
The Hubble Deep Field
Looking Back In Time

1
00:00:23,189 --> 00:00:15,790
[Music]

2
00:00:27,589 --> 00:00:25,990
the hubble space telescope is

3
00:00:29,750 --> 00:00:27,599
an outstanding

4
00:00:32,069 --> 00:00:29,760
time machine in a sense

5
00:00:35,270 --> 00:00:32,079
because of course in astronomy anything

6
00:00:37,830 --> 00:00:35,280
we look at in space we're seeing it as

7
00:00:40,549 --> 00:00:37,840
it was when the light from that object

8
00:00:42,470 --> 00:00:40,559
be it a planet a star or a galaxy began

9
00:00:43,750 --> 00:00:42,480
its journey to us

10
00:00:45,830 --> 00:00:43,760
now

11
00:00:47,029 --> 00:00:45,840
normally we don't really think about

12
00:00:48,310 --> 00:00:47,039
that when we're just looking at the

13
00:00:50,630 --> 00:00:48,320

night sky

14
00:00:52,630 --> 00:00:50,640
but it's incredibly important for our

15
00:00:55,189 --> 00:00:52,640
studies with the hubble space telescope

16
00:00:58,549 --> 00:00:55,199
to realize that when we're looking at

17
00:01:00,709 --> 00:00:58,559
a galaxy we're seeing it as it was

18
00:01:02,869 --> 00:01:00,719
millions of years ago sometimes billions

19
00:01:36,870 --> 00:01:02,879
of years ago it's taken that long for

20
00:01:40,390 --> 00:01:38,710
one of the neat things about the hubble

21
00:01:42,550 --> 00:01:40,400
ultra deep field and one of the things

22
00:01:44,789 --> 00:01:42,560
that made it so unique was how long it

23
00:01:46,389 --> 00:01:44,799
took us to take that image there's an

24
00:01:48,870 --> 00:01:46,399
exposure time that's expressed i think

25
00:01:50,950 --> 00:01:48,880
it's 11.2 days it's a very very long

26
00:01:53,510 --> 00:01:50,960
exposure time but probably what's more

27
00:01:54,670 --> 00:01:53,520
important is how many orbits it took us

28
00:01:57,749 --> 00:01:54,680
to do that

29
00:02:00,870 --> 00:01:57,759
400 orbits of hubble data to take that

30
00:02:02,709 --> 00:02:00,880
image that's a lot of orbits it was a

31
00:02:06,149 --> 00:02:02,719
lot of hubble time you only get 15

32
00:02:07,910 --> 00:02:06,159
orbits a day to take 400 orbits and say

33
00:02:10,790 --> 00:02:07,920
we're going to observe this one spot in

34
00:02:12,470 --> 00:02:10,800
the sky for 400 orbits and i think the

35
00:02:15,830 --> 00:02:12,480
results from the science i mean was

36
00:02:18,150 --> 00:02:15,840
amazing what they saw was spectacular

37
00:02:20,150 --> 00:02:18,160
we see some of the faintest objects

38
00:02:23,750 --> 00:02:20,160

showing up in these images and those

39
00:02:26,229 --> 00:02:23,760
faint objects are often distant galaxies

40
00:02:27,190 --> 00:02:26,239
these deep fields have revealed visually

41
00:02:29,750 --> 00:02:27,200
to us

42
00:02:31,589 --> 00:02:29,760
a universe absolutely teeming with

43
00:02:34,309 --> 00:02:31,599
galaxies hundreds of billions of

44
00:02:35,190 --> 00:02:34,319
galaxies in one deep field alone we can

45
00:02:37,270 --> 00:02:35,200
see

46
00:02:39,750 --> 00:02:37,280
a thousand of these little smudges of

47
00:02:42,470 --> 00:02:39,760
light which are distant galaxies by

48
00:02:44,309 --> 00:02:42,480
doing that we can compare galaxies that

49
00:02:47,030 --> 00:02:44,319
are shining to us

50
00:02:49,350 --> 00:02:47,040
from billions of light years away with

51
00:02:51,990 --> 00:02:49,360
galaxies closer to us or even to our own

52
00:02:53,190 --> 00:02:52,000
milky way and see if they're similar or

53
00:02:55,509 --> 00:02:53,200
different

54
00:02:58,390 --> 00:02:55,519
what hubble has revealed is that the

55
00:03:01,110 --> 00:02:58,400
universe has in fact changed over these

56
00:03:03,509 --> 00:03:01,120
billions of years of time

57
00:03:06,470 --> 00:03:03,519
we looked at the darkest part of the sky

58
00:03:08,869 --> 00:03:06,480
very small part of that and we were

59
00:03:10,949 --> 00:03:08,879
amazed at how many galaxies we found and

60
00:03:12,229 --> 00:03:10,959
we continue to go back to that portion

61
00:03:13,589 --> 00:03:12,239
of the sky

62
00:03:17,430 --> 00:03:13,599
to even

63
00:03:19,830 --> 00:03:17,440

increase that visibility and we've seen

64
00:03:21,670 --> 00:03:19,840
tens of thousands of galaxies just it's

65
00:03:23,509 --> 00:03:21,680
amazing

66
00:03:26,149 --> 00:03:23,519
hubble spent two weeks taking pictures

67
00:03:27,589 --> 00:03:26,159
of empty places in sky and they saw they

68
00:03:29,509 --> 00:03:27,599
weren't empty at all they were thousands

69
00:03:31,190 --> 00:03:29,519
and thousands of galaxies in astronomy

70
00:03:32,630 --> 00:03:31,200
there's what we knew before hubble and

71
00:03:34,550 --> 00:03:32,640
now there's what we know after hubble

72
00:03:37,350 --> 00:03:34,560
they're so different basically every

73
00:03:38,630 --> 00:03:37,360
page of an astronomy textbook now says

74
00:03:41,350 --> 00:03:38,640
something about

75
00:03:43,830 --> 00:03:41,360
discoveries made with hubble every page

76
00:03:45,990 --> 00:03:43,840
hubble has given us this picture of the

77
00:03:48,309 --> 00:03:46,000
universe evolving over billions of years

78
00:03:49,589 --> 00:03:48,319
of time into a place where now we have

79
00:03:52,710 --> 00:03:49,599
galaxies

80
00:03:55,429 --> 00:03:52,720
with plenty of stars and interesting

81
00:03:56,309 --> 00:03:55,439
chemical makeup so this is something

82
00:03:58,070 --> 00:03:56,319
that

83
00:04:06,550 --> 00:03:58,080
i'm grateful to the hubble space