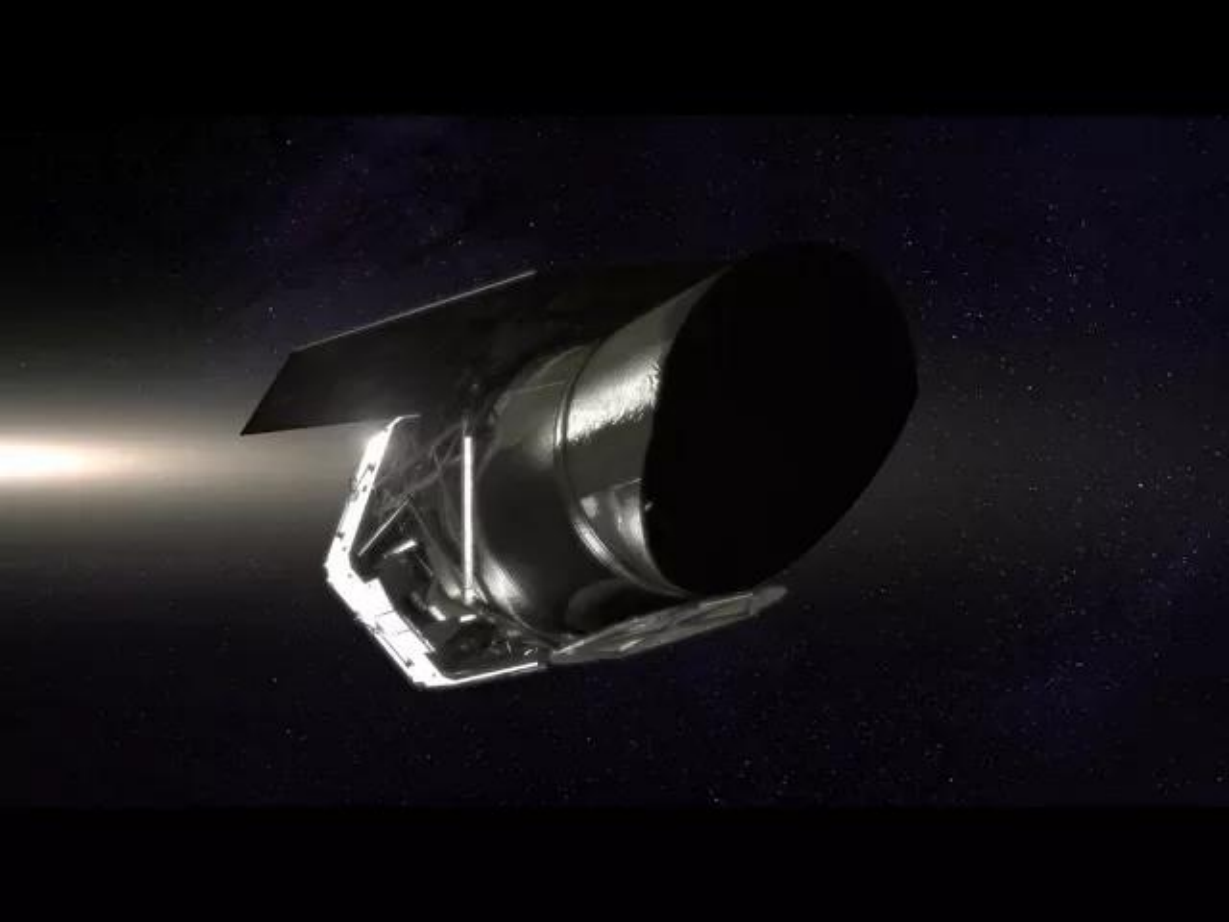

1
00:00:00,020 --> 00:00:04,050
■Music■

2
00:00:04,050 --> 00:00:08,090
Narrator: The universe. For all we have

3
00:00:08,090 --> 00:00:12,150
learned about it, we have still only scratched the surface.

4
00:00:12,150 --> 00:00:16,230
Everything that we can see around us makes up less than

5
00:00:16,230 --> 00:00:20,340
5 percent of what's actually out there.

6
00:00:20,340 --> 00:00:24,440
All the rest is called dark matter and dark energy. What are they?

7
00:00:24,440 --> 00:00:28,490
We still don't know, even thought they determine the fate

8
00:00:28,490 --> 00:00:32,560
of the universe. We have confirmed over

9
00:00:32,560 --> 00:00:36,620
3,000 planets orbiting stars other than the Sun, but most of these

10
00:00:36,620 --> 00:00:40,660
extrasolar planets are huge, and very close to their host

11
00:00:40,660 --> 00:00:44,690
star. How common are planetary arrangements like our own?

12
00:00:44,690 --> 00:00:48,720
And how many planets in our galaxy have the potential to harbor life?

13
00:00:48,720 --> 00:00:52,730

These fundamental questions are

14
00:00:52,730 --> 00:00:56,750
part of what drives NASA science, and they spur the development

15
00:00:56,750 --> 00:01:00,810
of new space observatories. WFIRST,

16
00:01:00,810 --> 00:01:04,900
the Wide Field Infrared Survey Telescope, is one of these.

17
00:01:04,900 --> 00:01:08,930
WFIRST is built on an existing telescope

18
00:01:08,930 --> 00:01:12,980
that is very similar to Hubble, but with the added benefit of

19
00:01:12,980 --> 00:01:16,990
25 years of technological development. Each of the

20
00:01:16,990 --> 00:01:21,030
Wide Field Instrument's images will have the depth and clarity of Hubble,

21
00:01:21,030 --> 00:01:25,120
but cover a sky area 100 times larger.

