
HUBBLE SCIENCE
EXOPLANETS
Alien Atmospheres

1
00:00:19,990 --> 00:00:17,510
exoplanets are very difficult to detect

2
00:00:25,349 --> 00:00:20,000
because they are tiny little objects

3
00:00:32,389 --> 00:00:28,550
other telescopes are designed to be

4
00:00:35,510 --> 00:00:32,399
better detectors of exoplanets

5
00:00:37,750 --> 00:00:35,520
but what hubble is used for is to find

6
00:00:40,260 --> 00:00:37,760
for some of them the atmospheric

7
00:00:41,510 --> 00:00:40,270
composition of these exoplanets

8
00:00:43,510 --> 00:00:41,520
[Music]

9
00:00:45,830 --> 00:00:43,520
it has to be a system that just by

10
00:00:48,470 --> 00:00:45,840
chance has to be aligned so that the

11
00:00:50,869 --> 00:00:48,480
planet is orbiting its star

12
00:00:56,510 --> 00:00:50,879
along the line of sight of the hubble

13
00:00:59,270 --> 00:00:57,670

[Music]

14
00:01:00,709 --> 00:00:59,280
for doing a lot of the exoplanet

15
00:01:03,189 --> 00:01:00,719
observations you have to catch what's

16
00:01:05,590 --> 00:01:03,199
known as a transit one the orbit of the

17
00:01:07,670 --> 00:01:05,600
exoplanet has to be such that it's going

18
00:01:10,789 --> 00:01:07,680
to go between you and the star it's

19
00:01:14,469 --> 00:01:12,469
and then you have to do the timing we

20
00:01:15,990 --> 00:01:14,479
can't just do an exoplanet observation

21
00:01:18,070 --> 00:01:16,000
whenever we want or whenever it's

22
00:01:20,230 --> 00:01:18,080
convenient we have to do an exoplanet

23
00:01:21,830 --> 00:01:20,240
observation when it's first starting to

24
00:01:23,990 --> 00:01:21,840
go into the star

25
00:01:25,749 --> 00:01:24,000
so they have to know very accurately the

26
00:01:27,270 --> 00:01:25,759
timing of that we have to schedule it

27
00:01:28,870 --> 00:01:27,280
ahead of time this is not something that

28
00:01:31,350 --> 00:01:28,880
you know hubble can get around to when

29
00:01:33,350 --> 00:01:31,360
it wants to we have to say no at this

30
00:01:34,550 --> 00:01:33,360
point in time on this date you have to

31
00:01:38,630 --> 00:01:34,560
be pointed here and you have to be

32
00:01:43,030 --> 00:01:40,550
when that planet passes in front of its

33
00:01:45,270 --> 00:01:43,040
star the starlight some of it is blocked

34
00:01:46,789 --> 00:01:45,280
by the planet but some of it comes

35
00:01:49,270 --> 00:01:46,799
through the outer

36
00:01:51,670 --> 00:01:49,280
ridge the outer rims of the atmosphere

37
00:01:53,190 --> 00:01:51,680
of that planet on its way to the hubble

38
00:01:55,429 --> 00:01:53,200

telescope

39
00:01:57,749 --> 00:01:55,439
some of that light is absorbed by

40
00:02:00,709 --> 00:01:57,759
whatever is in that atmosphere

41
00:02:03,270 --> 00:02:00,719
and it is absorbed at very particular

42
00:02:05,429 --> 00:02:03,280
frequencies that correspond to the atoms

43
00:02:07,590 --> 00:02:05,439
and molecules that are in the atmosphere

44
00:02:09,589 --> 00:02:07,600
of that exoplanet then when the hubble

45
00:02:12,070 --> 00:02:09,599
telescope receives that light and we

46
00:02:13,910 --> 00:02:12,080
take it in usually with a spectrograph

47
00:02:16,229 --> 00:02:13,920
we get the light we spread it out into

48
00:02:18,070 --> 00:02:16,239
its constituent colors or wavelengths of

49
00:02:21,110 --> 00:02:18,080
light and we can tell which of those

50
00:02:24,150 --> 00:02:21,120
wavelengths have been absorbed and that

51
00:02:26,550 --> 00:02:24,160
tells us by the pattern of spectroscopy

52
00:02:28,150 --> 00:02:26,560
what are the elements and molecules that

53
00:02:30,630 --> 00:02:28,160
are found in the atmosphere of that

54
00:02:33,830 --> 00:02:30,640
planet hubble has detected things like

55
00:02:37,190 --> 00:02:33,840
sodium and hydrogen and even evidence of

56
00:02:39,830 --> 00:02:37,200
methane and water vapor by using transit

57
00:02:41,910 --> 00:02:39,840
observations of exoplanets and measuring

58
00:02:43,990 --> 00:02:41,920
not only that composition but also the

59
00:02:45,990 --> 00:02:44,000
height of the atmosphere which can tell

60
00:02:47,430 --> 00:02:46,000
us something about how heavy the

61
00:02:51,270 --> 00:02:47,440
atmosphere is and that tells us

62
00:02:53,509 --> 00:02:51,280
something about its composition as well

63
00:02:55,589 --> 00:02:53,519

hubble was the pioneer in doing that and

64
00:02:57,670 --> 00:02:55,599
now other observatories are also using