22
00:01:25,120 --> 00:01:29,220
That's thanks to an arrangement of 18 sensors in the camera to

23
00:01:29,220 --> 00:01:33,280
Hubble's one. Viewing the sky in infrared wavelengths

24
00:01:33,280 --> 00:01:37,350
allows astronomers to see relatively cool objects,

25
00:01:37,350 --> 00:01:41,450
like interstellar gas, dust and exoplanets,

26
00:01:41,450 --> 00:01:45,480
as well as stars.

27
00:01:45,480 --> 00:01:49,510
WFIRST will lead the push to understand

28
00:01:49,510 --> 00:01:53,590
dark energy, a mysterious pressure that is making

29
00:01:53,590 --> 00:01:57,650
the universe expand ever faster. Dark energy makes

30
00:01:57,650 --> 00:02:01,750
up 68 percent of the cosmos, and its properties--

31
00:02:01,750 --> 00:02:05,760
whatever they are--determine the fate of the universe.

32
00:02:05,760 --> 00:02:09,870
But no one knows what it is, or exactly how it behaves.

33
00:02:09,870 --> 00:02:13,940
Another mysterious component of the

34
00:02:13,940 --> 00:02:18,030
universe WFIRST will study is dark matter. Dark matter

35
00:02:18,030 --> 00:02:22,120
accounts for 27 percent of the cosmos--5 times

36
00:02:22,120 --> 00:02:26,280
as much as the matter we can see--but has remained invisible to us.

37
00:02:26,280 --> 00:02:30,320
We can detect it by seeing how its gravity warps

38
00:02:30,320 --> 00:02:34,380

light from distant galaxies, a process called

39
00:02:34,380 --> 00:02:38,490
gravitational lensing. WFIRST's powerful

40
00:02:38,490 --> 00:02:42,500
2.4 meter telescope will also help us in the search for

41
00:02:42,500 --> 00:02:46,600
extrasolar planets, or exoplanets. Using the

42
00:02:46,600 --> 00:02:50,660
same gravitational lensing principles, WFIRST will

43
00:02:50,660 --> 00:02:54,710
watch for so-called 'gravitational microlensing events',

44
00:02:54,710 --> 00:02:58,790
a unique light signature caused when a planet and its host star

45
00:02:58,790 --> 00:03:02,830
pass in front of a background star. This technique

46
00:03:02,830 --> 00:03:06,930
extends planet-detection capabilities to smaller and more distant

47
00:03:06,930 --> 00:03:10,980
worlds than other methods, so it can catch ones that have

48
00:03:10,980 --> 00:03:15,030
eluded us before. WFIRST's enormous field

49
00:03:15,030 --> 00:03:19,130
of view will allow scientists to watch huge portions

50
00:03:19,130 --> 00:03:23,220
of the Milky Way for these microlensing events. As a result,

51
00:03:23,220 --> 00:03:27,270
they will be able to complete the census of exoplanets

52
00:03:27,270 --> 00:03:31,320
begun by Kepler. To deepen its study

53
00:03:31,320 --> 00:03:35,350
of exoplanets, WFIRST will also be outfitted a

54
00:03:35,350 --> 00:03:39,390
beyond state-of-the-art coronagraph. The coronagraph works

55
00:03:39,390 --> 00:03:43,450
by masking star light to reveal the faint light reflected by any

56
00:03:43,450 --> 00:03:47,520
potential planets. WFIRST's coronagraph

57
00:03:47,520 --> 00:03:51,580
will directly image and analyze Neptune-size planets

58
00:03:51,580 --> 00:03:55,640
in orbits slightly greater than Earth's. Existing coronagraphs

59
00:03:55,640 --> 00:03:59,690
can only image larger planets that are much more distant

60
00:03:59,690 --> 00:04:03,740
form their host stars, so this new capability

61
00:04:03,740 --> 00:04:07,850
represents a dramatic improvement. In order to make

62
00:04:07,850 --> 00:04:11,900
all these measurements, WFIRST will move to nearly

63
00:04:11,900 --> 00:04:15,970

1 million miles from Earth and orbit a special area of space

64
00:04:15,970 --> 00:04:20,030
called a Lagrange point. This particular point,

65
00:04:20,030 --> 00:04:24,120
called Earth-Sun L2, is one of several locations

66
00:04:24,120 --> 00:04:28,160
where the combined gravitational effects of the Sun and Earth, create a

67
00:04:28,160 --> 00:04:32,210
zone of stability where a spacecraft can pace Earth as it orbits.

68
00:04:32,210 --> 00:04:36,290
WFIRST will be a way to answer many

69
00:04:36,290 --> 00:04:40,390
of the biggest questions about the universe. Questions like

70
00:04:40,390 --> 00:04:44,420
"how does the universe work?" and "are we alone?"

71
00:04:44,420 --> 00:04:48,470
Its wide-field view and coronagraph will compliment

72
00:04:48,470 --> 00:04:52,520
missions like the James Webb Space Telescope and the

73
00:04:52,520 --> 00:04:56,580
Transiting Exoplanet Survey Satellite, TESS.

74
00:04:56,580 --> 00:05:00,630
WFIRST will be an indispensable part of space science

75
00:05:00,630 --> 00:05:04,680
during the next decade and beyond.